Bachelor of Science Program in Food Science and Technology (International Program 2022)

The Faculty of Agro-Industry

Chiang Mai University

The course details

Bachelor of Science Program in Food Science and Technology (International Program)

The Faculty of Agro-Industry Chiang Mai University

The course name

: Bachelor of Science Program in Food Science and Technology (International Program)

The Name of degree and field of study

: Bachelor of Science (Food Science and Technology)

: B.S. (Food Science and Technology)

The Number of credits all of the curriculum

a minimum of 136 Credits

The course structure		Credits
1. General Education		30
1.1 Learner Person		21
1.1.1 Required Courses		15
1.1.2 GE Electives		6
1.2 Innovative Co-creator		3
1.3 Active Citizen		6
1.3.1 Required Courses		3
1.3.2 Elective Courses		3
2. Field of Specialization	a minimum of	100
2.1 Core Courses		41
2.2 Major	a minimum of	59
2.2.1 Major Requirements		44
2.2.2 Major Electives	a minimum of	15
2.3 Minor (if any)	a minimum of	15
3. Free Electives	a minimum of	6

The subjects

1 General Education **30 Credits**

1.1 Learner Person **21 Credits**

1.1.1 Required Courses **15 Credits**

001101	ENGL	101	Fundamental English 1	3(3-0-6)
001102	ENGL	102	Fundamental English 2	3(3-0-6)

001201	ENGL	201	Critical Reading and Effective Writing	3(3-0-6)
001227*	ENGL	227	English for Agriculture and Agro-Industry	3(3-0-6)
204100	CS	100	Information Technology and Modern Life	3(3-0-6)

*Remark: 001227 can be opened for students only if there are more than 35 students.
If there is less than 35 students, please enroll 001202 (English in Professional Contexts) instead.

1.1.2 GE Electives **6 Credits**

A student also choose at least 6 credits from this group of GE courses.

011155	PHIL	155	Philosophy of Happiness	3(3-0-6)
011269	PHIL	269	Philosophy of Sufficiency Economy	3(3-0-6)
011277	PHIL	277	Bioethics	3(3-0-6)
057122	EDPE	122	Swimming for Life and Exercise	1(1-0-2)
057125	EDPE	125	Rhythmic Activities for Life and Exercise	1(1-0-2)
057127	EDPE	127	Badminton for Life and Exercise	1(1-0-2)
057128	EDPE	128	Tennis for Life and Exercise	1(1-0-2)
057135	EDPE	135	Aerobic Exercise for Health	2(2-0-4)
601212	FST	212	Nutrition for Contemporary Living	3(3-0-6)

1.2 Innovative Co-creator **3 Credits**

A student also choose 3 credits from this group of GE courses.

610112	AG	112	Food Product Innovation	3(3-0-6)
703103	MGMT	103	Introduction to Entrepreneurship and Business	3(3-0-6)

1.3 Active Citize **6 Credits**

1.3.1 Required Courses **3 Credits**

140104	PG	104	Citizenship	3(3-0-6)

1.3.2 Elective Courses

A student also choose at least 3 credits from this group of GE courses.

012200	RE	200	Mind Volunteer	3(2-2-5)
154104	GEO	104	Environmental Conservation	3(3-0-6)

Students may request, by approval of the curriculum administrative committee, to transfer the credits of his/her enrolled General Education courses offered by academic Thai or international institutions.

2. Field of Specialization **a minimum of** **100 Credits**

2.1 Core Courses **41 Credits**

202101	BIOL	101	Basic Biology 1	3(3-0-6)
202103	BIOL	103	Biology Laboratory 1	1(0-3-0)
203103	CHEM	103	General Chemistry 1	3(3-0-6)
203104	CHEM	104	General Chemistry 2	3(3-0-6)
203107	CHEM	107	General Chemistry Laboratory 1	1(0-3-0)
203108	CHEM	108	General Chemistry Laboratory 2	1(0-3-0)
203206	CHEM	206	Organic Chemistry for Non-Chemistry Students	3(3-0-6)
203209	CHEM	209	Organic Chemistry Laboratory for Non-Chemistry Students	1(0-3-0)
203226	CHEM	226	Physical Chemistry for Non-Chemistry Students	3(3-0-6)
203229	CHEM	229	Physical Chemistry Laboratory	1(0-3-0)
206108	MATH	108	Elementary Mathematics	3(3-0-6)
207123	PHYS	123	Physics for Agro-Industry Students	3(3-0-6)
207173	PHYS	173	Physics Laboratory for Agro-Industry Students	1(0-3-0)
208263	STAT	263	Elementary Statistics	3(3-0-6)
211311	BCT	311	Biochemistry 1	3(3-0-6)
211317	BCT	317	Biochemistry Laboratory 1	1(0-3-0)
215207	MICB	207	Introductory Microbiology	3(3-0-6)
215208	MICB	208	Introductory Microbiology Laboratory	1(0-3-0)
601462	FST	462	Human Nutrition Survey and Improvement	3(3-0-6)

2.2 Major **a minimum of** **59 Credits**

2.2.1 Major Requirements **44 Credits**

601231	FST	231	Food Microbiology	3(3-0-6)
601232	FST	232	Food Microbiology Laboratory	1(0-3-0)
601242	FST	242	Food Processing 1	3(3-0-6)
601341	FST	341	Fundamental Food Engineering 1	3(3-0-6)
601342	FST	342	Fundamental Food Engineering 2	3(2-3-4)
601344	FST	344	Food Processing 2	2(2-0-4)
601345	FST	345	Food Processing Laboratory 1	1(0-3-0)
601346	FST	346	Food Processing 3	2(2-0-4)

601347	FST	347	Food Processing Laboratory 2	1(0-3-0)
601351	FST	351	Food Legislation and Standards	2(2-0-4)
601361	FST	361	Food Chemistry	3(3-0-6)
601452	FST	452	Quality Control and Assurance	3(3-0-6)
601453	FST	453	Quality Control and Assurance Laboratory	1(0-3-0)
601460	FST	460	Food Analysis	4(3-3-6)
601471	FST	471	Food Product Development	3(2-3-4)
601472	FST	472	Food Manufacturing Management	3(3-0-6)
601496	FST	496	Work Training	2(0-12-0)
601497	FST	497	Seminar 1	1(1-0-2)
601499	FST	499	Research Exercise	3(0-9-0)

2.2.2 Major Electives a minimum of 15 Credits

A student also choose from the following courses.

321393	PHSO	393	Physiology for Agro-Industry Students	3(3-0-6)
601321	FST	321	Meat Technology	3(2-3-4)
601322	FST	322	Halal Food	3(3-0-6)
601352	FST	352	Food Sanitation	2(2-0-4)
601353	FST	353	Food Safety and Sanitation for Food Plants	3(3-0-6)
601362	FST	362	Functional Foods and Nutraceuticals	3(3-0-6)
601363	FST	363	Sustainable Food Systems	3(3-0-6)
601421	FST	421	Lipid Technology	3(2-3-4)
601422	FST	422	Sugar Technology	3(2-3-4)
601423	FST	423	Fruit and Vegetable Technology	3(2-3-4)
601424	FST	424	Bakery Technology	3(2-3-4)
601425	FST	425	Beverages	3(2-3-4)
601426	FST	426	Fishery Product Technology	3(2-3-4)
601427	FST	427	Legume Technology	3(2-3-4)
601428	FST	428	Dairy Technology	3(2-3-4)
601429	FST	429	Cereal Products Technology	3(2-3-4)
601430	FST	430	Food Microbial Technology	3(2-3-4)
601431	FST	431	Food Toxicology	3(2-3-4)
601432	FST	432	Dairy Microbiology	3(2-3-4)
601434	FST	434	Industrial Fermentation	3(2-3-4)
601435	FST	435	Yeast Technology	3(2-3-4)
601436	FST	436	Coffee Production Process and Quality Control	3(2-3-4)

601443	FST	443	Dried Food Production	3(2-3-4)
601444	FST	444	Food Packaging	3(3-0-6)
601446	FST	446	Freezing Preservation of Food	3(2-3-4)
601447	FST	447	Food Plant Layout Planning and Evaluation	3(2-3-4)
601454	FST	454	Selected Topics in Food Science and Technology 1	1(1-0-2)
601455	FST	455	Selected Topics in Food Science and Technology 2	2(2-0-4)
601456	FST	456	Selected Topics in Food Science and Technology 3	3(3-0-6)
601461	FST	461	Proteins in Foods	3(2-3-4)
601463	FST	463	Nutrition, Health and Prevention	3(3-0-6)
601464	FST	464	Nutrition for Food Manufacturer	3(3-0-6)
601465	FST	465	Dairy Chemistry	3(2-3-4)
601468	FST	468	Lipids in Foods	3(3-0-6)
601469	FST	469	Carbohydrates in Foods	3(2-3-4)
601481	FST	481	Food and Nutrition throughout Life Span	3(3-0-6)
601482	FST	482	Food and Nutrition for Alternative Group	3(3-0-6)
601483	FST	483	Nutritional Assessment	3(2-3-4)
601484	FST	484	Methods in Nutritional Sciences	3(3-0-6)
601485	FST	485	Nutrition and Obesity	3(3-0-6)
601486	FST	486	Food and Nutrition for Athletes	3(3-0-6)
601487	FST	487	Lipid Nutrition and Health	3(3-0-6)

2.3 Minor (if any) a minimum of 15 Credits

Student may choose to have academic minor offered and certified by Chiang Mai University. If so, at least 15 credits must be taken with the approval of the academic advisor and consequently at least 15 credits will be added to the total.

3. Free Electives a minimum of 6 Credits

Student are required to take at least 6 credits of elective courses, from outside the major fields and minor fields (if any).

Total 136 Credits

3.1.4 Study Plan

Year1 Semester 1		**Credits**
001101	Fundamental English 1	3(3-0-6)
202101	Basic Biology 1	3(3-0-6)
202103	Biology Laboratory 1	1(0-3-0)
203103	General Chemistry 1	3(3-0-6)
203107	General Chemistry Laboratory 1	1(0-3-0)
207123	Physics for Agro-Industry Students	3(3-0-6)
207173	Physics Laboratory for Agro-Industry Students	1(0-3-0)
204100	Information Technology and Modern Life	3(3-0-6)
	(Learner Person)	3
	Total	**21**

Year1 Semester 2		**Credits**
001102	Fundamental English 2	3(3-0-6)
140104	Citizenship	3(3-0-6)
203104	General Chemistry 2	3(3-0-6)
203108	General Chemistry Laboratory 2	1(0-3-0)
206108	Elementary Mathematics	3(3-0-6)
215207	Introductory Microbiology	3(3-0-6)
215208	Introductory Microbiology Laboratory	1(0-3-0)
	(Learner Person)	3
	Total	**20**

Year 2 Semester 1		**Credits**
001201	Critical Reading and Effective Writing	3(3-0-6)
203206	Organic Chemistry for Non-Chemistry Students	3(3-0-6)
203209	Organic Chemistry Laboratory for Non-Chemistry Students	1(0-3-0)
203226	Physical Chemistry for Non-Chemistry Students	3(3-0-6)
203229	Physical Chemistry Laboratory	1(0-3-0)
208263	Elementary Statistics	3(3-0-6)
601231	Food Microbiology	3(3-0-6)
601232	Food Microbiology Laboratory	1(0-3-0)
	Free Elective	3
	Total	**21**

Year2 Semester 2		**Credits**
001227	English for Agriculture and Agro-Industry	3(3-0-6)
211311	Biochemistry 1	3(3-0-6)
211317	Biochemistry Laboratory 1	1(0-3-0)
601242	Food Processing 1	3(3-0-6)
601341	Fundamental Food Engineering 1	3)3-0-6(
	(Innovative CO-creator)	3(3-0-6)
	(Active Citizen)	3
	Free Elective	3
	Total	**22**

Year3 Semester 1		**Credits**
601344	Food Processing 2	2(2-0-4)
601345	Food Processing Laboratory 1	1(0-3-0)
601351	Food Legislation and Standards	2(2-0-4)
601361	Food Chemistry	3(3-0-6)
601452	Quality Control and Assurance	3(3-0-6)
601453	Quality Control and Assurance Laboratory	1(0-3-0)
601462	Human Nutrition Survey and Improvement	3(3-0-6)
601497	Seminar 1	1(1-0-2)
	Major Elective	3
	Major Elective	3
	Total	**22**

Year3 Semester 2		**Credits**
601342	Fundamental Food Engineering 2	3(2-3-4)
601346	Food Processing 3	2(2-0-4)
601347	Food Processing Laboratory 2	1(0-3-0)
601460	Food Analysis	4(3-3-6)
601471	Food Product Development	3(2-3-4)
601472	Food Manufacturing Management	3(3-0-6)
601496	Work Training	2(0-12-0)
	Major Elective	3
	Total	**21**

1) Year4 Semester 1 Plan at CMU		Credits
	Major Elective	3
	Total	**3**

Year4 Semester 2 Plan at CMU		Credits
601499	Research Exercise	3(0-9-0)
	Major Elective	3
	Total	**6**

2) Year4 Semester 1 Plan at Deakin		Deakin Unit
HSN204	Food Safety (Lecture)	1
HSN302	Population Nutrition (Lecture)	1
HSN305	Assessing Food Intake and Activity (Lecture and Practicals)	1
HAI010	Academic Integrity (0 credit)	0
	Total	**3**

Year4 Semester 2 Plan at Deakin		Deakin Unit
HSN223	Sensory Evaluation of Food (Lecture and Practicals)	1
HSN301	Food Diet and Disease (Lecture)	1
HSN309	Food Policy and Regulation (Lecture)	1
HSN319	Consumer and Sensory Innovation of Food	1
	Total	**4**

Study Plan for International Course and Double Degree of B.S.
(Food Science and Technology)

Year 1					
Semester 1			Semester 2		
001101	Fundamental English 1	3	001102	Fundamental English 2	3
202101	Basic Biology 1	3	140104	Citizenship	3
202103	Biology Laboratory 1	1	203104	General Chemistry 2	3
203103	General Chemistry 1	3	203108	General Chemistry Laboratory 2	1
203107	General Chemistry Laboratory 1	1	206108	Elementary Mathematics	
207123	Physics for Agro-Industry Students	3	215207	Introductory Microbiology	3
207173	Physics Laboratory for Agro-Industry Students	1	215208	Introductory Microbiology Laboratory	3 1
204100	Information Technology and Modern Life	3	xxxxxx	Learner Person	3
xxxxxx	Learner Person	3			

		21			**20**
Year 2					
Semester 1			Semester 2		
001201	Critical Reading and Effective Writing	3	001227	English for Agriculture and Agro-Industry	3
203206	Organic Chemistry for Non-Chemistry Students	3	211311	Biochemistry 1	3
203209	Organic Chemistry Laboratory for Non-Chemistry Students	1	211317	Biochemistry Laboratory 1	1
203226	Physical Chemistry for Non-Chemistry Students	3	601242	Food Processing 1	3
203229	Physical Chemistry Laboratory	1	601341	Fundamental Food Engineering 1	3
208263	Elementary Statistics	3	xxxxxx	Innovative Co-creator	3
601231	Food Microbiology	3	xxxxxx	Active Citizen	3
601232	Food Microbiology Laboratory	1	xxxxxx	Free Elective	3
xxxxxx	Free Elective	3			
		21			**22**
Year 3					
Semester 1			Semester 2		
601344	Food Processing 2	2	601342	Fundamental Food Engineering 2	3
601345	Food Processing Laboratory 1	1	601346	Food Processing 3	2
601351	Food Legislation and Standards	2	601347	Food Processing Laboratory 2	1
601361	Food Chemistry	3	601460	Food Analysis	4
601452	Quality Control and Assurance	3	601471	Food Product Development	3
601453	Quality Control and Assurance Laboratory	1	601472	Food Manufacturing Management	3
601462	Human Nutrition Survey and Improvement	3	601496	Work Training	2
601497	Seminar 1	1	xxxxxx	Major Elective	3
xxxxxx	Major Elective	3			
xxxxxx	Major Elective	3			
		22			**21**
Year 4 (Deakin University: Nutrition Science)					
Semester 1 (Trimester 2 at Deakin)			Semester 2 (Trimester 1 of subsequent year at Deakin)		
HSN204	Food Safety	1 DU	HSN223	Sensory Evaluation of Food	1 DU
HSN302	Population Nutrition	1 DU	HSN301	Diet and Disease	1 DU
			HSN309	Food Policy and Regulation	1 DU

HSN305 HAI010	Assessing Food Intake and Activity Academic Integrity (0 credit)	1 DU 0 DU	HSN319	Consumer and Sensory Innovation of Food	1 DU
		3 DU			**4 DU**

Total = 136 credits and 7 DUs

Remarks: For Double Degree Curriculum

1. The first 3 years studies in CMU.
2. The last year (4th year) studies in other university.
3. CMU regulation for credits:
   - Lecture : 15 lecture hours per semester = 1 credit
   - Laboratory : 45 laboratory hours per semester = 1 credit

For FST International Degree Curriculum

Subject Code 611496 Work Training and Subject Code 601499 Research Exercise are required.

Major Elective (1) is 601481 Food and Nutrition throughout Life Span

Major Elective (2) is 321393 Physiology for Agro-Industry Students

Major Elective (3) is 601363 Sustainable Food Systems

Course Plan Trimester 2 entry

T2 (mid-July to end of October) HAI010 Academic Integrity (0 credit), HSN204 Food Safety, HSN302 Population Nutrition (Lecture), HSN305 Assessing Food Intake and Activity (Lecture+Practicals).

T3 (November to end of February) No course **Note: In Summer 2022, only HSN101 and HSN211 are offered.

T1 (March to end of June) HSN223 Sensory Evaluation of Food (Lecture+ Practicals), HSN301 Diet and Disease (Lecture), HSN309 Food Policy and Regulation (Lecture), HSN319 Consumer and Sensory Innovation of Food

(Note: T3= “Summer” semester)

Description of the course

1. General Education

1.1 Learner Person

1.1.1 Required Courses

ENGL 101 (001101) : Fundamental English 1 3(3-0-6)
Conditions : None

Communication in English for everyday interactions. Basic listening, speaking, reading and writing skills in various social and cultural contexts for life-long learning.

ENGL 102 (001102) : Fundamental English 2 3(3-0-6)
Conditions : 001101 or according to the approval of the committee

Communication in English for everyday interactions. More advanced listening, speaking, reading and writing skills in various social and cultural contexts for life-long learning.

ENGL 201 (001201) : Critical Reading and Effective Writing 3(3-0-6)
Conditions : 001102 or according to the approval of the committee

English language skills for critical reading from different sources and media and effective writing on topics of students' interests.

ENGL 227 (001227) : English for Agriculture and Agro-Industry 3(3-0-6)
Conditions : 001102 or according to the approval of the committee

Specific language skills, components and functions for effective communication in agricultural and agro-industrial contexts.

CS100 (204100) : Information Technology and Modern Life 3(3-0-6)
Conditions : None

Computer in everyday life, computer network and internet, online essentials, online collaboration, office productivity software for modern life, information technology security, information literacy.

1.1.2 GE Electives

PHIL 155 (011155) : Philosophy of Happiness 3(3-0-6)
Conditions : None

Human nature, Concepts of happiness, Main factors affecting human happiness, The art of creating a happy lifestyle.

PHIL 269 (011269) : Philosophy of Sufficiency Economy 3(3-0-6)
Conditions : None

Definition, concept and principle of philosophy of sufficiency economy. Livelihood according to philosophy of sufficiency economy. Application of the principle philosophy of sufficiency economy.

PHIL 277 (011277) : Bioethics 3(3-0-6)
Conditions : None

Meaning and scope of Bioethics. Evaluation and meaning-giving in ethics in general, especially concerning living creatures. Ethical thinking concerning living creatures. Problems and theories in Bioethics.

EDPE 122 (057122) : Swimming for Life and Exercise 1(1-0-2)
Conditions : None

The principles of exercise for health by Swimming. Warm up and cool down. Principles of breathing and movement under water. Using body physically to swim in each style. Helping others from dangers in swimming. Swimming for health and participation in competition at different levels. Benefits and etiquette for players and spectators.

EDPE 125 (057125) : Rhythmic Activities for Life and Exercise 1(1-0-2)
Conditions : None

The principles of exercise for health through Rhythmic Activity. Body movements in different styles. Body movements with rhythm and music. Folk dances and social dances. Social manners and social dances etiquette. Analysis of social dances types. Participating in and organizing social dance parties.

EDPE 127 (057127) : Badminton for Life and Exercise 1(1-0-2)
Conditions : None

The principles of exercise for health by playing Badminton. Warm up and cool down. How to hold the racquet and body movements to hit the shuttlecock. Rules and scoring in Badminton. Playing Badminton in different styles. Analysis of Badminton matches and participation in Badminton competition at different levels. Benefits and etiquette for players and spectators.

EDPE 128 (057128) : Tennis for Life and Exercise 1(1-0-2)
Conditions : None

The principles of exercise for health by playing Tennis. Warm up and cool down. How to hold the racquet and body movements to hit the tennis ball. Rules and scoring in Tennis. Playing Tennis in different styles. Analysis of Tennis matches and participation in Tennis competition at different levels. Benefits and etiquette for players and spectators.

EDPE 135 (057135) : Aerobic Exercise for Health 2(2-0-4)
Conditions : None

Exercise and aerobic exercise. Benefits of aerobic exercise and design of aerobic exercise for physical fitness. Evaluation of aerobic exercise.

FST 212 (601212) : Nutrition for Contemporary Living 3(3-0-6)
Conditions : None

Overview of nutrition for health in the modern society, dietary patterns for good health, dietary patterns for various life stages, dietary patterns for specific health purposes, popular diet trends, finding sources related to nutrition, personalized nutrition and social influence on eating behaviors.

1.2 Innovative CO-creator

1.2.1 Recommended course

AG 112 (610112) : Food Product Innovation 3(3-0-6)

Conditions : None

Definition and importance of food product innovation, food culture, types of new products, principles of food product development, concept of food innovation, food design and decoration, new product testing, intellectual property and case studies.

MGMT 103 (703103) : Introduction to Entrepreneurship and Business 3(3-0-6)

Conditions : None

Entrepreneur role in economics development country Entrepreneur and business opportunities. The characteristic of entrepreneur and motivation factors, environment, types of business, forms of business, business plans, principle of management, marketing management, production management, financial management, accounting, taxation, business law, international business and business ethics for entrepreneur.

1.3 Active Citizen

1.3.1 Required Courses

PG 104 (140104) : Citizenship 3(3-0-6)

Conditions : None

Meaning, definition and concept of citizenship. Rights, liberties and obligations of citizenship. Problems awareness of daily life at local, national and international levels. Creation of public mind and moral for social responsibility and social awareness. Citizenship and the way of life in plural and multicultural societies. Creating a positive and peaceful attitude to enable conflict resolution by peaceful means. Political expression under laws, regulations, social norms and communal practice. Citizenship and the understanding of cultural tradition and local history. Ethics and vocational citizen.

1.3.2 วิชาเลือก Elective courses

RE200 (012200) : Mind Volunteer 3(2-2-5)

Conditions : None

The concept of mind volunteer, basic principles of mind volunteer in various religions, the practice of mind volunteer.

GEO104 (154104) : Environmental Conservation 3(3-0-6)
Conditions : None

Problems in the management and the utilization of natural resources with emphasis on soil, forest, water, minerals and wildlife, introducing some conservation methods and conservation measures necessary for Thailand

2. Field of Specialization

2.1 Core Courese

BIOL101 (202101) : Basic Biology 1 3(3-0-6)
Conditions : None

Introduction, scientific methods, characteristics of life, biological level of organization, chemical of life, cell and metabolism, genetics and molecular genetics, mechanism of evolution, diversity of life, structure and function of plant, structure and function of animal and ecology and behavior.

BIOL103 (202103) : Biology Laboratory 1 1(0-3-0)
Conditions : register with 202101

Microscope, cell structure and functions, cellular respiration, cell divisions, genetics, evolution and biological diversity, plant tissues, animal tissues, behavior and population ecology.

CHEM103 (203103) : General Chemistry 13 (3-0-6)
Conditions : None

Stoichiometry, gases, liquids and solids, chemical thermodynamics, electrochemistry, chemical equilibrium, atomic structures and periodic table and chemical bonding.

CHEM104 (203104) : General Chemistry 2 (3-0-6)
Conditions : 203103

Solutions, acids-bases and ionic equilibrium, equilibria involving complex ions and solubility products, coordination compounds, nuclear chemistry, chemical kinetics and organic chemistry

CHEM107 (203107) : General Chemistry Laboratory 1 1 (0-3-0)
Conditions : register with 203103

Techniques in chemistry laboratory, the reactions of copper and its compounds, determination of gas constant, crystal structures, determination of vapor pressure and latent heat of vaporization of water, heat of reaction, galvanic cells, electrolysis, reversible reactions and chemical equilibrium, oxidation states of vanadium.

CHEM108 (203108) : General Chemistry Laboratory 2 1 (0-3-0)
Conditions : 203107 and 203104

Determination of molecular weight by freezing point depression, acid-base equilibria, buffer solution and hydrolysis, reaction titration curves for acid-base solution, effects of temperature on the solubility of salts, the solubility product, coordination compounds, rate of chemical reaction, organic chemistry, qualitative analysis of cations and anions group I, II, III, and IV, qualitative analysis of cation and anion in unknown salt, and special experiment**.**

CHEM206 (203206) : Organic Chemistry for Non-Chemistry Students 3(3-0-6)
Conditions : 203104 or 203111

Classification and nomenclature, bonding in molecules of organic compounds, organic reactions, organic compounds analysis, aliphatic hydrocarbons, isomerism and conformational isomers, stereochemistry, aromatic compounds, halogen compounds, alcohols, phenols and ethers, amines, aldehydes and ketones, carboxylic acids and derivatives, carbohydrates, lipids, amino acids, peptides and proteins.

CHEM209 (203209) : Organic Chemistry Laboratory for Non-Chemistry Students 1(0-3-0)
Conditions : 203108 or 203115; and register with 203206

Introduction to the equipment and safety procedure in chemistry laboratory, basic laboratory techniques in organic chemistry, conformational isomers and stereoisomers, basic organic reactions and preliminary analysis of functional groups.

CHEM226 (203226) : Physical Chemistry for Non-Chemistry Students 3(3-0-6)
Conditions : 203104 or 203111 or 203151

Chemical thermodynamics, phase equilibria, chemical kinetics, physical properties of macromolecular solution, electrolytic conductivity, acid-base and ionic equilibria and electrochemistry.

CHEM229 (203229) : Physical Chemistry Laboratory 1(0-3-0)
Conditions : 203108 or 203115 or 203157 ; and register with 203226

Basic techniques in physical chemistry: molecular mass determination (viscosity measurement, freezing point depression measurement), rate constant and overall order of reaction, transference number determination of ions (moving boundary method), conductance measurement, study of solid-liquid and liquid-liquid phase diagrams, pH and potentiometric titration, equilibrium constant determination by distribution method, equilibrium constant determination in keto-enol tautomerism, heat of combustion determination (Bomb calorimeter).

MATH 108 (206108) : Elementary Mathematics 3(3-0-6)
Conditions : None

Differentiation and applications, integration and applications, first-order differential equations and some applications, partial derivatives, matrices and systems of linear equations and applications, linear programming.

PHYS 123 (207123) : Physics for Agro-Industry Students 3(3-0-6)
Conditions : None

Nature of science and overall picture of physics, mechanics, mechanical properties of matter, hydrostatics and hydrodynamics, oscillations and waves, electrostatic, magnetostatic and electromagnetism, thermodynamics and kinetic theory of gas.

PHYS 173 (207173) : Physics Laboratory for Agro-Industry Students 1(0-3-0)
Conditions : None

Introduction to instruments, measurements and experimental techniques, experiments in mechanics, thermodynamics, hydrostatics, waves, properties of matters, electricity and magnetism.

STAT263 (208263) : Elementary Statistics 3(3-0-6)
Conditions : None ; For students of science and technology disciplines and groups Health Sciences

Review of basic statistical knowledge, probability and probability distribution, estimation and hypothesis testing of population mean, estimation and hypothesis testing of population proportion, estimation and hypothesis testing of population variance, chi - square application, analysis of variance, regression and correlation.

BCT311 (211311) : Biochemistry 1 3(3-0-6)
Conditions : 203113 or 203104

Introduction to biochemistry, buffering in biological system, techniques and tools in biochemistry, nucleotides and nucleic acids, amino acids and proteins, enzymes and coenzymes, carbohydrates and glycans, lipids, biological membrane and transport.

BCT317 (211317) : Biochemistry Laboratory 1 1(0-3-0)
Conditions : register with 211311

Buffer solution, nucleic acids, amino acids and proteins, enzymes, carbohydrates and lipids.

MICB207 (215207) : Introductory Microbiology 3(3-0-6)
Conditions : 202111

Scope, history and importance of microbiology, diversity of prokaryotic microorganisms, eukaryotic cell and eukaryotic microorganisms, prokaryotic forms and functions, principles and techniques in microbiology, control of microorganisms, microbial growth, microbial metabolism, microbial genetics, viruses, basic immunology, pathogenic microorganisms in human, animals and plants, food and industrial microbiology and environmental microbiology.

MICB 208 (215208) : Introductory Microbiology Laboratory 1(0-3-0)
Conditions : 202111 register with 215207 and students in majors are not allowed to register

Microscopy, control of microorganisms, isolation techniques of bacterial culture, staining of bacterial structures, cultivation of bacteria in anaerobic condition, cultural characteristics of bacteria, bacterial metabolism, cultivation of yeasts and molds, viruses, immunology, wine and yoghurt making, distribution of microorganisms in nature and microbiological examination of water.

FST462 (601462) : Human Nutrition Survey and Improvement 3(3-0-6)
Conditions : 211311 and 211317

Types of human food and food consumption. Functions of food, problems of malnutrition and diseases. The digestion absorption metabolism of foods I n health. Practical aspects of knowledge in the cooking processing and storage of foods. Topics for investigation and programs to improve nutrition.

2.2 Major

2.2.1 Requirements

FST 231 (601231) : Food Microbiology 3(3-0-6)
Conditions : 215207 and 215208
Or 602122 and 602123

Effect of microorganisms in food on economy, microorganisms causing food spoilage and food poisonings, principles of microbial examination in food, general principles on food preservation and food fermentation, microbiology of canned foods, sanitation and control of food plant.

FST232 (601232) : Food Microbiology Laboratory 1(0-3-0)
Conditions : register with 601231

Basic methods in microbiology, biochemical reactions, hygienic indicators of foods, water, utensils and equipment, biochemical examination.

FST242 (601242) : Food Processing 1 3(3-0-6)
Conditions : 203203 and 203207;
Or 203206 and 203209

Batch and continuous processes, water in food industry, steam generation and handling, raw material preparation and management, conveying system in food factory, non-thermal food processing techniques including chilling, freezing, fermentation, food preservation by salting and sugaring, and minimal processing

FST341 (601341) : Fundamental Food Engineering 1 3(3-0-6)
Conditions : 207117 and 207187 and 206104 or 206108; or 207123 and 20717 and 206104 or 206108

Dimension and units, thermodynamics, mass and energy balances, fluids and fluid flow, heat transfer and heat exchangers, and mass transfer.

FST342 (601342) : Fundamental Food Engineering 2 3(2-3-4)
Conditions : 601341

Size reduction and classification, mixing, fluidization, filtration and centrifugation, refrigeration and chilling, freezing, evaporation, drying, distillation and extraction.

FST 344 (601344) : Food Processing 2 2 (2-0-4)
Conditions : 601242

Food processing using thermal techniques including pasteurization, sterilization, microwave, irradiation, extrusion, frying, baking and roasting, drying, evaporation and concentration, food smoking, and effects of processing on food qualities.

FST345 (601345) : Food Processing Laboratory 1 1(0-3-0)
Conditions : register with 601344

Food chilling, food freezing, fermentation, minimal processing, food preservation using salting and sugaring, smoking, pasteurization, sterilization, frying, roasting, baking, drying, evaporation and concentration.

FST346 (601346) : Food Processing 3 2(2-0-4)
Conditions : 601344

Food coating and encapsulation, novel food processing technologies, food packaging and packaging materials, food storage, disposal and treatment of wastes and waste water from food industry, energy management in food factory, clean technology in food processing, food plant design and layout and automatic control systems in food processing.

FST347 (601347) : Food Processing Laboratory 2 1(0-3-0)
Conditions : register with 601346

Food processing using microwave, extrusion, food coating and encapsulation, novel food processing technologies, food packaging and packaging materials, food storage, disposal and treatment of wastes and waste water from food industry, energy management in food factory, clean technology in food processing, food plant design and layout, and automatic control systems in food processing.

FST351 (601351) : Food Legislation and Standards 2(2-0-4)
Conditions : A third year student

Thai food act, Thai food regulations and codes of Ministry of Public Health , international food regulations and international standards for food.

FST361 (601361) : Food Chemistry 3(3-0-6)
Conditions : 211311 and 211317

The chemical compositions, properties, and nutrition value of foods. Chemical and biological changes of foods and food products during storage and processing. Emphasis on changes at the cellular and molecutar levels.

FST 452 (601452) : Quality Control and Assurance 3(3-0-6)
Conditions : 208263 or 605314

Principles and organization management of quality control. Measurement of physical and chemical properties. Quality control system. Statistical methods and computer in quality control. Sensory evaluation. Quality assurance system.

FST 453 (601453) : Quality Control and Assurance Laboratory 1(0-3-0)
Conditions : register with 601452

Container evaluation, product examination, physical evaluation and chemical determination of color, maturity-texture determination, rheology evaluation, drosophia, and filth determination, defects examination, sensory evaluation, current methods in quality assurance.

FST460 (601460) : Food Analysis 4(3-3-6)
Conditions : 601361

Some important Techniques use for routine methods and reference methods of food analysis. Interpretations of results obtained from each experiment including legislations of each food and food products. Water analysis and applications**.**

FST471 (601471) : Food Product Development 3(2-3-4)
Conditions : 208263 and 601344

General characteristic of new products. Product development system and process in food industry. Idea generation, screening the ideas. Product formulation and product prototype development. Evaluation in product acceptance. Product market launch.

FST472 (601472) : Food Manufacturing Management 3(3-0-6)
Conditions : 601302 or 601344

Safe forecasting, capacity planning, production planning, scheduling, inventory management, project management, quality management, safety management, ergonomics design, factory visit or lecture from guest speaker.

FST496 (601496) : Working Training 2(0-12-2)
Conditions : A third year student

Preparing before work training, training in organization, company or industry related to food science and technology under supervision of consulting trainer(s) and/or instructor(s) at last 180 hours. Grading will be give on satisfactory or unsatisfactory basi**s.**

FST497 (601497) : Seminar 1 1(1-0-2)
Conditions : A third year student and according to the approval of the committee

The topics of the seminar will be offered by department, and presented by students enrolled in this course.

FST499 (601499) : Research Exercise 3(0-9-0)
Conditions : A four year student

An individual research work in the field of Food Science and Technology under general guidance and supervision of instructor.

2.2.2 Electives

PHSO 393 (321393) : Physiology for Agro-Industry Students 3(3-0-6)
Conditions : A third year student and according to the approval of the committee

Physiology of muscular system and nerve, circulatory system, respiratory system, gastrointestinal system, urinary system, water and electrolyte and acid-base balance, energy metabolism and body temperature regulation system, endocrine system and nervous system.

FST 321 (601321) : Meat Technology 3(2-3-4)
Conditions : 602120 or 602122 or 601231 ; And 203204 and 203208;
Or 203206 and 203209

The structure and growth of muscle and post mortem changes. Various influences on animal tissues. Pigment in muscle cells and their development. Palatability characteristics of meat. Assessment of spoilage of raw meat in term of total volatile nitrogen. Hydroxyproline as an index of toughness and tenderness of meat. Classification of meat products including canned meat products.

FST 322 (601322) : Halal Food 3(3-0-6)

Conditions : A third year student ; For students of the Faculty of Agro-Industry only

Importance of halal food. Domestic and international trades in halal food. Halal food laws and regulations. Principal guidelines of halal food production. Quality control of halal food. Guidelines of halal food production in different countries. Specific requirement of different halal food productions. Differences between kosher., halal and vegetarian food. Update topics of halal food.

FST 352 (601352) : Food Sanitation 2(2-0-4)

Conditions : 601231 or 601242

Food borne diseases, sanitation of various food premises as comply to the Food and Drug Control Acts, environmental cleanliness including the use of chemical disinfectants and sterilizing methods.

FST 353 (601353) : Food Safety and Sanitation for Food Plants 3(3-0-6)

Conditions : 601231 and 601242 ; or 606231

And 606244 ; or according to the approval of the committee

Food hazards and contaminants, food safety and food sanitation standard and regulations, personal hygiene, pest control and eradication, cleaning and sanitizing system in food industry, food plant sanitation management systems; Codex General Principles of Food Hygiene and Sanitation Standard Operating Procedure (SSOP).

FST 362 (601362) : Functional Foods and Nutraceuticals 3(3-0-6)

Conditions : 203201 or 203202 or 203203

Or 203204 or 203206

Definition and the importance of functional foods and nutraceuticals. Bioactive components in foods. Classification of functional foods and nutraceuticals. Functional food processing technology. Safety and related regulations of functional foods and nutraceuticals.

FST 363 (601363) : Sustainable Food Systems 3(3-0-6)

Conditions : according to the approval of the committee

Introduction to sustainable food systems, food-related sustainable development goals, agricultural roles in sustainable food systems, sustainable food manufacturing, influence of consumption on sustainable food systems, the roles of government, the private sector and individuals that threaten or promote will-being, relationships between society economy and environment for food sustainability, public communication of issues relating to the sustainability of food systems, strategies and Innovations in agriculture, food manufacturing and consumption for developing a sustainable food system**.**

FST421 (601421) : Lipid Technology 3(2-3-4)
Conditions : 601361

Roles of oils, fats and fatty foods in human diets. Structure, composition, reaction and physical properties of oils, fats and fatty foods. Source of raw materials, utilization, classification, extraction, refining, bleaching, hydrogenation, deodorization, fractionation, polymerization and isomerization of oils and fats. Utilization in food industries, i.e. cooking and salad oils, butter and margarine, bakery products and confection manufacture.

FST 422 (601422) : Sugar Technology 3(2-3-4)
Conditions : according to the approval of the committee

Manufacturing of raw cane sugar, i.e. sugar cane harvesting, juice extraction, liming process, clarification, filtration, evaporation, graining/crystallization. Sugar cane by products, molasses and bagasses are covered. Sugar and syrup industries, their standards and quality control, policy trends and trade are included. Lastly this course also concerns the manufacturing of candies and chocolates.

FST 423 (601423) : Fruit and Vegetable Technology 3(2-3-4)
Conditions : 601344

The application of thermal processing, freezing, drying to the manufacturing. Processes of fruits and vegetables. The production of fruits and vegetables, products such as; juices, concentrates, jams, jellies and the processing from some important fruits and vegetables wastes.

FST 424 (601424) : Bakery Technology 3(2-3-4)
Conditions : 601231 and 601242

Bakery industries, wheat classification, flour milling, testing of properties of wheat and flour, bakery types, equipment and ingredients in bakery, principle of bakery production, quality changes of bakery, bakery plant layout and good practice for bakery production.

FST 425 (601425) : Beverages 3(2-3-4)
Conditions : 601344

Kinds of beverage, raw materials of beverage, processing and problems of nonalcoholic carbonated beverages, nonalcoholic noncarbonated beverages, alcoholic beverages. The compositional, nutritional and microbiological aspects of beverages, their standards, sensory and instrumental method of quality control, and beverages legislation and truck lastly, and the recent development in beverage manufacture.

FST 426 (601426) : Fishery Product Technology 3(2-3-4)
Conditions : 601344

The biology and chemistry of economically important fish and shellfish, fishery and handling, sanitation of fishery product production, microbiology and chemistry of fish spoilage, processing and preservation of fish and shellfish and products of fish and shellfish including fish meal, fish oil and by products. The practices are emphasized on fresh water fishery products.

FST427 (601427) : Legume Technology 3(2-3-4)
Conditions : 601344

Production of food legume in Thailand; chemical and nutrition aspects: processed legumes by new and improved technologies; by-product utilization of legume processing and product development.

FST 428 (601428) : Dairy Technology 3(2-3-4)
Conditions : 601231 and 601232 and 601344

Milk composition and its nutritional values, standards and technology of raw milk, pasteurized milk, sterilized milk and U.H.T. milk including those of other dairy products.

FST 429 (601429) : Cereal Products Technology 3(2-3-4)
Conditions : 601344 or 606241

Industrial processing of cereals, rice products, pasta, Asian noodles, breakfast cereals, malting products and bakery products.

FST 430 (601430) : Food Microbial Technology 3(2-3-4)
Conditions : 601231 and 601232

Utilization of microorganisms in food industries, fermented food from soy, fermented food from rice, Nata de coco and vinegar process, fermented food from vegetable and fermented milk process.

FST 431 (601431) : Food Toxicology 3(2-3-4)
Conditions : 211311 and 215207 and 215208; or 211311 and 602122

Principles of toxicology, metabolism of toxic substances, nature toxic substances in food, Food-borne diseases, pathogen, poisonous metallic substances, poisonous pesticide, toxic of food additives and food processing aids, food allergy and cancer.

FST 432 (601432) : Dairy Microbiology 3(2-3-4)
Conditions : 601231 and 601232

Microorganisms of milk and milk products and their microbiological control such as raw and pasteurized milk, butter, cheese, fermented milk and ice-cream etc.

FST 434 (601434) : Industrial Fermentation 3(2-3-4)
Conditions : 601231 and 601232

Production of foods and related product; through the used of microbial fermentations, including utilization of micro-organisms such as yeasts and algae as foods and food products.

FST 435 (601435) : Yeast Technology 3(2-3-4)
Conditions : 601231 and 601232

Utilization of yeasts in food industries, winery, brewery, bread making, and alcoholic beverages. Food spoilage caused by yeasts.

FST 436 (601436) : Coffee Production Process and Quality Control 3(2-3-4)
Conditions : 601242

Importance of coffee on national economy. Specific properties of coffee. Coffee cultivation, caring and harvesting. Coffee bean processing. Coffee roasting. Coffee brewing. Coffee products. Quality control of coffee. Coffee standards and related standards. Coffee business management.

FST 443 (601443) : Dried Food Production 3(2-3-4)
Conditions : 601344 and 601345

Theoretical and terminology of dried food dehydration, methods used for the drying of food stuffs, drying mechanism, drying equipment principles, design features and application, special drying techniques.

FST 444 (601444) : Food Packaging 3(3-0-6)
Conditions : 601231 and 601346

Role and functional properties of food packaging. Mechanical, physical, chemical and biological properties of food packaging. Various kinds of food packaging material and their features. Packaging and storage study on a variety of food products. Methods of tin-plate and glass container manufacture and testing. Statutory regulation affecting food packaging.

FST 446 (601446) : Freezing Preservation of Food 3(2-3-4)
Conditions : 601342 and 601344

Methods and equipment for food freezing by contact with a cooled solid, liquid, gas. Cryogenic freezing dehydrofreezing, Freezing of precooked and prepared food. Cold storage design and maintenance. Refrigerating and transporting frozen foods. Factors affecting quality in frozen foods.

FST 447 (601447) : Food Plant Layout Planning and Evaluation 3(2-3-4)
Conditions : 601344

Site selection for food plant. Consideration for food plant layout, systematic lay-out planning pattern, lay-out of processing equipment, storage and piping.

FST 454 (601454) : Selected Topics in Food Science and Technology 1 1(1-0-2)
Conditions : according to the approval of the committee

Current topics in food science and technology.

FST 455 (601455) : Selected Topics in Food Science and Technology 2 2(2-0-4)
Conditions : according to the approval of the committee

Current topics in food science and technology.

FST 456 (601456) : Selected Topics in Food Science and Technology 3 3(3-0-6)
Conditions : according to the approval of the committee

Current topics in food science and technology**.**

FST 461 (601461) : Proteins in Foods 3(2-3-4)
Conditions : 601361

Fundamental properties of protein systems found in milk, eggs, meat, cereal grains. Effect of processing on food proteins.

FST 463 (601463) : Nutrition, Health and Prevention 3(3-0-6)
Conditions : A fourth year student ; For students , the major food science and technology

Introduction to nutrition. Components of nutrients in food: macronutrients and micronutrients e.g. carbohydrate, lipids, proteins and vitamins and minerals. Energy expenditure. Nutritional assessment. Dietary reference values and dietary assessment. Diet and disease e.g. diet and obesity, diet and diabetes mellitus, diet and cancer, diet and bone and teeth diseases, diet

and heart disease and diet and hypertension. Dietary supplements. Turning good intentions into good lifestyle behaviours.

FST 464 (601464) : Nutrition for Food Manufacturer 3(3-0-6)
Conditions : A fourth year student ; For students , the major food science and technology

Introduction to nutrition. Nutrition and consumers. Nutrients (macronutrients and micronutrients) e.g. carbohydrate, lipids, proteins and vitamins and minerals. Enhancing the nutritional values (meat and fruits and vegetables). Food processing and nutritional quality e.g. the stability of vitamin during food processing, thermal processing affecting nutrition quality, frying affecting nutrition quality, the processing of cereal foods affecting nutrition quality, chilling and freezing affecting nutrition quality, Modified Atmosphere Packaging (MAP) affecting nutrition quality, irradiation and microwave processing affecting nutrition quality, high pressure processing affecting nutrition quality. Consumers and nutrition labeling.

FST 465 (601465) : Dairy Chemistry 3(2-3-4)
Conditions : 601361

The sciences concerned with man's food supply are of obvious importance. Milk is of control significance in agriculture and in human health. This dairy chemistry course emphasizes towards the understanding of the nature of milk and milk products, i.e., the chemistry of milk constituents, the interaction of constituents with one another under various conditions, and the relationship of all these facts to the production and storage of dairy products. Analysis and tests on milk. Milk constituents and milk products are described.

FST 468 (601468) : Lipids in Foods 3(3-0-6)
Conditions : 601361 or 606264 or 606361

Composition and function of lipids in foods, physical and chemical properties of lipids in foods, industrial production of lipids, stability of lipids, composition of lipids in plants, composition of lipids in animals, composition of lipids in dairy, composition of lipids in seafoods, lipids based food products, industrial standards for lipids.

FST 469 (601469) : Carbohydrates in Foods 3(2-3-4)
Conditions : 601361 or 606264 or 606361

Types of carbohydrates in foods, structures and properties of carbohydrates, changes of carbohydrates during processing and storage, carbohydrate characterization, modified starches and

their properties, starch-based polymer products and utilization of carbohydrate in food manufactures.

FST 481 (601481) : Food and Nutrition throughout Life Span 3(3-0-6)
Conditions : 211311 or 211315

Overview of the life stages. Food and nutrition during pregnancy. Food and nutrition during lactation. Food and nutrition for infant. Food and nutrition for toddler/ preschool. Food and nutrition for children. Food and nutrition for adolescent. Food and nutrition for adult. Food and nutrition for elderly. Eating disorders. Updated topics in food and nutrition.

FST 482 (601482) : Food and Nutrition for Alternative Group 3(3-0-6)
Conditions : 211311 or 211315

Important of food and nutrition for alternative group, food and nutrition for vegetarian and vegan, food and nutrition for weight control and food and nutrition for athletes.

FST 483 (601483) : Nutritional Assessment 3(2-3-4)
Conditions : 208263

Overview of nutritional assessment. Standards for nutrient intake. Measuring dietary intake. Nutrition surveys. Anthropometry. Nutrition assessment. Counselting theories and techniques.

FST 484 (601484) : Methods in Nutritional Sciences 3(3-0-6)
Conditions : 211311 or 211315

Overview of nutritional sciences, nutrigenomics and nutrigenetics, experiments using cell lines and animal models and animal ethics, molecular biology tools and techniques for nutritional studies, assessment of nutritional and health outcomes in humans, food intake quantification methods, study design in human nutrition and ethics, overview of public health nutrition, overview of public health nutrition, basic principles of epidemiology, designs for the study of diet-disease relationships in a population and translation of nutritional evidence to policy.

FST 485 (601485) : Nutrition and Obesity 3(3-0-6)
Conditions : 211311 or 211315

Introduction and evolution of human obesity. Mechanism is of human of obesity. Food intake and body weight. Other factors that influence obesity. Dietary patterns for obesity prevention and management. Exercise and other guidelines in obesity management.

FST 486 (601486) : Food and Nutrition for Athletes 3(3-0-6)
Conditions : 211311 or 211315

Overview of food and nutrition for athletes, Energy requirements for athlete in normal situation, Necessary nutrients for athlete used in exercise, Food and drink during match, Nutrition for post event recovery, Sports food, beverage and supplements for athletes, Updated trends on food and nutrition for athletes.

FST 487 (601487) : Lipid Nutrition and Health 3(3-0-6)
Conditions : 211311 or 211315

Nature and sources of the main lipids, Metabolism and dietary requirements, Lipid oxidation and antioxidants, Fatty acids and health, Sterols and health, Cholesterols and health, Fat soluble vitamins and health, Phospholipids, sphingolipids, replacement lipids and health, Lipid and obesity, Lipid and cardiovascular disease, Updated topic in lipid and disease.