课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	**蛋白质工程 Protein Engineering**
2.	授课院系 Originating Department	生物系 Department of Biology
3.	课程编号 Course Code	BIO340
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业核心课（生物技术专业） Major Core Courses (Biotechnology Major) 专业选修课（生物科学、生物信息学专业） Major Elective Courses (Biological Sciences, Bioinformatics)
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	英文 English
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation& Contact （For team teaching, please list all instructors）	Peter Pimpl 生物系（Department of Biology） 88018485 pimpl@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment（Optional）	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other（Please specify）	总学时 Total
学时数 Credit Hours	32			Seminar 16	48

12.	先修课程、其它学习要求 **Pre-requisites or Other Academic Requirements**	BIO103 生物学原理 或 BIO102B 生命科学概论 Principles of Biology or Introduction to Life Science
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	None 无
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	None 无

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

内膜系统中蛋白质的分选和转运是真核生物的本质。 了解这些分子原理是未来细胞工程和分子农场的先决条件。 本课程旨在理解 1）细胞内区室的形态和功能以及生物发生 2）用于蛋白质分选和靶向的分选信号 3）囊泡介导的转运 4）分子工程中的标记蛋白标、报告蛋白及传感蛋白 5）纳米抗体介导的蛋白质组装和 6）基于纳米抗体的蛋白质靶向。 每个讲座的主题都会在接下来的一周内通过口头介绍各自对已发表的研究文章进一步深化，每篇文章后面都会简要讨论方法，实验策略和结果。

Sorting and transport of proteins in the endomembrane system is the very essence of eukaryotic life. Understanding of these molecular principles is the prerequisite for cellular engineering and molecular farming approaches in the future, independent of the model organisms used. The course aims at understanding 1) morphology & function and biogenesis of intracellular compartments, 2) sorting signals for protein sorting and targeting, 3) vesicle mediated transport 4) engineering of marker, reporter and sensor proteins, 5) Nanobody-mediated protein assembly and 6) Nanobody-based protein targeting. The lecture topics are deepened in accompanying seminars by oral presentations of respective published research articles by the students, each of which is followed by a short discussion of methods, experimental strategies and results.

16. **预达学习成果 Learning Outcomes**

学生将深入了解产生融合蛋白的基本分子概念，他们将学习标记可溶性蛋白、尾锚定蛋白、I 型和 II 型跨膜蛋白的基本策略，使用传统抗体的表位标记和最近发现的纳米体表位标记。学生将学习设计、表达和纯化用于抗体生产的融合蛋白的基本要求。学生将了解基于纳米体-表位相互作用触发蛋白复合物组装的标记蛋白、报告蛋白和传感器蛋白的产生、使用和特定靶向的分子要求。此外，本课程亦旨在掌握软技能，例如口头报告技巧、演示幻灯片/讲义的设计、对已发表的研究文章的批判性解释/评价，所有这些都是从事科学工作的先决条件。

The students will gain insight into fundamental molecular concepts of generating fusion proteins and they will learn basic strategies for tagging soluble proteins, tail-anchored proteins and type I and type II transmembrane proteins, using epitope tags for conventional antibodies and most recent discovered epitope tags for nanobodies. Students will learn about the basic requirements for designing, expressing and purifying fusion proteins for the the production of antibodies. The students will understand the molecular requirements for the generation, the usage and the specific targeting of marker and reporter and sensor proteins based on nanobody-epitope interaction-triggered assembly of protein complexes. The course aims furthermore at the acquisition of soft skills e.g. oral presentation skills, design of presentation slides/handouts, critical interpretation/evaluation of published research articles, all of which are prerequisites for pursuing a scientific career.

17. **课程内容及教学日历 （如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）**
Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Section 1	Lecture 1: Structure, function & dynamics of the intracellular compartments 2019-2-20	
Section 2	Lecture 2: Protein targeting in the endomembrane system 2019-2-27	
Section 3	**Seminar 1**: Protein targeting in the endomembrane system 2019-3-1	
Section 4	Lecture 3: Protein targeting to mitochondria and plastids 2019-3-6	
Section 5	Lecture 4: Transport vesicles and bi-directional transport systems 2019-3-13	
Section 6	**Seminar 2**: Transport vesicles and bi-directional transport systems 2019-3-15	
Section 7	Lecture 5: Targeting in the early secretory pathway 2019-3-20	
Section 8	Lecture 6: Targeting in the endocytic/lysosomal/vacuolar pathway 2019-3-27	
Section 9	**Seminar 3**: Targeting in the endocytic/lysosomal/vacuolar pathway 2019-3-29	
Section 10	Review session I 2019-4-3	
Section 11	Lecture 7: Generation and use of specific antibodies I 2019-4-10	
Section 12	**Seminar 4**: Generation and use of specific antibodies I 2019-4-12	
Section 13	Lecture 8: Generation and use of specific antibodies II 2019-4-17	
Section 14	Lecture 9: Engineering of molecular marker and reporter proteins I 2019-4-24	
Section 15	**Seminar 5**: Engineering of molecular marker and reporter proteins I 2019-4-26	
Section 16	Lecture 10: Engineering of molecular marker and reporter proteins II 2019-5-3	
Section 17	Lecture 11: Intermolecular protein assembly via nanobodies 2019-5-8	
Section 18	**Seminar 6**: Intermolecular protein assembly via nanobodies 2019-5-10	
Section 19	Lecture 12: Nanobody-based intracellular protein targeting 2019-5-15	
Section 20	Lecture 13: Nanobody-based *in vivo* immunoprecipitation (iVIP) 2019-5-22	
Section 21	**Seminar 7**: Nanobody-based *in vivo* immunoprecipitation (iVIP) 2019-5-24	
Section 22	Review session II 2019-5-29	

18. **教材及其它参考资料 Textbook and Supplementary Readings**

1.Munro, S. (2011). What is the Golgi apparatus, and why are we asking? BMC Biology 9, 63

2.Barlowe, C., and Helenius, A. (2016). Cargo Capture and Bulk Flow in the Early Secretory Pathway. Annu. Rev. Cell Dev. Biol. 32, 197-222

3.Faini, M., Beck, R., Wieland, F.T., and Briggs, J.A. (2013). Vesicle coats: structure, function, and general principles of assembly. Trends Cell Biol. 23, 279-288

4.Giepmans, B.N., Adams, S.R., Ellisman, M.H., and Tsien, R.Y. (2006). The fluorescent toolbox for assessing protein location and function. Science 312, 217-224

5.Dmitriev, O.Y., Lutsenko, S., and Muyldermans, S. (2016). Nanobodies as Probes for Protein Dynamics in Vitro and in Cells. J. Biol. Chem. 291, 3767-3775

Steeland, S., Vandenbroucke, R.E., and Libert, C. (2016). Nanobodies as therapeutics: big opportunities for small antibodies. Drug Discov Today 21, 1076-1113

课程评估 ASSESSMENT

19.

评估形式 **Type of Assessment**	评估时间 **Time**	占考试总成绩百分比 **% of final score**	违纪处罚 **Penalty**	备注 **Notes**
出勤 **Attendance**		10		

课堂表现 Class Performance		20 (口头报告 oral presentation)		
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		30		
期中考试 Mid-Term Test		20		
期末考试 Final Exam				
期末报告 Final Presentation				
其它（可根据需要改写以上评估方式） Others (The above may be modified as necessary)				

20. 记分方式 **GRADING SYSTEM**

☑ A. 十三级等级制 **Letter Grading**
☐ B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. **本课程设置已经过以下责任人/委员会审议通过**
This Course has been approved by the following person or committee of authority

本课程经生物系本科教学指导委员会审议通过。
This Course has been approved by Undergraduate Teaching Steering Committee of Department of Biology.