# 《农业生物技术》课程教学大纲

# Course Outline

<table>
<tr><td colspan="6">课程基本信息（Course Information）</td></tr>
<tr><td>课程代码<br>（Course Code）</td><td>AB028</td><td>*学时<br>（Credit Hours）</td><td>32</td><td>*学分<br>（Credits）</td><td>2</td></tr>
<tr><td rowspan="2">*课程名称<br>（Course Name）</td><td colspan="5">（中文）农业生物技术</td></tr>
<tr><td colspan="5">（English）Agricultural Biotechnologies</td></tr>
<tr><td>课程性质<br>(Course Type)</td><td colspan="5">选修课<br>Elective Course</td></tr>
<tr><td>授课对象<br>（Target Audience）</td><td colspan="5">Open to any SJTU student interested in subject area (specifically Juniors and Seniors majoring in Plant Science)</td></tr>
<tr><td>授课语言<br>(Language of Instruction)</td><td colspan="5">English</td></tr>
<tr><td>*开课院系<br>（School）</td><td colspan="5">School of Agriculture and Biology</td></tr>
<tr><td>先修课程<br>（Prerequisite）</td><td colspan="5">General biology and first year college mathematics</td></tr>
<tr><td>授课教师<br>（Instructor）</td><td colspan="2">Jocelyn Rose 教授<br>教授是美国康奈尔大学植物生物系教授和生物技术中心主任<br>Dan Luo 教授<br>美国康奈尔大学生物与环境工程学院的教授，纳米生物技术中心、康奈尔材料研究中心、生物医学工程与新生命科学计划的成员之一</td><td>课程网址<br>(Course Webpage)</td><td colspan="2"></td></tr>
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| | 赵凌侠教授负责教学实践<br>上海交大农业与生物学院 | | |
| *课程简介<br>（Description） | （中文 300-500 字，含课程性质、主要教学内容、课程教学目标等）<br>本门课程的主要教学内容将包括：纳米生物技术的基本概念以及构建模块,介绍纳米技术与生物技术的相关概念，包括 DNA, RNA,TNA,PNA 等；电子光刻法以及 DNA 计算和 DNA 结构纳米生物技术，从全新的角度认识 DNA；纳米生物技术的运用；植物生物学在现实与未来的需求及其在 21 世纪面临的挑战；植物基因组学、蛋白质组学和代谢组学的进步；植物生物学，基因改造与社会，从社会角度探讨生物新技术的应用及发展；食品的未来：基因型分析与分子育种，植物转化与基因组编辑技术。 | | |
| *课程简介<br>（Description） | **Basic concepts and building blocks.** Nanobiotechnology strides at the interface between nanotechnology and biotechnology. We will introduce the “nano” concept related to nanotechnology and biotechnology, from scales to sizes to energy. We will also cover nanoscale building blocks of life, in particular nucleic acids (including DNA, RNA, TNA, PNA, etc.). We will learn the concepts of polymers, hierarchy assemblies and self-assemblies.<br><br>**Technologies** We will learn photolithography (including microfluidics), which is one of the fundamental tools to realize nanotechnology. We will also learn DNA from an entirely new perspective: as programmable molecules. Examples including DNA computing and DNA structural nanotechnology (e.g., DNA origami).<br><br>**Applications of nanobiotechnology I**: DNA as nanoscale organizers to assemble nanoparticles and as nanoscale scaffolds for novel biosensing and diagnosis.<br><br>**Applications of nanobiotechnology II:** DNA as both generic and generic nanoscale building blocks for the creation of novel materials.<br><br>**Plant biotechnology:** current and future needs and the challenges of the 21st century. Society is facing growing challenges associated with feeding the rapidly expanding global population, while dealing with factors that limit food production, such as climate instability and loss of agricultural land. We will discuss those challenges and identify issues that will limit future food security.<br><br>**Advances in plant genomics, proteomics and metabolomics.** The last decade has seen an explosion in the development of new technologies to study living organisms, and particularly those related to the study of their genomes. This lecture will provide an overview of cutting edge technologies that are used to study plants, crop production and plant genetic diversity.<br><br>**Plant biotechnology, genetic modification and society.** The application of biotechnology to agricultural crop production, and particularly the use of genetic modification technologies is a politically sensitive issue that can be difficult for the | | |

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| | general public to understand. This lecture and discussion section will focus on the related issues of new technologies, food, communication and the sensitivities of society to the nature of the food supply.<br><br>**The future of food:** genotyping and molecular breeding, plant transformation and genome editing technologies.<br><br>Feeding a human population that will likely reach 10 billion over the next few decades will require the development of new types of crops and cropping systems. This lecture will examine current technologies that are being used to create new generations of crops. |
| 课程教学大纲（Course – Syllabus） | |
| *学习目标(Learning Outcomes) | 1. The student will be able to identify, evaluate and discuss major factors that will limit global crop production over the coming decades.(B1,B2)<br><br>2. The student will be able to identify and evaluate 'omics' technologies that are being used to study plant biological processes and diversity.(A5 2.1,A5.2.2)<br><br>3. The student will be able to identify and evaluate arguments that are used both for and against the use of genetically modified crops and their application to enhance food security.V(B3,B9,C3,C4,C7)<br><br>4．The student will be able to identify and evaluate biotechnologies and strategies that are being used to develop new crops and plant products that benefit society.(A3,A5,B2,B3,B9,C7)<br><br>5. The students will understand the importance of sizes when down to the nanoscale; different sets of physical rules start to govern the behavior of objects. Students will also grasp the concept of movement at the nanoscale related to diffusion and energy.(A5,A5.2,A5.2.1)<br><br>6. The students will learn the concept that DNA is not only a genetic biomaterial but also a generic nanomaterial. (B3)<br><br>7. The students will gain knowledge of several fundamental tools related to nanobiotechnology. (B7,B10,C3,C7)<br><br>8. The students will be exposed to real world applications of nanobiotechnology.(C3,C4,C7) |
| *教学内容<br><br>进度安排及要求 | |

| 教学内容<br>Content | 学时<br>Credit | 教学方式<br>method | 作业及要求<br>Assignment &requireme | 基本要求<br>Basic requiremen | 考查方式<br>Examination |
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| (Class Schedule & Requirements) | | hours | | nt | t | |
| | Plant biotechnology: current and future needs and the challenges of the 21st century | 4 | Lectures & Discussions | Reading of assigned materials and participation in discussion | Homework after each lecture | Covered by a final exam |
| | Advances in plant genomics, proteomics and metabolomics | 4 | Lectures & Discussions | Reading of assigned materials and participation in discussion | Homework after each lecture | Covered by a final exam |
| | Plant biotechnology, genetic modification and society | 4 | Lectures & Discussions | Reading of assigned materials and participation in discussion | Homework after each lecture | Covered by a final exam |
| | The future of food: genotyping and molecular breeding, plant transformation and genome editing technologies | 4 | Lectures & Discussions | Reading of assigned materials and participation in discussion | Homework after each lecture | Covered by a final exam |
| | Basic concepts and | 4 | Lectures & Discussions | Reading of assigned | Homework after each | Covered by a final exam |

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| | building blocks. | | | materials and participation in discussion | lecture | |
| | Technologies | 4 | Lectures & Discussions | Reading of assigned materials and participation in discussion | Homework after each lecture | Covered by a final exam |
| | Applications of nanobiotechnology I | 4 | Lectures & Discussions | Reading of assigned materials and participation in discussion | Homework after each lecture | Covered by a final exam |
| | Applications of nanobiotechnology II | 4 | Lectures & Discussions | Reading of assigned materials and participation in discussion | Homework after each lecture | Covered by a final exam |
| *考核方式 (Grading) | （成绩构成）<br>(Grade Constitution)：Homework (70%) and Final Exam (30%) | | | | | |
| *教材或参考资料 (Textbooks & Other Materials) | （必含信息：教材名称，作者，出版社，出版年份，版次，书号）<br>(Required Information: Textbook title, Author, Press, Publication year, Edition, Book number)<br>The following textbook may be used as a reference:<br>”Plant Biotechnology and Agriculture- Prospects for the 21st Century” (2012, First Edition). Eds. Arie Altman and Paul Michael Hasegwa. Elsevier Publishing. ISBN 978-0-12-381466-1.<br>However, students will not be required to purchase this books because specific course | | | | | |

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| | handouts will be provided to students from current and relevant sources from refereed publications accessible via the internet.<br><br>Handouts related to nanobiotechnology will be provided; students will be required to read a number of published papers before and after the class. |
| 其它（More） | |
| 备注（Notes） | |