

BIOENG-444

**Advanced bioengineering methods laboratory**

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Cursus	Sem.	Type
Biotechnology and Bioengineering		Obl.
Life Sciences Engineering	MA2, MA4	Opt.

Language of teaching	English
Credits	4
Withdrawal Session	Unauthorized Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
TP	4 weekly
<b>Number of positions</b>	<b>24</b>

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

**Remark**

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

**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

## 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](http://beast-epfl.hosted.exlibrisgroup.com/primo_library/libweb/action/search.do?cs=frb&ct=frb&frbg=&fctN=facet_frbrgr))

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- [Optical Trapping Review / Neuman](#)
- [Surface Plasmon resonance Based Sensors / Homola](#)
- [An introduction to Error Analysis / Taylor](#)
- [Lab on a Chip Technology / Herold](#)
- [Atomic force microscopy/ Peter Eaton ; Paul West](#)
- [Intermolecular and Surface Forces / Israelachvili](#)
- [Surface Design: Applications in Bioscience and Nanotechnology / Förch](#)

### Notes/Handbook

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

### Moodle Link

- <https://go.epfl.ch/BIOENG-444>