

# Exam of the course

## “Biomedical Applications of Mathematics”

### (2015/16)

The student has to choose **one** of the three parts of the course, and do what is there requested.

★ First part: **Roberto Bonmassari** and **Eleuterio F. Toro/Christian Contarino**

The procedures for the exam are described in “BAM-Cardiovascular”; in summary, oral presentation with slides [time: about 15/20 minutes].

★ Second part: **Luciano Bertoldi**

The exam consists in a oral presentation with slides of one of the following topics [time: about 20 minutes ]:

- Biomechanics of the knee

Related papers:

- Masouros et al., (i) Biomechanics of the knee joint, *Orthopaedics and trauma*, 24 (2010), 84–91
- Shenoy et al., (iii) Biomechanics of the knee and TKR, *Orthopaedics and trauma*, 27 (2013), 364–371

- Biomechanics of the shoulder

Related paper:

- Berliner et al., Biomechanics of reverse total shoulder arthroplasty, *J. Shoulder Elbow Surgery*, 24 (2015), 150–160

The quoted papers have to be requested to Prof. Valli

★ Third part: **Nivedita Agarwal**

The exam consists in a oral presentation with slides of one of the following topics [time: about 20 minutes ]:

- Diffusion Tensor Imaging (DTI): theoretical basis for the study of water molecules diffusion in the brain tissue

Related papers:

- Basser et al., Estimation of the effective self-diffusion tensor from the NMR spin echo, *J. Magnetic Resonance (Series B)*, 103 (1994), 247–254
- Basser et al., Diffusion-tensor MRI: theory, experimental design and data analysis. A technical review, *NMR in Biomedicine*, 15 (2002), 456–467
- Mori et al., Fiber tracking: principles and strategies. A technical review, *NMR in Biomedicine*, 15 (2002), 468–480
- Westin et al., Processing and visualization for diffusion tensor MRI, *Medical Image Analysis*, 6 (2002), 93–108

- Functional MRI (fMRI): mapping the brain activity by means of magnetic resonance. From the basis to data analysis

Related papers:

- Ogawa et al., Functional brain mapping by blood oxygenation level-dependent contrast magnetic resonance imaging. A comparison of signal characteristics with a biophysical model, *Biophys. J.*, 64 (1993), 803–812
- Friston et al., Analysis of functional MRI time-series, *Human Brain Mapping*, 1 (1994), 153–171
- Friston et al., Statistical parametric maps in functional imaging: a general linear approach, *Human Brain Mapping*, 2 (1995), 189–210

- Functional connectivity MRI (fCMRI): methods to analyze brain functional connectivity using fMRI

Related papers:

- Lowe et al., Functional connectivity in single and multislice echoplanar imaging using resting state fluctuations, *Neuroimage*, 7 (1998), 119–132
- Li et al., Review of methods for functional brain connectivity detection using fMRI, *Comput. Med. Imaging Graph*, 33 (2009), 131–139

The quoted papers have to be requested to Prof. Valli