

# Biomedical Photonics.

## Syllabus

### 1. Introduction

### 2. Optical Microscopy

2.1 Basic set up: Bright field

2.2 Increase of the contrast by optical techniques: Oblique illumination, Dark field, Phase contrast, Differential interference contrast and Interference reflection microscopy

2.3 Fluorescence microscopy:

2.4 3D imaging: Laser scanning Confocal, multiphoton, light sheet microscopy.

### 3. Effects of Tissue on light

3.1 Tissue optics: absorption, scattering, photon transport theory, models etc.

3.2 Diagnostic techniques

3.2.1 Optical Coherent Tomography (OCT)

3.2.2 Reflectance and fluorescence spectroscopy

3.2.3 Raman spectroscopy

3.2.3 Pulsioximeter and vein-viewer

3.2.4 Optical diffuse Tomography

3.2.5 Photoacoustic imaging

3.2.6 Novel diagnostic techniques

3.3 Simulation (TracePro)

### 4. Effects of absorbed Light on tissue: Laser therapy

4.1 Photothermal effects. Application to surgery and dermatology

4.2 Ablation. Application to refractive surgery

4.3 Photomechanical effects. Application to ophthalmology

4.4 Photochemical effects: Photodynamic therapy. Application in cancer and dermatology

### Evaluation

3 partial exams for each subject (50%) and final exam(50%)

### Bibliography

P. N. Prasad, "Introduction to biophotonics", John Wiley & Sons, Inc., New Jersey, 2003.

Markolf H. Niemz, "Laser-Tissue Interactions", Springer, Berlin, 2007.