Course Detail

Master of Science Program in Biotechnology

1. Course Title: Master of Science Program in Biotechnology

2. Master Degree: Master of Science (Biotechnology)

3. Academic Institution: Faculty of Science, Naresuan University

4. Duration: 2 years, from June 2025- April 2027

5. Background and Rational:

Our Biotechnology program was established in 2005 to study and research in the specific area of plant biotechnology and molecular biotechnology. Because of the lower northern part of Thailand are rich of diverse biological resource which can be used as an upstream for developing biotechnological products or innovation passthrough midstream. Currently, several research received from the graduate master's study have been developed and gradually hit the goal at downstream. Our Biology Department was continuously promoted to receive new device and instruments to support research facilities especially in Plant and molecular biotechnology and potential faculty staffs have also gradually received research funds to support thesis research. Furthermore, our program also has national and international collaboration with institutions for research sharing and exchange facilities.

6. Objectives:

-To create novel Biotechnological knowledges which are usable for area-based. development

-To develop incremental and radical innovation for sustainable utilization.

7. Course Synopsis and Methodology:

7.1 Study plan

1st Year, 1st semester

Course type	**Course**	**Credit**
Required Courses	275511: Biotechnology	3
	275512: Molecular Biotechnology	3
	275572: Techniques in Biotechnology	3
Required Courses-Noncredit	275575: Biosafety and Regulation in Biotechnology	-
	275571: Research Methodology in Science and Technology	-
Elective Course*	XXXXXX	3
	Total	**12**

1st Year, 2nd semester

Course type	Course	Credit
Required Courses	275521: Biotechnology Innovation Trends	3
Required Courses-Noncredit	275501: Seminar in Biotechnology 1	-
	275580: Scientific Communication	-
Elective Course*	XXXXXX	3
	XXXXXX	3
	XXXXXX	3
Thesis	275594: Thesis 1	3
	Total	**15**

2nd Year, 1st semester

Course type	Course	Credit
Required Courses-Noncredit	275502: Seminar in Biotechnology 2	-
Thesis	275594: Thesis 2	3
	Total	**3**

2nd Year, 2nd semester

Course type	Course	Credit
Thesis	275594: Thesis 2	6
	Total	**6**

Thesis timeline

Within 2nd semester of 1st Year:	Determining the thesis concept and title.
	Perform preliminary experiment (if necessary)
Within 1st semester of 2nd Year:	Pass thesis proposal presentation
Within 2nd semester of 2nd Year:	Pass thesis defense examination

7.2 Course Content

Required Courses (12 credits)

275511: Biotechnology **3 credits**

Principles of biotechnology including chemical and biological phenomena in organisms, techniques and procedures for development of new strains of organisms and production process of biologically valuable in aspect of industry

275512: Molecular Biotechnology **3 credits**

Structures and functions of organelles at the molecular level, cell metabolism, mutation, DNA repair, recombination, cell communication, cell-environment interaction and applications of cell technologies

275521: Biotechnology Innovation Trends **3 credits**

Current trends of biotechnology innovations and products in Thailand and global markets, the biotechnological knowledge behind the current popular innovations and products

275572: Techniques in Biotechnology **3 credits**

Knowledge, principles and theories related to biotechnology instrument, usage and maintenance of essential instruments in industrial, plant and animal biotechnology

Required Courses- Noncredit

275501: Seminar in Biotechnology 1

Searching, reading, writing, presentation and discussion on research topics in biotechnology and related fields to generate draft thesis proposal

275502: Seminar in Biotechnology 2

Presentation and discussion on results of thesis and research topics in biotechnology and related fields

275571: Research Methodology in Science and Technology

Meaning, characteristics and goals of research, processes and types of research, determination of research problem, variables and hypothesis, data collection and analysis, research proposal and report writing, research evaluation and its application, ethics of researcher and proper techniques of research methodology in science and technology

275575: Biosafety and Regulation in Biotechnology

Safety assessment of biotechnology-based products and genetically modified organism, organization and regulations for risks prevention from genetically modified organisms, laws, rules and risks from genetic modification, development of standards for quality assurance of biotechnology-based products

275580: Scientific Communication

Overview of communication, developing skills and techniques of research translation and communication to diverse audiences, especially to the public

<u>*Elective Course (not less than 12 credits)</u>

275513: Advanced Gene Technology 3 credits

Principles and applications of recombinant DNA technology, DNA markers, isolation of gene of interest, recombinant protein production, genetically modified organisms, gene therapy and technology for analysis of genome, transcriptome and proteome

275514: Omics Technology 3 credits

Principles and advanced techniques in omics technology including genomics, transcriptomics, proteomics, metabolomics, epigenomics and etc. as well as bioinformatics for manipulating and analyzing big data acquired from omics

275541: Environmental Biotechnology 3 credits

Theories and practice in applying biotechnological progress om stidying ecology in various environments, the application of biological and chemical processes for pollution and waste management generated by industrial, agriculture sectors as well as for environmental conservation

275542: Biotechnology for Waste and Wastewater Treatment 3 credits

Treatments of organic and inorganic forms wastewater and solid waste by applying biotechnological, biochemical and microbiological processes to obtain the highest efficiency

275543: Biodegradation and Bioremediation 3 credits

Principles of biodegradation process of bio and synthetic materials that contaminated in environment by industrial, domestic and agricultural activities using various bioremediation techniques for ecological revitalization, monito and evaluating the process efficiency

275544: Renewable Resources Technology **3 credits**

The use of agricultural waste for producing gas and liquid fuel by agricultural chemical and biological processes, value of energy from biomass, various forms of gas fuel production, biogas production, butanol production and alcohol production

275551: Plant Genetics Resources **3 credits**

Principles of plant genetic resources, gene within population, biodiversity and conservation of threaten and endangered plant species including wild parental species of commercial varieties in Thailand

275552: Advanced Plant Biotechnology **3 credits**

Applications of plant cell and tissue culture techniques for micropropagation, crop improvement, secondary metabolite production, gene transformation, genetic engineering and plant genome project

275573: Bioinformatics **3 credits**

Using computer programs and softwares, information technology and databases for DNA, RNA and protein sequences analysis, analysis of structures and functions of genes and proteins, molecular evolution and systematics and other applications

275574: Molecular Systematics and Evolution **3 credits**

Classification of organisms using the differences of molecular data, mechanisms for evolution and molecular phylogenetic relationships

275576: Biotechnology for Biodiversity **3 credits**

Definition and importance of biodiversity, biotechnological process for diversity study including techniques and applications of biotechnological tools for conservation, evaluation, improvements of living organisms to provide desirable products from biological diversity

275581: Special Topics in Biotechnology **3 credits**

Study, analysis and discussion on special interest topics in biotechnology

275582: Special Problem in Biotechnology **3 credits**

Literature reviews, and/or experimentation on assigned special problem in biotechnology, analysis, discussion and conclusion on the study results, writing a special problem report and presentation

8. Graduation Conditions:

1. Registered and pass all courses according to program requirement with GPA not lower than 3.00.

2. Pass English proficiency test according to Naresuan University requirement

3. Pass thesis defense examination.

4. Thesis or part of thesis work was accepted to publish in journal listed in Scopus or Web of science database.

9. Applicant Qualifications

Hold a Bachelor's degree in Biotechnology, Biology, Biological Sciences, Medical Sciences, Agriculture or related fields.

English Proficiency Test:

Applicant must hold a minimum score of English proficiency from either TOEFL (paper based or internet based; not TOEFL ITP) or IELTS as shown in the followings:

- Paper-based TOEFL 417, 453 (International Program)
- Internet-based TOEFL 35, 46 (International Program)
- IELTS 5.0, 5.5 (International Program)

10. Document Required

- Application form
- Medical report
- Transcript
- Recommendation letter
- English proficiency test (IELTS, TOEFL)
- Statement of purpose

11. Contact:

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