BIOENG-444

Advanced bioengineering methods laboratory

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Cursus	Sem.	Type
Bioengineering	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Withdrawal	Unauthorized
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
Lecture	1 weekly
Exercises	2 weekly
Practical work	1 weekly
Number of positions	**18**

It is not allowed to withdraw from this subject after the registration deadline.

Remark

This year the course is held in an amended format giving more freedom to students to learn plan and perform research

Summary

Advanced Bioengineering Methods Laboratories (ABML) offers laboratory practice and data analysis. These active sessions present a variety of techniques employed in the bioengineering field and matching a quantitative and technological based approach.

Content

Keywords

Atomic force microscopy (AFM), Lab on the chip (LOC) , Brownian motion, Optical trapping , Surface Plasmon Resonance. bioanalytics, surface design, writing scientific papers

Learning Prerequisites

Required courses

Required background: Biophysics I, Biothermodynamics, Biomicroscopy I, + mandatory courses of M1

Learning Outcomes

By the end of the course, the student must be able to:

- Demonstrate oral and written communication skills
- Perform experiments
- Coordinate experiments
- Operate the respective instruments of their assigned exercises
- Compose a convincing research paper describing their research project following the style guides of a letter to Nature

Expected student activities

Beyond the work requested during the supervised sessions (practice and analysis), the student will have to:

- *Read the introduction of each topic before the corresponding practice, and summarize this information in his laboratory notebook.*
- *Review the data analysis tools needed for the analysis sessions and prepare the required calculations ahead of the corresponding analysis session.*
- *Fill the laboratory notebook progressively along the semester.*
- *Develop a research plan for the independent project*
- *Write the research paper*

The workload varies widely with the capabilities of each student. However, we expect, for each of the 6 topics investigated, an approximate working time of

- *2 h : Preparation of the practical session*
- *4 h : Practical session*

Supervision

Office hours	No
Assistants	Yes
Forum	No

Resources

Bibliography

- Handouts given during the course.
- *Intermolecular and Surface Forces, J. Israelachvili, Academic press*
- *Surface Plasmon resonance Based Sensors, J.Homola et al., Springer*
- *Surface Design: Applications in Bioscience and Nanotechnology, R. Forch, H. Schonherr, A.T. Jenkins, Wiley*
- *"Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements," Taylor, John R., 1997, University Science Books,*
- *Optical Trapping Review : K.C. Neuman & S.M. Block, "Optical trapping," Rev. Sci. Instrum. 75 (2003).*
- *Lab on a Chip Technology, Volume 1: Fabrication and Microfluidics, Keith E. Herold and Avraham Rasooly, Caister Academic Press, 2009*
- *Atomic Force Microscopy, Peter Eaton and Paul West, Oxford University Press 2010*

Ressources en bibliothèque

- Intermolecular and Surface Forces / Israelachvili
- Surface Plasmon resonance Based Sensors / Homola
- Surface Design: Applications in Bioscience and Nanotechnology / Forch
- Introduction to Error Analysis / Taylor
- Optical Trapping Review / Neuman
- Lab on a Chip Technology / Herold
- Atomic force microscopy/ Peter Eaton ; Paul West (http://beast-epfl.hosted.exlibrisgroup.com/primo_library/libweb/action/search.do?cs=frb&ct=frb&frbg=&fctN=facet_frbrgr

Ressources en bibliothèque

- Lab on a chip technology / Herold

- Atomic force microscopy / Eaton
- Intermolecular and surface forces / Israelachvili
- An introduction to error analysis : the study of uncertainties in physical measurements / Taylor
- Optical trapping / Neuman
- Surface design : applications in bioscience and nanotechnology / Förch
- Surface plasmon resonance based sensors / Homola

Notes/Handbook

Can be downloaded from
http://lben.epfl.ch/Teaching

Websites

- http://lben.epfl.ch/Teaching