

National Pingtung University of Science and Technology
International Master's Degree Program in Food Science
Course Descriptions

Compulsive Courses

Seminar	1×4 cts	1st & 2nd yrs	Fall & Spring	Dr. Jia-Hsin Guo Dr. Susana Lin
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In this course each student will select their own research subject; they will collect and summarize literature concerning the chosen subject, write abstracts, design posters for conferences, as well as the power-points slides for oral presentation. All students will participate in the discussion and acquire skills for an effective oral presentation. During the last sessions of the course, the students will simulate a conference situation, where each one will present their research work on stage.

Methodology for Food Research	3 cts	1st yr	Fall	Dr. Alex Liaw Dr. George Huang
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Describe experimental designs, general techniques and methodologies in related to food researches. To understand the basic principles of experimental design and apply them to realistic food problems. Also to have a familiarity of general techniques and methodologies in a specific field. To have a knowledge of the state of the art of current research efforts relating to carbohydrates, lipids, proteins, and other components in foods. To be able to design an appropriate experiment to solve the problems we proposed. To be able to collect, analyze and interpret the data and able to organize the results and have a paper publication.

Trends in Sustainable Development	0 ct	1st yr	Fall	Dr. Kurtis Pei
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This course is designed to expose students to vital issues and trends in sustainable development, such as population, natural resources, environmental changes, biodiversity. Through seminar discussions and student presentations, upon the completion of this course, students should be able to develop a greater awareness of the trends in sustainable development, have a broader global view, and acquire a fundamental vocabulary of terms in the fields covered.

Special Topics in Global Food Technology and Industry	2 cts	1st yr	Spring	Dr. Ming-Chang Wu
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Speakers specialized in Food Biotechnology/Applied Microbiology, Food Chemistry/Instrumental Analysis, and Food Processing/Technology Development from industry, government or university will be invited to share their knowledge and working experiences. One of the objectives is to give students an in-depth understanding of the most global concerns in biological, chemical, and physical sciences to the processing, preservation, quality evaluation, public health aspects, and utilization of foods.

Thesis	3×2 cts	2nd yr	Fall & Spring	Dr. Jia-Hsin Guo
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After a well-designed project being properly conducted by students, he/she will be asked to give a oral presentation and submit the thesis before a deadline. Knowledge acquired during the study should be made use of sufficiently in the preparation of the thesis. Frequent and intensive discussions among teachers and students will be arranged to improve the quality of his/her research.

Optional Courses

Microbial Biotechnology	3 cts	1st yr	Fall	Dr. Jia-Hsin Guo
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This is a graduate level overview of selected topics in microbial biotechnology. This course covers how microbes are used to manufacture components of food and consumer products, biologics and biomaterials using recombinant DNA and is organized following the steps in discovery and

development of biologics. An introduction to microbial growth kinetics is included as well as discussions on generating products from genetically modified microorganisms. A major portion of this class will also present schemes for choosing microbial hosts & vector expression systems for the production of heterologous peptides, proteins, or post translational-modified proteins and how this affects overall process strategy. Methods for production of industrial enzymes and selected applications of enzyme technology; for the pharmaceutical, chemical industries and for environmental remediation are presented.

Special Topics in Food Chemistry 3 cts 1st yr Fall Dr. Alex Liaw

Food is composed of carbohydrates, lipids and proteins and the major resources are derived from animal, plant, fungi, algae, and even microbials. The functional properties of carbohydrates, lipids and proteins such as viscosity, gelation, emulsification, foaming, gelatinization and water holding capacity are dependent upon their structures which in related to the composition, linkages, degree of polymerization, intensity of branching, shape, conformation, functional group and degree of substitution of themselves and exhibit various functional properties change during processing, handling and storage. This course deals with the connection between the shape, building unit, linkages, conformation and structure of carbohydrates, lipids and proteins produced from various resources and their functions. Furthermore, understanding the physiological function of food components is critical and will be discussed in the current course.

Special Topics in Bioactive Natural Products 3 cts 1st yr Fall Dr. George Huang

The course will introduce the biosynthesis, purification, structural determination and biological activities of some important bioactive natural products, including alkaloids, flavonoids and terpenoids. The topics also discuss the applications of healthy food in human diet and new drugs derived from natural resource using recent scientific literature.(journals, reviews, books, etc)

Food Biotechnology 3 cts 1st yr Fall Dr. Mei-Li Wu

This course provides students with the basic concepts of modern food biotechnology. It includes detailed information on recombinant DNA technology, enzyme and protein engineering, biosensor (DNA probe and Monoclonal antibodies), and plant and animal biotechnology which surround food biotechnology

Microbial Physiology and Metabolism 3 cts 1st yr Fall Dr. Jia-Hsin Guo

Interrelationship of physiology in microbial nutrition for growth ∨ microbial propagation and death ∨ and the effect of the environmental factor on microbial growth. The interrelationship of microbial metabolism (the relationship of energy and growth ∨ microbial metabolism of aerobic and anaerobic ∨ microbial fermentation and respiration

Advanced Food Processing 3 cts 1st yr Fall Dr. Ming-Chang Wu

The course offers the technologies of membrane processing, frozen, aseptic packaging, vacuum, high pressure and over heat steam treatment, high pressure, microwave, supercritical extraction, oxygen scavenging, chill preservation biochemical reactor, wine making and plant productions. The processing and application of these technologies are introduced

Special Topics in Global Food Marketing 2 cts 1st yr Fall Recruiting

The objective of the course is to develop students' knowledge and understanding of the global marketing environment through key concepts, and tools, and theory. The course challenges students to think critically about global competition. Specifically, the course is designed to provide students with (a) familiarity with the problems and perspectives of marketing across national boundaries and within foreign countries; (b) an understanding of consumer similarities and differences outside the home country; (c) the analytical ability to make marketing decisions concerning all parts of the marketing mix (product development, branding, promotion, pricing, and distribution); (d) competence in researching trade laws and regulations in other markets; (e) knowledge of global analytical frameworks and tools; and (f) an understanding of the current strategies of major global food firms.

Special Topics in Food Safety 2 cts 1st yr Fall Dr. Jia-Hsin Guo
The course is designed to provide students with the background necessary to understand how pathogens cause disease, how foodborne illness is transmitted and how it can be controlled. This course also provides up-to-date information in current "hot topics" in food microbiology, including food safety regulations and emerging food safety issues.

Special Topics in Applications of Food Enzymes 3 cts 1st yr Spring Dr. Shawn Sheu
Overview of characteristics, nomenclature, activity assay and purification of enzymes. Quality changes related to the endogenous enzymes in foods. Applications of enzymes currently used in food industry.

Special Topics in Food Engineering 3 cts 1st yr Spring Dr. Henry Chen
Objectives of this course are to introduce modern technologies of food engineering. The scope includes microwave heating, impulse sterilization, high pressure sterilization, membrane separation technology, new dehydration technology, bio chemical engineering technology, with theories, equipment and applications.

Special Topics in Food Analysis 3 cts 1st yr Spring Dr. Chyi-Shen Lin
Instrumental analytical methods widely used to measure micro/trace nutrients of food products were presented in this course. Emphasis is on the basic introduction and practical operation of gas/liq chromatography, atomic absorption spectrometer, inductive coupled plasma spectrometer and capillary electrophoresis system.

Advanced Molecular Biology 3 cts 1st yr Spring Dr. George Huang
The course introduces the nucleic acids (DNA · RNA), structure and function of proteins, genetic engineering and recombinant DNA technology. The course contents include: vectors of introduction, construction of recombinant DNA, gene expression, and purification and application of recombinant proteins.

Special Topics in Instrumental Analysis 3 cts 1st yr Spring Dr. Chin-Chun Huang
Designed to acquaint the students with the advanced knowledge and fundamental principles of analytical instruments commonly used by food analysts. Emphasis is on understanding the theoretical and practical aspects of spectroscopy (UV Visible, fluorescence, and atomic absorption spectrophotometer) and chromatography (TLC, GC, and HPLC).

Chemical and Physical Changes in Foods 3 cts 1st yr Spring Dr. Chan-Chiung Liu
This course is designed to cover the following fields related to physicochemical properties of foods, such as fundamentals of physical chemistry and its experimental techniques, applied physical chemistry in material analysis of foods, changes of physicochemical properties in foods during processing, and the effects on physical properties of final products. The goal of this course is to prepare students with the capabilities of developing new food products. Topics included are : (1) Molecular interaction in food processing. (2) Gels and emulsions. (3) Analytical techniques of structure and components for foods. (4) Fundamental mechanical and rheological properties of foods. (5) Relationships between food structure and texture.

Molecular Nutrition 2 cts 1st yr Spring Dr. Wen-Hsing Cheng
This is a co-taught course among University of Maryland at College Park (UM), National Taiwan University (NTU), National Taiwan Normal University (NTNU) and National Pingtung University of Science & Technology (NPUST) supported by the MOU between UM and NTU, UM and NTNU, as well as the MOU between UM and NPUST. Faculty and students in these universities will participate in the course via videoconferencing. The emerging discipline of molecular nutrition encompasses nutritional biochemistry, nutritional genomics, nutritional metabolomics, and epigenetics. The course focuses on the effects of diet and nutrients on an individual's genome and metabolism, and how the

molecular events affect human health. This course is a lecture course designed to acquaint senior undergraduate and graduate students with current concepts, knowledge and strategies for understanding molecular nutrition.

Special Topics in Sensory Evaluation 2 cts 1st yr Spring Dr. Chyi-Shen Lin
The course is prepared for students with basic sensory analysis training background. The descriptive analysis method of sensory evaluation will be reviewed and discussed using available literatures. Further discusses the application of this methodology can be used by the quality control and research development section. Also by the statistical analysis, the results from the descriptive analysis will be summarized following the experimental design and graphic analysis.

Special Topics in Management and Administration of Food Industry 2 cts 1st yr Spring Recruiting
The objective of this course is to train the student getting the ability to manage the food business. The efficiency of the food business will be increased under their management. The contents of this course are as following : 1. Introduction: It includes the economics of food business, the culture and environment of the food, business management. 2. Agriculture: The general situation and the development of agriculture, agriculture management will be included in this sector. 3. Food industry: This sector contains the general situation and the development of food industry, the management of food industry. 4. Food distribution: The general situation and development of food distribution, the management of food distribution will be talked in this sector. 5. Food Service: It includes the general situation of food service.

Biochemical Engineering 3 cts 2nd yr Fall Dr. Henry Chen
Based on the principles of chemical engineering, the course presents the design and analysis of processes which deal with biochemical materials. Scopes of this course include kinetics of microbial growth and enzymatic reactions, biotechnologies and applications in biochemical process, design calculations of bioreactors, designs of bio-processes, and unit operations such as centrifugation, extraction, membrane separation, chromatography and crystallization and their applications for recovery and purifications of bio- and physiologically active materials from fermentation broths.

Bioconversion and Biocatalysis 3 cts 2nd yr Fall Recruiting
This course deals with methodology and processes to convert biomass into food, feed, fuel and other useful products This course will discuss properties of biomass that make them amendable to bioconversion, the major microbial and enzymatic processes that occur during bioconversion, and the design and economic considerations that influence the feasibility of bioconversion systems. The course will emphasize: biomass pretreatments systems to increase bioconversion efficiency; anaerobic fermentation systems to convert biomass into methane, fertilizer and other products; yeast fermentation systems to produce ethanol, feed, and other products; and composting systems.

Practical Immunology in Food Science 3 cts 2nd yr Fall Dr. Shawn Sheu
To improve immune function by healthy food is a popular topic. The objectives of this course are to introduce the immune system in living organisms and the application of immunoassay in food science. Furthermore, the evaluation method of immune function of healthy food will also be included in this course.

Functional Foods 2 cts 2nd yr Fall Dr. Albert Charles
The course comprise the physiological function and process of nutritional supplements · functional foods · designers foods and pharmacy foods. Men women and children are different in nutritional requirements due to their distinct physiological structure. The functional foods for aged people emphasize the effect of anti-aging and building the immune system. Physiochemical which contain natural physiological active ingredients are more popular in western countries. The Chinese herb should play an important role for the future healthy food market. This course will illustrate their physical and chemical functions.

Optimization in Food Science and 2 cts 2nd yr Fall Dr. Jenshinn Lin

Technology

Due to the increasing cost of energy and the significant awareness of environmental protection, food manufacturing processes have been changed dramatically. In order to achieve optimal production conditions and maximize profits, factors such as plant design, operation methods and conditions have to comply with the constraints caused by these changes. This course will focus on the following subjects: (1) Introduction of optimization (what is it? why is it necessary? its fundamental features); (2) Theory of optimization (basic functions and numerical methods); (3) Case studies of practical applications. Objectives are thus to implement students with the concepts and applications of optimization on food science and technology.

Experimental Design

2 cts 2nd yr Fall Dr. Henry Chen

The objective of this course is to offer the assorted subjects concerning experimental design and data analysis used in the research fields of food science. Topics include: 1. Simple Comparative Experiments: normal distribution, t distribution and t-test, F distribution and F-test, Chi-Square distribution and Chi-Square test, confidence interval, hypothesis testing. 2. ANOVA (Analysis of Variance): partition of sum of squares, model adequacy checking and sample size determining. 3. Block and Paired Design: general regression analysis, Latin Square design, balanced block design. 4. Factorial Designs: definitions and principles of general factorial design, statistical response curves and surfaces, blocking in factorial design. 5. Response Surface Methodology: first and second order RSM, steepest ascent method, optimal experimental design.

Special Topics in Food Processing

2 cts 2nd yr Fall Recruiting

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Scientific Writing in English For Chinese Authors

2 cts 2nd yr Fall Recruiting

This course is to develop students' language proficiency via writing practices and revisions to improve their skills. The content of the course covers constructing basic vocabulary, expanding vocabulary, learning and knowing grammar well, and building up writing ability of English abstract.

Internship Training

2 cts 2nd yr Fall Dr. Jia-Hsin Guo

This course is offered students who can practically work in food related industry or research institute during summer break. So, they will understand what those works in the food related fields are. Students will learn and understand the right working attitude, needed profession knowledge, how independently work in group, increase the ability of self-resolving problems, in the working process. After having this course, students will understand those practical works in the food related industry, and will push themselves to learn and strengthen needed professional knowledge.

Independent Study

2x4 cts 1st & 2nd yrs Fall & Spring Dr. Jia-Hsin Guo

Independent Study is offered to give the student experience in planning and outlining a course of study on the student's own initiative under the International Master's Degree Program in Food Science supervision. Independent Study should deal with a special interest not covered in a regular course or with exploration in greater depth of a subject presented in a regular course. Independent study may be desirable preparation for the thesis or other advanced study.