In The Name Of GOD

Course: Optics and its Applications in Biomedical Engineering

Field: Biomedical Engineering (PhD)

Credit: 3

Topics:

- Introduction to Light Properties and Definitions (Coherence, Polarization, Abs/Scat/Ext, Diffraction)
- Interaction of Light with Matter (Ray, Wave, Statistics, Fourier, Quantum)
- Tissue Optics and Monte Carlo
- Optical Elements : Sources/Detectors, Monochromators, Gratings - Interferometers
- Fiber Optics (Principles, Theories)
- Laser (Principle, Theories, Types)
- Nonlinear Optics
- Microscopies (Bright, Dark, Phase, DIC, Confocal, Electron)
- Fluorescence (Principles, Microscopy, Confocal)
- Spectroscopies (IR, Raman, UV-Vis)
- Polarization Imaging and Mueller Matrix
- Functional Near Infrared Spectroscopy- IR Imaging
- Holography, OCT
- Biomedical Application of Laser (Photochemical, Photothermal, Photoablation, Plasma-induced ablation)
- Photothermal & Photodynamic Therapies
- Clinical Application of Laser (Ophtalmology, Dermatology, Cardiology, ORL Head-Neck, Urology Neurology, Dentistry).
- Optical Biosensors, Flow Cytometry
- Photoacoustic Techniques
- Computational Modelling and Simulations

References:

- Biomedical Optics: Principles and Imaging: *Wang, Wu*, John Wiley & Sons.
- Laser Fundamentals: *Silfvast*, Cambridge University Press
- Lasers for Medical Applications : Diagnostics, Therapy and Surgery: *Jelinkova*, ELSEVIER SCIENCE & TECHNOLOGY.
- Optical Fluorescence Microscopy: From the Spectral to the Nano Dimension: *Diaspro*, Springer
- Laser-Tissue Interactions Fundamentals and Applications: *Niemz, Markolf*, Springer
- Fourier Optics: *Goodman*, McGgraw Hill
- Biophotonics Optical Science and Engineering for the 21st Century: *Shen, Wijk*, Springer
- Fundamentals of Photonics: *Saleh*, Wiley