

*Project Title:*

## **Developing biomechanical tools for cartilage & arthritis studies**

*Academic Supervisor:*

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*Project Description:*

Arthritis is a musculoskeletal disease affecting around 500 million people worldwide. This disease, which is seen in many forms, is painful though nonfatal, and results in high costs to society. Furthermore, it is difficult to treat and diagnose. Mechanical evaluation of joints is one route to understanding more about the effects of arthritis on function.

In order to measure mechanics of biological systems, we need custom-designed mechanical testing rigs. In this project, the student(s) will design a testing rig for reproducible mechanical testing of joints and soft tissues that can be coupled with imaging devices (microscopes and microCT), so we can link mechanics to structural breakdown.

Various projects are available utilising classical mechanical engineering techniques (device design for mechanical testing, FE modeling of tissue behaviour, biomaterials testing), bioengineering techniques (tissue engineering, 3D microscopy of cellular structures, tissue staining for novel imaging techniques), image processing methods, as well as cutting-edge techniques (synchrotron radiation and ionic contrast imaging).

Depending on the students' backgrounds (biotechnology, biomedical engineering, design, materials science, etc), interests and timeframe, a project can be defined that allows the student to get insight into the broad topic of arthritis research and learn and apply techniques that can be used in this field. Project aims will be adapted to the scientific background of the student.

Tasks

10% literature review & project planning

20% investigation of potential solutions

60% design and proof of concept work

10% report & presentation preparation

Suitable as either a year-long (two semester), a single semester project, or an international internship.

Keywords: mechanical testing; biomaterials; tissue engineering; device development

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