

# Southwest University

## Graduate Course Syllabus

### Course Unit: School of Food Science

Course No.		Course	Modern Food Analysis and Detection Technology								
Course category (√)	Compulsory courses () Elective courses (√)	Credit hour	2	Total class hours	40	Lecture hours	28	Discussion Hours	9	Experiment hours	3
Lecturer	Ma Liang	Job title Degree	Associate Professor Ph.D.		Specialties	Food safety analysis & control And food detection technology research					
Range of application by majors: food science, agricultural products processing and storage engineering, food, oil and vegetable protein engineering, tea and other food professional direction											
Prerequisites course: Analytical Chemistry, Food Analysis and Testing, Instrumental Analysis, Food Biotechnology, etc.											

**Teaching objectives and requirements:**

Teaching objectives: "Modern Food Analysis and Testing Technology" is a highly applied professional elective courses opened for graduates from the food science and other food professionals and the directions. This course is mainly to teach the basic principles and application scope of modern food analysis and detection technology, including various domestic and international advanced food separation, analysis and testing methods and techniques, and set up the corresponding discussion class. And cultivate students, especially graduate students, to understand and grasp the current advanced food analysis and detection technology, the basic concepts, basic principles, application status and development trends, such as the new chromatographic technology, spectral technology, immunoassay technology, sensor technology, lossless bionic technology, Technology, so that students can read the relevant literature, and have the initial ability of solving the practical problems by use of modern separation and analysis techniques and modern instrumentation technology, and promote students' innovative thinking and application, and complete its design and practice of scientific research papers better and faster.

**Teaching requirements:**

**1. Cultivation of Self-learning ability and analysis ability:** Combining the current background of food and specific topics or projects, and cultivate and improve students' abilities to learn the knowledge of collation, generalization, digestion and absorption, for the classroom teaching content, encourage students to read and analysis the professional books and the literature, especially the reading and analysis of foreign literature, and cultivate students' ability to self-expand knowledge and analyze the specific problems by combining with the development trend of modern science and technology.

**2. Cultivation of Innovative ability and practical ability:** For the detection technology and testing equipment or systems which has a wide application in the field of food or has a good application prospects, we should truly understand and master it, understand the detection technology or instrument principle, characteristics and the scope of their application, and play an innovative thinking to apply the classroom teaching content selectively into the appropriate field of research papers or the design & practice; for the general detection subject, the student can use the knowledge for it, and design the corresponding detection technology, equipment or systems with the high performance cost ratio through the demonstration and analysis. For some high-precision detection equipment and devices (students cannot operate directly), the students should understand its structural characteristics, scope, working principle, innovative applications in the development of scientific research ideas;

Teaching methods and test methods (it should be conducive to cultivate graduates' innovative thinking and innovation ability):

Teaching methods: the classroom teaching and discuss are the main part. The heuristic teaching is adopted, and combine with specific topics or projects for classroom lectures, classroom discussions, training graduate students' self-learning and analysis capabilities on the professional data, the independent completion of the project or project design operations should be applied to cultivate the graduate students' innovative thinking and ability.

Test methods: paper writing, the course score is judged by the combination of the daily achievement and the course paper score. Among them, the daily score accounts for 40%(Seminar results, attendance, homework, etc.), the course results accounts for 60% (attendance, attendance, assignment, etc.)

## Course content and course hours allocation

### **Chapter I Separation Technology of Modern Food**

**(5 hours, of which 2 hours for discussion, 1 hour for the experiment)**

Teaching purpose: Grasp the basic principles and processes of a variety of modern new pre-processing technology, which are based on the separation and enrichment technology, and be familiar with the application and scope of various technologies, and understand its application prospects and development trends.

Teaching focus: principles, processes and applications of a variety of separation, enrichment technology;

Difficulties in Teaching: the organic combination between all kinds of pre-processing technology, especially the separation, enrichment technology and the practical application.

Teaching methods and means: teaching / lecture.

The key points of Lecture:

Section 1 Immunoaffinity and Separation Technology

Section 2 Membrane separation technology

Section 3 Supercritical Fluid Extraction Technology

Section 4 Molecular Distillation Technology

Section 5 Magnetic Separation Technology

Section 6 Molecular Imprinting

Section 7 Solid - phase Micro-extraction

Section 8 Matrix solid - phase dispersion technology

Section 9 Other New Food Separation Technology

### **Chapter 2 Non-destructive Testing of Modern Food (3 hours)**

Teaching purpose: grasp the basic principles and analysis of detection process of modern non-destructive testing technology, and be familiar with the application and scope of a variety of non-destructive testing technology, and understand its application prospects and development trends.

Teaching focus: The principles and applications of a variety of non-destructive testing technology.

Difficulties in Teaching: Model Establishment and Data Processing of Nondestructive Testing Technology.

Teaching methods and means: teaching / lecture

The key points of Lecture:

Section 1 Computer vision technology

Section 2 The force, sound, electrical detection technology of the food

Section 3 Bionic Nondestructive Testing Technology

Section 4 Analysis Technology of Near Infrared Spectroscopy

Section 5 Analysis Technology of Infrared Spectroscopy

Section 6 Nuclear Magnetic Resonance Spectroscopy

Section 7 Other modern non - destructive testing techniques

### **Chapter III Modern Food Chromatography Technology**

**(10 hours, of which 3 hours for discussion, 1 hour for the experiment)**

Teaching purpose: Master the basic principles of chromatographic separation and the basic structure of various chromatographic instruments, which can be independent to take the establishment and evaluation of the liquid chromatography, gas chromatography, and be familiar with the basic steps and methods of testing applications, scope, and understand its application prospects and development trends.

Teaching focus: The principles, application fields of a variety of new chromatographic technology, as well as the establishment of evaluation process of practical methods.

Difficulties in Teaching: Chromatographic Conditions, Columns, Selection of Separation Patterns and Evaluation of Methods.

Teaching methods and means: teaching / lecture

The key points of Lecture:

Section 1 High efficiency chromatography (liquid, gas, capillary electrophoresis)

Section 2 High Speed Countercurrent Chromatography

Section 3 Affinity Chromatography

Section 4 New Chromatographic Techniques - Integral Columns and Molecular Imprinting

Section 5 Multidimensional Chromatography and unified Chromatography

Section 6 Chromatographic Fingerprints and Their Applications

### **Chapter IV Spectrum Detection Technology of Modern Food (6 hours)**

Teaching purpose: master the basic principles of a variety of spectral technology separation and the basic structure of a variety of spectrometers, and be familiar with the application fields and scope of various technologies, and understand its application prospects and development trends.

Teaching focus: the principles and applications of a variety of new spectrum technology.

Difficulties in Teaching: Combination of Spectroscopy and Biotechnology.

Teaching methods and means: teaching / lecture

The key points of Lecture:

Section I Laser spectroscopy

Section 2 Spectral Probes and Their Applications

Section 3: Modern Fluorescence Spectroscopy

Section 4 Atomic Spectroscopy

Section 5 Modern Near Infrared Spectroscopy

Section 6 Spectral Fingerprints and Complex Composition Analysis

### **Chapter V Application of Modern Sensing Technology in Food Testing (3 hours)**

Teaching purpose: understand the applications and development trends of the various sensing technology and sensor in food testing.

Teaching focus: the principles and applications of a variety of sensing technology.

Difficulties in Teaching: the understanding of the sensor principle of various sensors.

Teaching methods and means: teaching / lecture

The key points of Lecture:

Section 1 Bio-sensing technology

Section 2 Immunosensor

Section 3 Sonic sensing technology

Section 4 Nano Biosensor and SPR Biosensor

Section 5 Piezoelectric Biosensor

Section 6 Other modern sensing technology

### **Chapter VI Immunoassay Technology of Modern Food**

**(6 hours, of which 3 hours for discussion, 1 hour for the experiment)**

Teaching purpose: master the applications and scope of a variety of immune technology in food industry, and be familiar with its principles and analysis process, and understand the application prospects and trends of immune analysis.

Teaching focus: immune affinity technology, immunofluorescence technology, enzyme-linked immunosorbent assay, monoclonal antibody technology.

Difficulties in Teaching: monoclonal antibody and other immunological theory knowledge.

Teaching methods and means: teaching / lecture

The key points of Lecture:

Section 1 The principle of immunological detection technology

Section 2 Monoclonal Antibody Technology

Section 3 Immunoaffinity Detection Technology

Section 4 Enzyme Immunization Technology

Section 5 Immunofluorescence technique

Section 6 Radioimmunoassay

Section 7 Other Immunoassay Detection Techniques

### **Chapter VII Molecular Detection Technology of Modern Food**

**(3 hours, of which 1 hour for discussion)**

Teaching purpose: Master the applications and scope of PCR technology and other molecular biology technology in food industry, and be familiar with its principles and analysis process, and understand its

application prospects and development trends.

Teaching focus: the principle of PCR technology, a variety of chip technology, probe technology.

Difficulties in Teaching: Understanding of Molecular Biology Theory in the Principle of Food Molecular Detection Technology.

Teaching methods and means: teaching / lecture

The key points of Lecture:

Section 1 PCR technology

Section 2 Chip technology

Section 3 Molecular Probe Technology

Section 4 RFLP Technology

Section 5 RAPD Technology

Section 6 Other Food Molecular Detection Technology

### **Chapter VIII Rapid Detection Equipment of Modern Food (2 hours)**

Teaching purpose: understand the detection principal and application fields of a variety of modern rapid detection equipment.

Teaching focus: the technical principles, the system's work principle, instrument features, application areas and limitations of a variety of modern rapid detection equipment.

Difficulties in Teaching: The system work principle of the instrument.

Teaching methods and means: teaching / lecture

The key points of Lecture:

Section 1 Automation equipment of food microbial

Section 2 Rapid Detection Instrument of Biological Toxins

Section 3 Rapid detection of pesticide residues

Section 4 Near Infrared Rapid Measurement Instrument

Section 5 Other rapid detection equipment

Discussion Course Research trends and application prospects of modern food's analysis and testing technology (2 hours)

Teaching Objective: fully explore the application field, prospects and future trends of modern analytical and analytical techniques in food industry.

Teaching methods and means: discussion in the classroom.

### **The Catalog for main reference book (periodicals):**

S.N.	Author	Books and Periodicals' name	Press
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1	Zhao Jiewen Sun Yonghai	<i>"Modern Food Detection Technology"</i>	China Light Industry Press
2	Wang Erkang	<i>"Analytical Chemistry in the 21st Century"</i>	Science Press
3	Chen Ying Ge Yiqiang	<i>"Modern Food Molecular Detection and Identification Technology"</i>	China Light Industry Press
4	Wang Erkang	<i>"Life Analytical Chemistry"</i>	Science Press
5	Chen Fusheng Gao Zhixian etc.	<i>"Food Safety Testing and Modern Biotechnology"</i>	Chemical Industry Press

Review Comments of School (Institute, Center):

Signature (Date)

Review Comments of Student Committee:

Signature (Date)

Review Comments of Graduate School

Signature (Date)