

科目ナンバリング							
授業科目名 <英訳>	ILAS Seminar-E2 :Introduction to Engineering in Biology and Medicine (医学の基礎) ILAS Seminar-E2 :Introduction to Engineering in Biology and Medicine			担当者所属 職名・氏名	医生物学研究所 講師 OKEYO , Kennedy Omondi		
群	少人数群	単位数	2単位	週コマ数	1コマ	授業形態	ゼミナール (対面授業科目)
開講年度・ 開講期	2025・前期	受講定員 (1回生定員)	20 (10) 人	配当学年	主として1回生	対象学生	全学向
曜時限	月5	教室	教育院棟演習室21			使用言語	英語
キーワード	Biomedical engineering / Microengineering / Micro/Nano systems / Biomanipulation						
[授業の概要・目的]							
<p>With increasing integration of science and engineering, more and more focus is being placed on multidisciplinary research. Against this background, this seminar will aim at introducing students, in particular first year students, to on-going engineering approaches aimed at understanding and/or solving biological and clinical problems. Discussions will be centered on (biological/clinical) problem identification, hypothesis setting around the problem, discussions on potential engineering solutions and, as may be necessary, experimental verification of the discussed solution.</p>							
[到達目標]							
<p>It is intended that the course will help students develop interest in the development and application of engineering concepts and methods to biology, medicine and health sciences to provide effective solutions to biological, medical and healthcare problems, an important aspect in their growth to becoming next generation leaders.</p>							
[授業計画と内容]							
<p>This seminar will tackle different selected topics related to application of engineering principles and knowledge to solving clinical problems or elucidating known and unknown biological phenomena. Although the topics listed below are wide and varied, discussions will be consistent with the main focus of problem setting and identifying the most appropriate solution to the set problem.</p> <p>1) Engineering in biology at the micro and nano scale and their clinical applications (3 weeks) We will discuss the convergence of biology with micro/nano technology that have enabled the manipulation, analysis and detailed study of living systems including single cells, DNA molecules and other biological materials. Engineering principles behind micro/nano technology will be highlighted and potential clinical applications discussed.</p> <p>2) Introduction to point-of-care diagnostics (3 weeks) Provision of medical care at the bedside of a patient or at home (at the comfort of a patient) is increasingly becoming important in the face of a rapidly aging society. Here we will identify and discuss emerging technologies such as microfluidics/wearable clinical devices that are enabling the realization of point-of-care or personalized medicine.</p> <p>3) Introduction to emerging trends in engineering artificial organs/tissues (3 weeks) Fusion of engineering and biology has made it possible to realize constructs of organs or tissues which mimic the functions of native organs/tissues. One such technology is "organ-on-a-chip" which borrows from the semiconductor technology to fabricate organ or tissues models on a chip for disease modeling and drug development. Here, we will discuss _ _ _</p>							
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emerging trends in fabricating body organs/tissues and highlight the potential applications of this technology in disease modeling, drug development and basic biology.

4) Biochips and their applications (3 weeks)

Biochips are products of micro/nano fabrication which have increasingly found application in cell, DNA and protein analyses for disease diagnosis and drug screening. In this seminar, we will look at specific examples of biochips based on specific application areas such as cell manipulation and DNA analysis.

5) Discussions on the future role of engineering in biology and medicine (3-4 weeks)

We will discuss the importance of multidisciplinary research and highlight emerging technologies such as brainchips, wearable diagnostic devices that are promising to revolutionize traditional medicine, drug discovery, cancer research and personal disease management. On a rotational basis, students will each pick a topic of interest for discussion and presentation. Grading will be based on how well a topic is researched, presented and discussed.

【履修要件】

None in particular. The seminar will be discussion-based, so prior preparation by way of reading about the above topics will be helpful in making the discussions lively.

【成績評価の方法・観点】

Class Presence / Participation 10%, Homework 15%, Midterm Report 25%, Final Report 35%, Final Presentation: 15%

【教科書】

Handouts

【参考書等】

(参考書)

Yoshihiro Ito 『Biochip Technologies-Principles and Applications』 (CMC Books) ISBN:9784781310794
Paul G. Yock and others 『The Process of Innovating Medical Technologies 2nd Edition』 (Biodesign)
ISBN:978-1107087354

【授業外学修（予習・復習）等】

Prior reading of scientific papers on topics to be discussed is recommended to enhance understanding.

【その他（オフィスアワー等）】

To be announced during class. However, questions, suggestions and comments can be posted by email anytime.

【主要授業科目（学部・学科名）】