The Master Degree Course Syllabus for Overseas Postgraduate Students

Course code ： 083200B1801

Food Microbiology

Ⅰ. scheduled total credits： 24 （experiments: 0 credits） credits： 2 term： Ⅰ

Teaching method：PPT Assessment method ： Essay Report

Ⅱ.Compatible Major：Food science and engineering

Ⅲ.prerequisite course：Biology, Biochemistry

Ⅳ.OBJECTIVE：

Describe the characteristics and sources of predominant microorganisms in food. Describe the causative agents, suspect foods, signs and symptoms of some major foodborne diseases, with an emphasis on staphylococcal food poisoning, salmonellosis, cholera, *Escherichia coli* gastroenteritis, hepatitis, etc. Apply appropriate principles and approaches for the detection of various pathogenic microorganisms e.g. *Escherichia coli*, *Bacillus cereus*, *Campylobacter*, *Listeria monocytogenes*, *Salmonella*, *Clostridium*, *Vibrio* and *Statphylococcus aureus*. Compare and contrast the pathological effects and detection methods for common food indicator microorganisms, foodborne pathogens e.g. fungi, viruses and parasites.

Ⅴ.Content of the Syllabus and the Scheduled Study Hours:

Chapter 1 History of microorganisms in food （2 credits hours）

1．Food microbes in human welfare

2．The more significant dates and events in the history of food preservation, food spoilage, food poisoning, and food legislation

Chapter 2 Taxonomy of microorganisms in foods （4 credits hours）

1．BacteriaL taxonomy

2．Primary sources fo microorganisms found in foods

3．Synopsis of common foodborne bacteria

4．Synopsis of common genera of foodborne molds

5．Synopsis of common genera of foodborne yeasts

Chapter 3 Parameters of foods that affect microbial growth （2 credits hours）

1．Intrinsic parameters

2．Extrinsic parameters

Chapter 4 Culture, microscopic, and sampling methods （4 credits hours）

1．Conventional standard plate count

2．Membrane filters

3．Microscope colony counts

4．Agar droplets

5．Dry film and related methods

6．Most probablenumbers methods

7．Dye reduction

8．Roll tubes

9．Direct microscopic count

10．Microbiological examination of surfaces

11．Viable but nonculturable organisms

Chapter 5 Indicators of food microbial quality and safety （2 credits hours）

1．Some indicators of product quality

2．Indicators of food safety

3．The possible overuse of fecal indicator organisms

4．Predictive microbiology

Chapter 6 Foodborne pathogens （4 credits hours）

1．Foodborne illness cases

2．Host invasion

3．Quorum sensing

4．Biofilms

5．Sigma factors

6．Pathogenesis

Chapter 7 Viruses and some other proven and suspected foodborne biohazards （2 credits hours）

1．Viruses

2．Bacteria

3．Prion diseases

4．Toxigenic phytoplanktons

Chapter 8 Industrial Media and Nutrition of Microorganisms （4 credits hours）

1．The basic nutrient compistions of industrial media

2．Criteria for the choice of raw materials used in industrial media

3．Some raw materials used in compounding industrial media

Ⅵ.Teaching Materials and Reference Books：

1．Modern Food Microbiology, Edited by James M. Jay, Martin J. Loessner, David A. Golden, Published in 2005 Springer.

2．Industrial Biotechnology: Sustainable Growth and Economic Success, Edited by Wim Soetaert and Erick J. Vandamme, Published in 2010 WILEY-VCH Verlag GmbH & Co. KGaA,Weinheim.

3．Modern Industrial Microbiology and Biotechnology, Edited by Ndoka Okafor. Published in 2007 Science Publishers.

Ⅶ.Lecture(s)：Heng-Lin Cui, Feng-Jie Cui, Lin Zhu, Jing Hou

Ⅷ.the Author who write the Syllabus：Heng-Lin Cui, Feng-Jie Cui

Course code ： 083200B1802

Advanced Food Chemistry

Ⅰ. scheduled total credits: **24** （experiments: **0** credits）credits：2 term：Ⅰ

Teaching method: PPT/Case study

Assessment method : Exam (Open)

Ⅱ.Compatible Major: For doctoral students in food science and engineering (0832) first-level disciplines.

Ⅲ.prerequisite course: Analytical Chemistry, Organic Chemistry, Physical Chemistry, Biochemistry

Ⅳ.OBJECTIVE：

The objectives are to: (1) learn the properties, structure and functions of main ingredients in food raw materials and their changes in the chemical composition during processing and their relationship with nutritional quality, sensory quality and safety control of food products, (2) understand the relationship between the structure and function of food ingredients and the mechanism of changes in the processing of the preservation process;, (3) master the food to maintain the color, smell, texture, texture, nutrition and food safety to provide a theoretical basis, and (4) provide a broader theoretical basis for foreign students to engage in food processing, preservation and new product development.

Ⅴ.Content of the Syllabus and the Scheduled Study Hours:

Chapter 1 introduction; **（2 credits hours）**

1. Food chemistry development history
2. The role of food chemistry in the food industry
3. Food chemistry research content and direction
4. Food chemistry research methods and techniques

Chapter 2 Water and ice **（2 credits hours）**

1. Structure and properties of water and ice in food
2. Water adsorption isotherms and effects
3. Food in the distribution of water and ice, morphology and regulation
4. Relationship between water activity and food quality

Chapter 3 Carbohydrates **（6 credits hours）**

1. Structure and properties of monosaccharide and polysaccharide
2. Distribution and morphology of carbohydrate in food
3. Changes in carbohydrates in food processing and storage
4. Carbohydrates and food quality
5. Discussion

Chapter 4 Lipids **（4 credits hours）**

1. Structure, properties and morphology of food Lipids

2. Food processing and storage of lipid changes

3. Regulation of lipids in food

4. Lipids and food quality

Chapter 5 Amino acids, peptides and proteins （6 credits hours）

1. Structure, properties of amino acids, peptides and proteins

2. Amino acid and protein changes in food processing

3. Regulation of amino acids and proteins in food

4. Amino acids, protein and food quality

5. Discussion

Chapter 6 Vitamins （2 credits hours）

1. The structure and nature of vitamins
2. Distribution and morphology of vitamins in food
3. Changes in vitamins in food processing and storage
4. Regulation of vitamins in food
5. Vitamins and food quality

Chapter 7 Minerals （2 credits hours）

1. Classification and nature of minerals in food

2. Distribution and morphology of mineral in food and processed products

3. Changes in minerals during food processing and storage

4. Regulation of minerals in food

5. Minerals and food quality

Ⅵ.Teaching Materials and Reference Books：

1. Owen R. Fennema. Food Chemistry. 4th Edition, 2013.
2. Hans-Dieter Belitz and Werner Grosch. Food Chemistry. 4th Edition, 2009.
3. Zella Isabel Perkins Egdah. An Elementary Course Of Food Chemistry, 2011.
4. Connie M. Weaver. The Food Chemistry Laboratory:A Manual for Experimental Foods,
5. Dietetics, and Food Scientists, 2003.
5. Dominic W.S. Wong. Mechanism and Theory in Food Chemistry, 1989.
6. Dennis D. Miller. Food Chemistry: A Laboratory Manual, 1998.
7. Frank Lee. Basic Food Chemistry, 2012.
8. John M. deMan. Principles of Food Chemistry (Food Science Text Series, 3rd Edition, 2013.

Ⅶ.Lecture(s)： WenJuan Qu

Ⅷ.the Author who write the Syllabus： WenJuan Qu

Course code: 083200C1803

Modern Instrumental Analysis

Ⅰ. scheduled total credits：36（experiments: 4 hours） credits：3 term：Ⅰ

Teaching method： PPT and experiments Assessment method ： homework report

Ⅱ.Compatible Major：Food Science and Engineering

Ⅲ.prerequisite course：Analytical Chemistry、Biochemistry

Ⅳ.OBJECTIVE：

The main contents of the course include the basic principles and application skills of common instrument analysis methods, such as chromatography, spectroscopy, mass spectrometry and electrophoresis. Through the learning of this course, students can master the principles, structural characteristics and analysis methods of modern common instruments, and have the ability to solve various practical problems with various modern instruments.

Ⅴ.Content of the Syllabus and the Scheduled Study Hours:

Chapter One Biological mass spectrometry （2 hours）

1．Summary

2．Mass spectrometer

3．Ionization mode (matrix assisted laser desorption and ionization, electrospray ionization)

4．Analyzer

5．Tandem mass spectrometry

6．Progress in the application of mass spectrometry in protein identification

Chapter Two Gas chromatography （4 hours）

1．Brief introduction of chromatography

2．Brief introduction to gas chromatography

3．Instrument

4．Sampling method

5．Chromatographic column

6．Detector

7．Application

Chapter Three Classical liquid chromatography and high performance liquid chromatography （2 hours）

1．Summary

2．Classification of liquid chromatography

3．Liquid chromatography separation

4．Liquid chromatography injector

5．Liquid chromatography detector

Chapter Four Atomic absorption and ICP **（4 hours）**

1. Summary
2. Characteristics of atomic absorption spectrometry
3. The relationship between the absorbance and the concentration of the sample
4. Atomic absorption spectrometer
5. Determination
6. ICP

Chapter Five Fluorescence spectrum **（4 hours）**

1. The basic principle of fluorescence emission spectroscopy
2. Fluorescence quantum efficiency
3. Factors affecting fluorescence emission spectra
4. Fluorescence spectrometer
5. Application of fluorescence emission spectroscopy in biochemical analysis

Chapter Six Infrared absorption spectrum **（4 hours）**

1. The basic principle of infrared absorption spectroscopy
2. Relationship between infrared absorption spectrum and molecular structure
3. Infrared spectrometer
4. Preparation of samples
5. Application of infrared absorption spectroscopy in food analysis

Chapter Seven UV visible absorption spectrum **（4 hours）**

1. The mechanism of ultraviolet visible absorption spectrum
2. Law of absorption
3. The influence factors of ultraviolet visible absorption spectrum
4. Ultraviolet visible absorption spectrometer
5. Application of UV visible absorption spectroscopy in food analysis

Chapter Eight Mass spectrum **（2 hours）**

1. Summary of mass spectrometry
2. The basic principle of mass spectrometric analysis
3. The basic structure and analysis process of mass spectrometer
4. Analysis of mass spectrogram
5. Chromatography-mass spectrometry

Experiment: Analysis of volatile components in food by gas chromatography-mass spectrometry **（2 hours）**

Chapter Nine Raman spectroscopy **（4 hours）**

1. Detection principle
2. Raman spectrometer
3. The application of Raman spectroscopy

Chapter Ten PCR and qPCR **（2 hours）**

1．The principles of PCR and qPCR

2．Application of PCR and qPCR

Experiment: Using PCR to verify the insertion of exogenous fragments （**2 hours**）

Ⅵ.Teaching Materials and Reference Books：

1．Principles and Techniques of Practical Biochemistry (5th Edition). Keith Wilson and John Walker, Cambridge Press, 2000.

Ⅶ.Lecture(s)：Yun Wang, Ronghai He, Lin Luo, En Han, Yansheng Zhao, Xinai Zhang, Xiaoli Tan

Ⅷ.the Author who write the Syllabus：Yun Wang, Ronghai He, Lin Luo, En Han, Yansheng Zhao, Xinai Zhang, Xiaoli Tan

Course code ： 083200C1804

Food physics Processing

Ⅰ. scheduled total credits: **36** （experiments: **12** credits）credits：3 term：Ⅰ

Teaching method: PPT/Case study

Assessment method : Report

Ⅱ.Compatible Major: For doctoral students in food science and engineering (0832) first-level disciplines.

Ⅲ.prerequisite course: Food Technology, Food Equipment

Ⅳ.OBJECTIVE：

The objectives are to: (1) describe the modern agricultural products processing technology background, (2) show in the processing of agricultural products, separation and purification, drying sterilization, fermentation, analysis and testing, and other commonly used processing technology, and (3) describe the working principle of these processing methods and their specific application cases.

Ⅴ.Content of the Syllabus and the Scheduled Study Hours:

Chapter 1 Physical Processing Technology （7 credits hours）

1. Ultrasonic physics processing technology and its application cases
2. Microwave physics processing technology and its application cases
3. Experiment 1 (3 credits hours)

Chapter 2 Separation and purification technology （7 credits hours）

5. Ultrafiltration separation and purification technology and its application cases
6. Column chromatography purification technology and its application cases
7. Experiment 2 (3 credits hours)

Chapter 3 Drying sterilization technology （9 credits hours）

1. Spray drying technology and its application cases
2. Infrared drying sterilization technology and its application case
3. Experiment 3 (3 credits hours)
4. Seminar 1 (2 credits hours)

Chapter 4 Fermentation technology （7 credits hours）

1. Anaerobic fermentation technology and its application cases
2. Microbial fermentation technology and its application cases
3. Experiment 4 (3 credits hours)

Chapter 5 Analysis of detection technology （6 credits hours）

1. High Performance Liquid Chromatography Detection Technology and Its Applications
2. Gas chromatography analysis and detection technology and its application cases
3. Seminar 2 (2 credits hours)

Ⅵ.Teaching Materials and Reference Books：

1. Niir Board. Modern Technology of Agro Processing and Agricultural Waste Products. National Institute Of Industrial Re, 2000.

2. Carl W. Hall. Processing Equipment for Agricultural Products. Avi Publishing Co Inc., 1963

Ⅶ.Lecture(s)：WenJuan Qu

Ⅷ.the Author who write the Syllabus：CunShan Zhou, WenJuan Qu

Course code ： 083200C1805

Advanced Biochemistry

I. Scheduled total credits hours： 36 （experiments: 0 credits） credits： 3 term：I

Teaching method：Blackboard-writing/PPT/Case study

Assessment method： Essay Report

II. Compatible Major：Food Science and Engineering

III. Prerequisite course：Organic Chemistry, Biochemistry

IV. OBJECTIVE：

Biochemistry involves the study of the molecular composition of living cells, the organization of biological molecules within the cell, and the structure and function of these biological molecules. The biological macromolecules which this course focuses on are proteins (enzyme), polysaccharides, lipid and polynucleic acids (DNA and RNA), including the monomeric units of these macromolecules.

Upon completion of the course, the student should achieve an understanding of the following:

Structures of amino acids, their chemical properties and their organization into polypeptides and proteins.

Methods for isolating and characterizing proteins the basic elements of protein structure key principles of protein function.

Enzymes and how they catalyze reactions as well as enzyme kinetics.

Structure of fundamental monosaccharides and polysaccharides.

Structure and basic function of nucleotides.

Structure of different classes of lipids and their roles in biological systems.

V. Content of the Syllabus and the Scheduled Study Hours:

Chapter 1 Carbohydrate （3 credits hours）

1. Structural and physicochemical aspects of carbohydrate
2. Protein glycosylation
3. Starch and cell-wall polysaccharide

Chapter 2 Lipid （3 credits hours）

1. Structural and physicochemical aspects of lipid
2. Membrane and membrane transport
3. Food applications of lipid

Chapter 3 Protein structure and function （8 credits hours）

1. Structure and function relationships of protein
2. Protein-protein interaction
3. Protein engineering and its related technologies
4. Functional polypeptides

Chapter 4 Enzyme and enzyme engineering （6 credits hours）

1. Progress in enzymology
2. Enzyme engineering
3. Application of enzyme in food processing

Chapter 5 Nucleic acid （6 credits hours）

1. Structural and functional aspects of nucleic acid
2. Genomics
3. DNA-based information technologies

Chapter 6 Metabolism and its regulation （5 credits hours）

1. Carbohydrate/ lipid metabolism and nutrition balance
2. Metabolism network and regulation
3. Metabolomics

Chapter 7 Signal transduction and gene expression （6 credits hours）

1. Signal transduction
2. Regulation of gene expression
3. Protein synthesis, assembling and degradation

VI. Teaching Materials and Reference Books：

1. David L. Nelson, Michael M. Cox. 《Lehninger Principles of Biochemistry》（5th edition），W. H. Freeman Company，2008

2. Reginald H. Garrett, Charles M. Grisham.《Biochemistry》（5th edition），Cengage Learning Company, 2013

3. Benjamin K. Simpson.《Food Biochemistry and Food Processing》（2nd edition），John Wiley & Sons，2012

VII. Lecture(s)：Yun WANG, Qin GUO, Ling SUN

VIII. The Author who write the Syllabus： Yun WANG