

Southwest University

Graduate Course Syllabus

Course Unit: School of Food Science

Course No.	1108320053		Course Name	Advanced Food Biological Technology							
Course category (√)	Compulsory courses () Elective courses (√)	Credit hour	2	Total class hour	60	Lectures hours	36	Discussion hours	15	Experiment hours	9
Lecturer	Zhifei He	Job title degree	Professor Doctor degree		Specialties		Food microbiology and food biotechnology				
<p>Range of application by majors: food science and engineering, agricultural products processing and storage engineering, microbiology, molecular biology and biochemistry, cell biology, animal science, environmental science and other relating to microorganism fermentation engineering and enzyme engineering related major.</p>											
<p>Prerequisite courses: microbiology, food microbiology, microbial genetics, biochemistry, molecular biology.</p>											
<p>Teaching objectives and requirements:</p> <p>The purpose of this course is to make the students master the basic theory and knowledge of biotechnology, master the scientific research methods of separating and screening microbial strains from the ecological environment, use the metabolic regulation theory of microorganisms to control the fermentation conditions to improve the yield of fermentation products, the requirements of the bacteria, the key technology of industrial enzyme preparation research and the application of characteristics in food processing, etc. know about the new technology and methods application of biotechnology in food industry. It requires the students to master the research overview and development trend of the fermentation engineering, enzyme engineering, cell engineering, downstream engineering, and master the techniques of experimental operation.</p>											

Teaching and testing methods (it's need to be conducive to cultivating the innovative thinking and ability of graduate students)

Course teaching is the main method, and there will be part of discussion class, which required each postgraduate student to consult a large number of literature to submit the paper and give a speech to guide the class discussion, train the problem analyze and solve ability. At the same time, collaborate to develop the written expression ability, verbal express ability, evaluate ability of the students, and carry out the experimental class as planned.

Course contents and course hours allocation

Theory teaching 36 course hours, discussion 15 course hours, experiment 9 course hours

Theory teaching including two parts:

Part I Fermentation engineering

1. Overview of fermentation engineering and its research progress, introduction of the development of fermentation engineering, single batch fermentation and continuous fermentation characteristics.
2. Selection of fine strains: separation and selection of microbes in nature and purification methods and a variety of special microbial separation and screening methods, high yield of mutant breeding research methods.
3. Metabolic regulation and fermentation production of microorganisms: regulation of enzyme synthesis (induction of enzymes, inhibition of enzyme synthesis), molecular regulation mechanism of enzyme synthesis, regulation of enzyme activity, enzyme activity will be regulated by cell load and its feedback inhibition type.
4. The type and control of the fermentation process: the process of microbial fermentation and its condition control (temperature control, ventilation and mixing, pH control, defoaming, etc.)
5. Bioreactors: objectives and types of bioreactor design, direction and prospects for the development of bioreactors
6. Application of fermentation engineering: laboratory liquid fermentation and solid fermentation methods, liquid fermentation and solid fermentation methods in production, continuous fermentation, semi-continuous fermentation and mixed fermentation

Part II Enzyme engineering (16 course hours)

1. Enzyme engineering contents and development trends of enzyme research, natural enzymes, enzyme modification, immobilized enzyme, enzyme sensor, antibody enzyme, artificial enzyme and mimetic enzyme, organic medium enzyme reaction, enzyme technology.

2. The basic principles of enzyme action, single substrate, two-substrate enzymatic reaction catalytic kinetics, enzyme fermentation production, domestic and foreign requirements of the production of bacteria

3. Isolation and purification of enzymes: enzyme activity determination, enzyme separation and purification theory, enzyme separation and purification methods, enzyme purification method - ion exchange method, gel separation method,

4. Immobilization technology: the principle and method of immobilized enzyme, immobilized cell technology and method, the characteristics of immobilized cells

5. Application of enzyme preparation in food industry: Application of enzyme preparation in beverage industry, application of enzyme preparation in starch processing, application of enzyme preparation in beer industry

Part III Discussion course (15 course hours)

Submit a course review paper, every students is required to give a speech and trigger a discussion of the core issue of the class.

Part V Experiments (9 course hours)

Experiment 1: the application of pectinase in beverage processing

Experiment 2: immobilization technology of yeast cells

Experiment 3: the fermentation of immobilized yeast

(Please add more pages if this page is insufficient)

The Catalog for main reference book (periodicals):

S.N.	Author	Books and Periodicals' name	Press
1.	Zhiying Peng	Food Chemistry Technology	China Light Industry Press
2	Peilin Cen and Cai Jin	Industrial Microbiology	Chemical Industry Press
3	Xiaozhong He	Introduction of Modern Biotechnology	Beijing Normal University Press
4	Ruhua Yao	Principles of Microbial Engineering	South China University of Technology Press
5	Juntang Yu and Xiaoxuan Tang	Biotechnology (up and down)	South China University of Technology Press
6	Guimin Luo	Enzyme Engineering	Chemical Industry Press
7	Guo Yong	Enzyme Engineering	Science Press

Review Comments of School (Institute, Center):

Signature

(Date)

Review Comments of Student Committee:

Signature

(Date)

Review Comments of Graduate School

Signature

(Date)