Text Books:
Rayleigh-based optical reflectometry
M. Wuilpart

An Introduction to Distributed optical fibre sensors
Arthur H. Hartog
CRC Press

Fiber Optic Sensors
Ericc Udd, William B. Spillman
Wiley

Fiber Optic Test and Measurement
Chapter 4: Wavelength Meters
Chapter 5: High Resolution Optical Frequency Analysis
Chapter 10: Optical Reflectometry for Component Characterization
Chapter 11: OTDRs and Backscatter Measurements
D. Derickson
HP Company
Prentice Hall

Scientific articles:

An Overview of the Recent Advances in FBG-Assisted Phase-Sensitive OTDR Technique and its Applications
K Yüksel, J Jason, EB Kocal, MLA Sainz, M Wuilpart
2020 22nd International Conference on Transparent Optical Networks (ICTON), 1-7

A comprehensive study of optical fiber acoustic sensing
Y. Wang et al.,
IEEE Access, 2017
10.1109/ACCESS.2019.2924736

Distributed Fiber-optic sensors for vibration detection,
Xin Liu,
Sensors 2016, 16, 1164

Distributed fiber sensor and machine learning data analytics for pipeline protection against extrinsic intrusions and intrinsic corrosions

Recent progress in the performance enhancement of phase-sensitive OTDR vibration sensing systems,
Romain Zinsou,
Sensors, 2019, 19, 1709
Towards a Uniform Metrological Assessment of Grating-Based Optical Fiber Sensors: From Refractometers to Biosensors
Francesco Chiavaioli et al.,
Biosensors 2017, 7, 23; doi:10.3390/bios7020023

A Simple All-Optical Water Level Monitoring System Based on Wavelength Division Multiplexing with an Arrayed Waveguide Grating
Sensors 2019, 19, 3095; doi:10.3390/s19143095

Discrimination of chemicals via refractive index by EF-FLRD
Alim Yolalmaz

Grading
Project (Presentation and report)……30 %
Simulation Homework………………30 %
Final Exam (written and oral)………40 %

Course coordinator: Dr. Kivlicim Yulesel Aldogan

Contents
1) Introduction & course outline
2) Review of optical fiber technology
   a. Optical fibers
   b. Light sources
   c. Optical detectors
   d. Modulators
   e. Passive devices
3) Intensity-based sensors
   a. Water level measurement
   b. Position detection
   c. Point vibration sensor
4) Fiber Grating Sensors
   a. Fabrication
   b. Modelling of fiber grating sensors
   c. Multi-parameter sensitivity problem
   d. Applications
   e. Future perspectives
5) Distributed FOS
   a. Rayleigh backscatter
   b. Principles of OTDR
   c. Brillouin and Raman scattering
   d. Polarisation concepts (review) and P-OTDR
   e. Photon counting OTDR,Phase-OTDR
   f. Optical Frequency Domain Reflectometry
   g. Distributed vibration sensing (DAS) and its applications.
6) Interferometric FOS
   a. Optical modulators for fiber optic sensors
   b. Mach-Zehnder and Michelson interferometers
   c. Fading issue
   d. Sagnac interferometer and passive ring resonator
   e. Fiber-optic gyroscope
   f. Faraday effect and current sensor

7) Multiplexing of FOS

8) Fiber Optic Biosensors
   a. Sensor classes
   b. Transducer mechanisms
   c. Vital sign monitoring
   d. Biochemical sensing
   e. Plastic fiber optic endoscope
   f. Fiber optic smart bed

Course plan:

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<td>FIBER GRATING SENSORS I (Fabrication, types, multi-parameter sensitivity)</td>
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