

DOCTOR OF PHILOSOPHY PROGRAM IN BIOLOGICAL SCIENCE

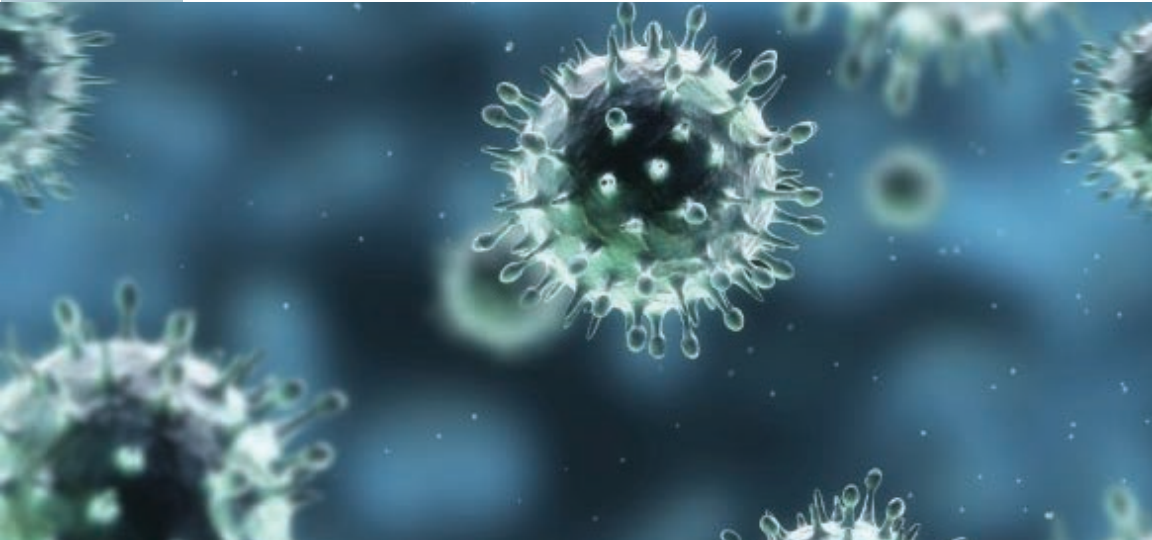
■ FACULTY OF SCIENCE

DOCTOR OF PHILOSOPHY PROGRAM IN BIOLOGICAL SCIENCE

Biological science studies all living organisms, their interactions, related factors, and processes intertwined in sustaining all lives in their paths of survival, growth, and regeneration. Inquiries into all lives lay bare human understanding and our interdependence with all co-existing on earth. The department conducts research studies to discover new knowledge appropriate for human sustainability on balance with natural resource sharing mechanisms for mutual benefits.

The Faculty conduct research in a wide array of life-science sub-disciplines, especially focused, as experts in neuro-toxicology, biological diversity, genetics, ecology, and environments.

While many Ph.D. graduates seek a traditional academic career, an increasing number find vocations in government agencies and a wide range of private enterprises.



Objectives

Upon graduation, the following characteristics are expected:

- Knowledgeable, competent with in-depth understanding in biological science.
- Empowered as the leader and principal driver in biological science research.
- Skillful in research and development in discovering new knowledge, leading to proper solutions locally, nationally, and internationally.
- Professionally ethical, positive in attitudes, and acceptable as a role model in the society.

Admission

In accordance with the Graduate School Rules and Regulations. The program committee reserves the rights to require more qualifications as deemed appropriate.

Medium of Instruction

Thai and English



Research Focus

Plant Biology

- Plant Morphology, Plant Physiology, Plant Anatomy (Rice/Papaya)
- Plant Diversity Zingiberaceae and other species

Genetic and Molecular Biology

- Plant Molecular Phylogenetic and Evolution
 - Genetic Markers of Nymphaeaceae
 - Genetic of Drosophila Melanogaster
 - Plant Mutation
 - Cytogenetic of Zingiberaceae and other species
 - Microsatellite Markers of Fruit Fly Parasitoids

Ecology and Environmental Biology

- Ornithology
 - Bird Diversity
 - Breeding Ecology of Edible Nesting Swiftlets and others

Animal Biology

- Entomology
 - Diversity and Taxonomy of Hymenopterans and Fireflies
 - Biology of Fireflies
 - Bee Biology and Bee Products
 - Insect Pollinators and Floral Structure
 - Diversity of Cyprinidae
 - Human and Animal Parasites
 - Biology and Taxonomy of Scorpions
 - Natural Toxins Affecting Nervous System
 - Taxonomy of Earth worms

Requirement for Graduation

In accordance with Graduate School Rules and Regulations.

Doctor of Philosophy Program in Biological Science

■ FACULTY OF SCIENCE

Structure of the Program

1. Credit Requirements. *

Requirements	Option 1.1	Option 1.2	Option 2.1	Option 2.2
Coursework	-	-	12	24
Core Courses	-	-	6	18
Electives	-	-	6	6
Required Non-credit Courses	4	9	4	9
Dissertation	48	72	36	48
Total	48	72	48	72

* Minimum credits required.

2. Core Courses

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Molecular Aspects of Cell Biology	-	-	-	-	257641	3	-	-
Molecular Approach in Developmental Biology	-	-	-	-	257642	3	-	-
Plant, Animal and Microbial Interactions	-	-	-	-	-	-	257531	3
Biological Sciences	-	-	-	-	-	-	257541	4
Metabolism and Responses in Organism	-	-	-	-	-	-	257542	4
Scientific Communication	-	-	-	-	-	-	257543	1

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Molecular Aspects of Cell Biology	-	-	-	-	-	-	257641	3
Molecular Approach in Developmental Biology	-	-	-	-	-	-	257642	3
Total	-	-	-	-	2	6	6	18

3. Electives

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Plant Metabolism	-	-	-	-	-	-	257511	3
Pollen Biology	-	-	-	-	-	-	257512	3
Biochemistry of Plant Hormones	-	-	-	-	-	-	257513	3
Plant Ecophysiology	-	-	-	-	-	-	257514	3
Environmental Physiology	-	-	-	-	-	-	257521	3
Comparative Endocrinology	-	-	-	-	-	-	257522	3
Comparative Vertebrate Anatomy	-	-	-	-	-	-	257523	3
Population Ecology	-	-	-	-	-	-	257532	3
Ecotoxicology and Monitoring	-	-	-	-	-	-	257533	3
Environment and sustainable development	-	-	-	-	-	-	257534	3
Biosystematics	-	-	-	-	-	-	257544	3
Selected Topics in Biological Sciences	-	-	-	-	-	-	257545	3
Special topics in Biological science research	-	-	-	-	-	-	257546	3
Plant Morphogenesis	-	-	-	-	257611	3	257611	3
Plant Biochemistry and Molecular Biology	-	-	-	-	257651	3	257651	3

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Plant Metabolic Engineering	-	-	-	-	257652	3	257652	3
Insect Evolutionary and systematics	-	-	-	-	257621	3	257621	3
Arachnology	-	-	-	-	257622	3	257622	3
Comparative Reproductive Physiology	-	-	-	-	257623	3	257623	3
Neurobiology	-	-	-	-	257624	3	257624	3
Neuroendocrinology	-	-	-	-	257625	3	257625	3
Aquatic Toxicology	-	-	-	-	257631	3	257631	3
Management and Conservation of Biodiversity	-	-	-	-	257632	3	257632	3
Ecosystem Ecology	-	-	-	-	257633	3	257633	3
Bioinformatics and Genomics	-	-	-	-	257643	3	257643	3
Genetics and Molecular Evolution of Prokaryotes	-	-	-	-	257644	3	257644	3
Currents Topics in Biological Sciences	-	-	-	-	257646	3	257646	3
Total	-	-	-	-	14	≥6	27	≥6

4. Required Non-credit Courses.

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Research Methodology in Sciences and Technology	-	-	257501	3	-	-	257501	3
Seminar in Biological Sciences 1	-	-	257601	1	-	-	257601	1
Seminar in Biological Sciences 2	-	-	257602	1	-	-	257602	1
Seminar in Biological Sciences 3	257603	1	257603	1	257603	1	257603	1
Seminar in Biological Sciences 4	257604	1	257604	1	257604	1	257604	1
Seminar in Biological Sciences 5	257605	1	257605	1	257605	1	257605	1
Seminar in Biological Sciences 6	257606	1	257606	1	257606	1	257606	1
Total	4	4	7	9	4	4	7	9

5. Dissertation Credit Requirements.

Requirements	Option 1.1		Option 1.2		Option 2.1		Option 2.2	
	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.	Course No.	Cr.
Dissertation 1 Option 1.1	257660	6	-	-	-	-	-	-
Dissertation 2 Option 1.1	257661	6	-	-	-	-	-	-
Dissertation 3 Option 1.1	257662	6	-	-	-	-	-	-
Dissertation 4 Option 1.1	257663	6	-	-	-	-	-	-
Dissertation 5 Option 1.1	257664	12	-	-	-	-	-	-
Dissertation 6 Option 1.1	257665	12	-	-	-	-	-	-
Dissertation 1 Option 1.2	-	-	257670	6	-	-	-	-
Dissertation 2 Option 1.2	-	-	257671	6	-	-	-	-
Dissertation 3 Option 1.2	-	-	257672	6	-	-	-	-
Dissertation 4 Option 1.2	-	-	257673	6	-	-	-	-
Dissertation 5 Option 1.2	-	-	257674	12	-	-	-	-
Dissertation 6 Option 1.2	-	-	257675	12	-	-	-	-
Dissertation 7 Option 1.2	-	-	257676	12	-	-	-	-
Dissertation 8 Option 1.2	-	-	257677	12	-	-	-	-
Dissertation 1 Option 2.1	-	-	-	-	257680	6	-	-
Dissertation 2 Option 2.1	-	-	-	-	257681	6	-	-
Dissertation 3 Option 2.1	-	-	-	-	257682	6	-	-
Dissertation 4 Option 2.1	-	-	-	-	257683	6	-	-
Dissertation 5 Option 2.1	-	-	-	-	257684	12	-	-
Dissertation 1 Option 2.2	-	-	-	-	-	-	257690	3
Dissertation 2 Option 2.2	-	-	-	-	-	-	257691	3
Dissertation 3 Option 2.2	-	-	-	-	-	-	257692	6
Dissertation 4 Option 2.2	-	-	-	-	-	-	257693	6
Dissertation 5 Option 2.2	-	-	-	-	-	-	257694	6
Dissertation 6 Option 2.2	-	-	-	-	-	-	257695	6
Dissertation 7 Option 2.2	-	-	-	-	-	-	257696	9
Dissertation 8 Option 2.2	-	-	-	-	-	-	257697	9
Total	6	48	8	72	5	36	8	48

Course Descriptions

257501 Research Methodology in Science and Technology 3(3-0-6)

Examination of the following topics: research definition, characteristics, and research goals; data collection and analysis; proposal and research report writing; research evaluation and application; research ethics; and proper research techniques in science and technology.

257511 Plant Metabolism 3(2-3-5)

A study of metabolic pathways in plant growth and development, the relationship between metabolic pathways and regulation, carbon metabolism, N and S assimilation pathways, and cell wall biosynthesis.

257512 Pollen Biology 3(2-3-5)

Morphological and taxonomic characteristics of angiosperm pollen; evolutionary trends; pollen patterns of some selected families for classification and identification; and applications related to plant geography, geology, archeology, and forensic science.

257513 Biochemistry of Plant Hormones 3(2-3-5)

An examination of the structure and function of plant hormones; immunological methods and plant hormone analysis; metabolism and regulation of biosynthesis of plant hormones; molecular signal transduction in plant hormones.

257514 Plant Eco Physiology 3(2-3-5)

A study of a plant's eco physiological response to environmental conditions concerning photosynthesis, respiration, solute transport, and plant growth and development; and plant adaptation and acclimatisation to abiotic stresses.

257521 Physiology of Environmental Adaptation**3(2-3-5)**

An in depth study of the interaction between animals and physical environments and the adaptation of different animal groups to their various environments; the adaptation of respiratory, locomotor, sensory, and integumentary systems; mechanisms for responding to changes in environmental parameters, e.g., thermoregulation, osmoregulation, aestivation, and hibernation; and physiological consequences of environmentally imposed behavioral and physiological responses to a variety of stresses.

257522 Comparative Endocrinology**3(2-3-5)**

A study of the following topics: integrative chemical message signaling, hormone biosynthesis, mechanisms influencing hormone secretions, the physiological actions of hormones, the roles of major endocrine glands and neuroendocrine systems among invertebrate, and non-mammal vertebrates and mammal vertebrates.

257523 Comparative Vertebrate Anatomy**3(2-3-5)**

A study of the evolution, development, structure, and functions of the following: integumentary systems, skeleton systems, locomotion systems, digestive systems, respiratory systems, circulatory systems, excretory systems, reproductive systems, nervous and sensory systems, and endocrine systems of all groups of vertebrates on the basis of phylogeny.

257531 Plant, Animal and Microbial Interactions**3(2-3-5)**

Examination of interactions among plants, animals, and microbes; the physical and biological factors affecting patterns of interaction and also the effects of interactions on adaptation and evolution; and the effects of interaction amongst living creatures on ecosystems.

257532 Population Ecology

3(2-3-5)

A study of population characteristics and dynamics; population size and factors that might govern population growth; population control; survival strategies; niche populations; and mathematical models of interaction including competition, predation, parasitism, and mutualism.

257533 Ecotoxicology and Monitoring

3(2-3-5)

A study of sources, accumulation, and distribution of toxicants; metabolism and the effect of toxicants on organisms and ecosystems; determination, risk analysis, and assessment; and prevention and monitoring of toxicants.

257534 Environmental and Sustainable Development

3(3-0-6)

Concepts of sustainable development, environmental degradation, the environment and society, and forms of sustainable resource development.

257541 Biological Science

4(3-3-7)

A study of genetic information transfer and gene expression, evolution and biodiversity, plant and animal structures and functions, and ecological and environmental issues.

257542 Metabolism and Responses of Organisms

4(3-3-7)

Mechanisms of cell activities and regulation, bioenergetics and the regulation of metabolic processes, and organism responses.

257543 Scientific Communication

1(0-2-4)

A study of the processes involved in grant application writing, publication processes, oral presentation, and writing for scientific publications.

257544 Biosystematics

3(2-3-5)

Systematics, identification, and classification of organisms using bio-data.

257545 Selected Topics in Biological Science**3(2-3-5)**

Reviewing, practicing, presenting, and discussing selected topics in biological sciences.

257546 Special Topics in Biological Science Research**3(2-3-5)**

Reviewing, practicing, presenting, and discussing interesting issues in biological sciences.

257601 Seminar in Biological Science 1**1(0-2-4)**

An initial literature review, interpretation, discussion, presentation, and writing of scientific reports on biological science research topics.

257602 Seminar in Biological Science 2**1(0-2-4)**

A second literature review, interpretation, discussion, presentation, and writing of scientific reports on biological science research topics.

257603 Seminar in Biological Science 3**1(0-2-4)**

A third literature review, interpretation, discussion, presentation, and writing of scientific reports on biological science research topics related to the proposed dissertation.

257604 Seminar in Biological Science 4**1(0-2-4)**

A fourth literature review, interpretation, discussion, presentation, and writing of scientific reports on biological science research topics related to the proposed dissertation.

257605 Seminar in Biological Science 5**1(0-2-4)**

A fifth literature review, interpretation, discussion, presentation, and writing of scientific reports on biological science research topics related to the proposed dissertation.

257606 Seminar in Biological Science 6

1(0-2-4)

A sixth literature review, interpretation, discussion, presentation, and writing of scientific reports on biological science research topics related to the proposed dissertation.

257611 Plant Morphogenesis

3(2-3-5)

A study of the following: mechanisms that regulate the different phases of plant development at the molecular, cellular, and organism levels with emphasis on flowering plants; the quantitative analysis of growth, plant hormone action, and metabolism; growth responses to light, temperature, and gravity; photoperiodism and flowering; photomorphogenesis; dormancy; and senescence and abscission throughout the plant life cycle.

257621 Insect Evolution and Systematics

3(2-3-5)

A study of the following topics: the origin and evolutionary relationships amongst insect groups, insect systematic, and phylogeny; biogeography and natural selection; the roles of morphological, genetic, and molecular biology in insect classification; and the impact of insect evolution on humans and ecosystems.

257622 Arachnology

3(2-3-5)

A study of the following topics of Arachnology: taxonomy, morphology, physiology, adaptation and evolution, reproduction, ecology, and distribution and biography of animals in the Arachnida classification.

257623 Comparative Reproductive Physiology

3(3-0-6)

An examination of comparative anatomy and physiology of reproductive systems; the evolution of reproductive behavior in vertebrates and invertebrates; courtship, mating, fertilisation, estrous, and menstrual cycles; and factors affecting the control of seasonal reproduction.

257624 Neurobiology**3(3-0-6)**

Biophysics of cell membrane and ion channels; mechanisms of neuronal and neuroglia function; neurotransmitters and mechanisms of neuronal cell signaling; electrical potential and integration of synapses; organization of sensory system, motor systems and effectors; biochemistry and physiology of learning and memory; neuronal development.

257625 Neuroendocrinology**3(3-0-6)**

Topics include: normal functioning of the neural and endocrine systems and the relationships between the two systems, hypothalamus and neuro-secretions, the importance of the interaction of neuropeptide and steroid hormones that control reproductive processes, social behaviors, stress responses, and cognitive functions and mood states.

257631 Aquatic Toxicology**3(2-3-5)**

A study of the following: aquatic environments, basic toxicological concepts and principles; toxic agents and their effects, toxicity testing, toxicant metabolism, deposition bio-monitoring, and aquatic assessment.

257632 Management and Conservation of Biodiversity**3(2-3-5)**

A study of biodiversity, indigenous endemic plant and animal species, ecosystems, genetic diversity loss, management of genetic diversity, in situ and ex situ conservations, international germplasm collection and exchange, genetic analysis, databases, genetic engineering, and sustainable resource use and free trade agreements.

257633 Ecosystem Ecology**3(2-3-5)**

A holistic approach to the principles of community and ecosystem ecology, species diversity, cybernetic control and stability, ecosystem energetic, modeling, the relevance of ecosystem theories to human ecology, and ecosystem management.

257641 Molecular Aspects of Cell Biology

3(2-3-5)

A study of the following: relationships among molecular design, cellular organization and structure and cell functions, intercellular RNA and protein traffic, molecular structure, the function and biogenesis of subcellular organelles, protein synthesis, protein folding and maturation, molecular structure and the functions of extracellular matrix and cell adhesion molecules with their roles linked to signal transduction, and mechanisms of signal transduction and the responses of cells.

257642 A Molecular Approach to Developmental Biology

3(2-3-5)

A study of cellular, molecular, and genetic mechanisms of development; descriptive eukaryote embryology: the control of development by gene expression; mechanisms of differentiation and morphogenesis; and developmental genetics.

257643 Bioinformatics and Genomics

3(2-3-5)

Computational and experimental methods in bioinformatics and genomics, database searching, multiple sequence alignment, molecular phylogeny, microarrays, proteomics, pharmacogenomics, and the analysis of protein structures and functions.

257644 Genetics and Molecular Evolution of Prokaryotes

3(3-0-6)

A comparative study of genetic systems and the evolution of bacteria and Achaea at the molecular level.

257645 Current Topics in Biological Science

3(3-0-6)

The study, analysis, and discussion of advanced current research in biological science.

257660 Dissertation 1, Option 1.1**6Credits**

Reviewing relevant literature and publications related to research topics and submitting literature review reports.

257661 Dissertation 2, Option 1.1**6Credits**

Conducting a preliminary investigation of a proposed dissertation under the guidance of the dissertation advisory committee and submitting a progress report on the research and dissertation proposal.

257662 Dissertation 3, Option 1.1**6Credits**

Presenting a dissertation proposal, discussing and seeking suggestions from the dissertation advisory committee, and submitting a progress report.

257633 Dissertation 4, Option 1.1**6Credits**

Conducting research under supervision of the dissertation advisory committee and submitting a progress report.

257644 Dissertation 5, Option 1.1**12 Credits**

Conducting research, collecting and analysing data, and preparing a draft dissertation and progress report.

257655 Dissertation 6, Option 1.1**12 Credits**

Passing a dissertation defense and submitting a completed dissertation to the Graduate School.

257670 Dissertation 1, Option 1.2**6Credits**

Researching and reviewing literature relevant to the dissertation and submitting a literature review report.

257671 Dissertation 2, Option 1.2**6Credits**

Planning a dissertation and conduct a preliminary research investigation under the guidance of the dissertation advisory committee and submitting a progress report.

257672 Dissertation 3, Option 1.2**6Credits**

Conducting a preliminary investigation of a proposed dissertation under the guidance of the dissertation advisory committee and submitting a progress report on the research and dissertation proposal.

257673 Dissertation 4, Option 1.2**6Credits**

Conducting research under the guidance of the dissertation advisory committee, preparing a dissertation proposal and submitting a preliminary progress report.

257674 Dissertation 5, Option 1.2**12 Credits**

Conducting research under the guidance of the dissertation advisory committee, submitting the proposal for examination, and also submitting a progress report.

257675 Dissertation 4, Option 1.2**12 Credits**

Continuing the research under the guidance of the dissertation advisory committee and submitting a progress report.

257676 Dissertation 7, Option 1.2**12 Credits**

Preparing a draft dissertation under the guidance of the dissertation advisory committee and submitting a progress report.

257677 Dissertation 8, Option 1.2**12 Credits**

Passing a dissertation defense and submitting a completed dissertation to the Graduate School.

257680 Dissertation 1, Option 2.1**6Credits**

Researching and reviewing literature relevant to the dissertation and submitting a literature review report.

257681 Dissertation 2, Option 2.1**6Credits**

Conducting a preliminary investigation of a proposed dissertation under the guidance of the dissertation advisory committee and submitting a progress report on the research and dissertation proposal.

257682 Dissertation 3, Option 2.1**6Credits**

Conducting a preliminary research investigation of a proposed dissertation under the guidance of the dissertation advisory committee and submitting a progress report on the research and dissertation proposal.

257683 Dissertation 4, Option 2.1**6Credits**

Conducting research and data analysis and preparing a draft dissertation under the guidance of the dissertation research committee.

257684 Dissertation 5, Option 2.1**12 Credits**

Passing a dissertation defense and submitting a copy of the completed dissertation to the Graduate School.

257690 Dissertation 1, Option 2.2**3Credits**

Researching and reviewing literature relevant to the dissertation and submitting a literature review report.

257691 Dissertation 2, Option 2.2**3Credits**

Planning a dissertation and conducting a preliminary research investigation under the guidance of the dissertation advisory committee and submitting a progress report.

257692 Dissertation 3, Option 2.2**6Credits**

Conducting a preliminary research investigation under the guidance of the dissertation advisory committee and submitting a progress report.

257693 Dissertation 4, Option 2.2**6Credits**

Conducting research under the guidance of the dissertation advisory committee and submitting a progress report.

257694 Dissertation 5, Option 2.2**6Credits**

Conducting a preliminary research investigation under the guidance of the dissertation advisory committee and submitting a progress report.

257695 Dissertation 6, Option 2.2**6Credits**

Conducting further research under the guidance of the dissertation advisory committee and submitting a progress report.

257696 Dissertation 7, Option 2.2**9Credits**

Preparing a draft dissertation under the guidance of the dissertation advisory committee and submitting a progress report.

257697 Dissertation 8, Option 2.2**9Credits**

Passing a dissertation defense and submitting a copy of the completed dissertation to the Graduate School.

275651 Plant Biochemistry and Molecular Biology**3(3-0-6)**

A study of the following topics: plant metabolic pathways and biosynthesis; plant cell structure; light reaction of photosynthesis and photosynthetic carbon assimilation; respiration; synthesis and mobilization of storage and structural carbohydrates; nitrogen and sulfur metabolism phloem transport; plant storage; proteins and lipids biosynthesis; structure, functions, and types of secondary metabolites in plants; signals regulating the growth and development of plant organs; the genomes of plant cells; and protein biosynthesis and plant gene technology.

275652 Plant Metabolic Engineering**3(3-0-6)**

This course includes: plant secondary metabolism, agrobacterium, natural metabolic engineers of plants, metabolic engineering of crop and medicinal plants, gene expression in plant biosynthetic pathways, plant molecular farming, and plant based medicine.