

Course Selection Guidelines for the Bio-Industrial Automation Program
College of Bioresources and Agriculture, NTU

A. Research Unit

Education and Research Center for Bio-Industrial Automation of the College of Bioresources and Agriculture (hereafter referred to as the College)

B. Purpose

To cultivate talents for bio-industrial automation, the Center established the Agricultural Automation Program in 1999. The Program offers two schemes: “Design and Research of Agricultural Automated System (both software and hardware)” and “Automated Planning and Management of Agricultural Corporation”.

Since the College have made huge changes to the curriculum and faculty in recent years, differing greatly from when the Agricultural Automation Program was first established, the Center decided to adjust the content of the Agricultural Automation Program, transferring it into the Bio-Industrial Automation Program so that it better meets the needs today. The Program now offers two schemes for the two different subfields mechatronics and computational biology under the bio-industrial automation, committed to developing automation technology and automated systems for bio-industries such as agriculture, forestry, fishery, animal husbandry, and their service industries in pursuit of the overall automation of production, manufacturing, and marketing.

By collaborating with experts and talents from the College and other relevant fields in NTU, the Program is able to support cross-departmental and cross-college researches and teaching on bio-industrial automation technology. The Center hopes to improve the career prospects of students who wish to become interdisciplinary talents in the field of bio-industrial automation.

C. Title

Bio-Industrial Automation Program (originally Agricultural Automation Program)

D. Design

Since the objective and the nature of the courses included differ, the Program offers two different schemes for the subfields under bio-industrial automation:

1. Mechatronics
2. Computational Biology

Mechatronics scheme focuses on automation techniques applied in bio-

industrial sector, which enables students to use, design, and conduct R&D on bio-industrial automated systems.

Computational biology scheme emphasizes on using computational methods in the emerging bio-industries, which equips students with the abilities to calculate and integrate systematic functions of bioinformatics when engaging in R&D activities.

Program students should choose at least one scheme. All courses are classified as introductory, fundamental, and professional according to the order students are recommended to take. Course titles and credits are listed in Figure 1 and 2 below.

Each scheme offers introductory courses so that students may have a general understanding of the subfield before selecting more advanced courses. After finishing the introductory courses, students are recommended to select from the fundamental courses according to personal need in application and proceed their study orderly. They may then possess the integral concept and application ability they would need in pursuit of the career in the subfields of bio-industrial automation they aim at, adopting strong ability in designing and conducting IR&D on bio-industrial automation systems or the solid background in bio-industrial automation planning and management.

E. Credits

A student enrolled in the Program should select at least 1 introductory course and 3 professional courses. The total credits the student selects from introductory, fundamental, and professional courses should exceed 20 credits. The minimum score to pass in all courses is 60.

F. Qualification

NTU students in the 2nd year or above who are aiming at the career in bio-industrial automation.

G. Application Verification

The applicant, an NTU student in the 2nd year or above, may apply through NTU's online application system (https://ifsel3.aca.ntu.edu.tw/cou_stu/) during the period of course selection. The applicant should print the application form out or request a copy of the form from the Center (Figure 3) and submit it with a copy of complete academic transcript to the Education and Research Center for Bio-Industrial Automation after obtaining permission from his or her home department chair and home college dean. After the application is verified by the Center and

permitted by the College of Bioresources and Agriculture, the Center will announce the result before the second week of the semester is over. Students who complete the required number of credits and meet grading standards before graduation must notify the Center initiatively a month before graduation and submit both Chinese and English transcripts (one copy of each) and the Application Form for the Enrollment Certificate to the Center. Once this form is reviewed and passed by the Center and approved by the Dean of Academic Affairs and the President of NTU, the student will receive a Certificate of Completion of the Bio-Industrial Automation Program.

Figure 1. Mechatronic Scheme

(a) Introductory Courses (required)

Curriculum Identity Number	Course Title	Credits	Designated for	Availability	Remarks
611 38100	Automatic Control	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
525 U3150		3	Dept. of Engineering Science and Ocean Engineering	Available	
502 45100		3	Dept. of Mechanical Engineering	Available	

(b) Fundamental Courses (Select at least 2 courses.)

Curriculum Identity Number	Course Title	Credits	Designated for	Availability	Remarks
611 10800	Introduction to Bio-industrial Mechatronics Engineering	1	Dept. of Bio-Industrial Mechatronic Engineering	Available	
611 17100	Principles and Applications of Microcontrollers-Mechatronics (1)	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	

611 37300	Principles and Applications of Sensors-Mechatronics (2)	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
611 37400	Principles and Applications of Actuators-Mechatronics (3)	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
611 42100	Mechatronics and System Design-Mechatronics (4)	4	Dept. of Bio-Industrial Mechatronic Engineering	New	
525 U0270	Optimal Control and Estimation	3	Dept. of Engineering Science and Ocean Engineering	Available	
522 U4720	Microprocessor Controlled Systems	3	Dept. of Mechanical Engineering	Available	
522 U1290	Introduction to Robotics	3	Dept. of Mechanical Engineering	Available	
901 43100	Control Systems	3	Dept. of Electrical Engineering	Available	

(c) Professional Courses (Select at least 3 courses.)

Curriculum Identity Number	Course Title	Credits	Designated for	Availability	Remarks
611 41100	Measurements in Biological Systems	4	Dept. of Bio-Industrial Mechatronic Engineering	Available	
631 M8210	Principles and Applications of Digital Image Processing	3	Inst. of Bio-Industrial Mechatronic Engineering	Available	
631 U1590	Special Topic on Embedded Robotics	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	

631 M3130	Signal Processing	3	Inst. of Bio-Industrial Mechatronic Engineering	Available	
631 U8300	Controlled Environment Agriculture Engineering	3	Inst. of Bio-Industrial Mechatronic Engineering	Available	
631 M1500	Design of Automated Systems	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
631 U1620	Automatic Control II	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
631 U5400	Bio-industrial Machinery	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
631 U1550	Dynamics and Control of Robots	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
631 U0510	Vehicle Engineering	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
631 U5500	Power Machinery	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
622 U2680	Bioenvironmental and Structure	3	Dept. of Engineering for Sustainable Environment	Available	
622 U2850	Environmental Monitoring and Instrumentation of Biophysics	3	Dept. of Engineering for Sustainable Environment	Available	
628 U1040	Protected Horticulture (II)	3	Dept. of Horticulture and Landscape Architecture	Available	
522 U4720	Microprocessor Controlled Systems	3	Dept. of Mechanical Engineering	Available	
522 M3960	Intelligent Control	3	Inst. of Mechanical Engineering	Available	
921 EU4350	Advanced Robot Sensing and Control	3	Inst. of Electronic Engineering	Available	
521 U8900	Automation and Robotics	3	Dept. of Civil Engineering	Available	

606 63100	Automation of Animal Production	2	Dept. of Animal Science and Technology	Available	
525 U2530	Control System Analysis and Design	3	Dept. of Engineering Science and Ocean Engineering	Available	

Figure 2. Computational Biology Scheme

(d) Introductory Courses (required)

Curriculum Identity Number	Course Title	Credits	Designated for	Availability	Remarks
626 M1610	Bioinformatics	3	Inst. of Animal Science and Technology	Available	
922 EU0370		3	Inst. of Computer Science and Information Engineering	Available	
B21 U2190		3	Dept. of Life Science	Available	

(e) Fundamental Courses (Select 1 required course according to your major and 1 course each from biological and computational groups.)

Curriculum Identity Number	Course Title	Credits	Designated for	Availability	Remarks
603 33600	Molecular Biology	2	Dept. of Agricultural Chemistry	Available	Required courses for biological sciences majors
633 U0770		3	Dept. of Plant Pathology and Microbiology		
632 U1120		4	Dept. of Entomology		
B01 31210		4	Dept. of Life Science		
B22 U0200		4	Inst. of Biochemical Science and Technology		

448 M0070		4	Inst. of Molecular Medicine		
628 U1830	Fundamentals of Plant Molecular Biology	3	Dept. of Horticulture and Landscape Architecture	Available	Required courses for science and engineering majors
603 23100	General Microbiology	3	Dept. of Agricultural Chemistry	Available	
B01 101A1	General Biology (a)(1)	3	Dept. of Life Science	Available	
B01 101B1	General Biology (b)(1)	2	Dept. of Biochemical Science and Technology	Available	
B01 101C0	General Biology (c)	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	

※ **Biological sciences majors** refer to students from the College of Bioresources and Agriculture excluding the Department of Bioenvironmental Systems Engineering and the Department of Bio-Industrial Mechatronic Engineering, the College of Medicine, the College of Public Health, and the College of Life Science.

※ **Science and engineering majors** refer to students from the Department of Bioenvironmental Systems Engineering and the Department of Bio-Industrial Mechatronic Engineering of the College of Bioresources and Agriculture, the College of Science, the College of Engineering, and the College of Electrical Engineering and Computer Science.

※ Cases unmentioned above will be discussed and decided by the Advisory Committee of the Center.

Curriculum Identity Number	Course Title	Credits	Designated for	Availability	Remarks
601 20000	Genetics	3	Dept. of Agronomy	Available	Biological group
606 20000		3	Dept. of Animal Science and Technology		
608 20000		3	Dept. of Horticulture and Landscape Architecture		
612 20000		3	Dept. of Entomology		
B01 31110		3	Dept. of Life Science		

621 U5300	Molecular Genetics	3	Dept. of Agronomy	Available
455 U0010	Genomics	2	Inst. of Medical Genomics and Proteomics	Available
B21EU2240		3	Dept. of Life Science	
621 U6220	Introductory Crop Functional Genomics	2	Dept. of Agronomy	Available
445 M1960	Microbial Genomics	2	Inst. of Microbiology	Available
B42 U1240	Proteomics	2	Dept. of Plant Pathology and Microbiology	Available
606 62040	Animal Cell Biology	2	Dept. of Animal Science and Technology	Available
524 M6130	Protein Engineering	3	Inst. of Chemical Engineering	Available
621 U5400	Crop Genetic Engineering	2	Dept. of Agronomy	Available
621 U6450	Plant Genomics	3	Dept. of Agronomy	Available
628 U1190	Plant Molecular Biology	3	Dept. of Horticulture and Landscape Architecture	Available
606 64040	Introduction of Genomics	2	Dept. of Animal Science and Technology	Available
623 U4320	Microbial Genetics	2	Inst. of Agricultural Chemistry	Available
849 U0430	Applied Biostatistics (B)	3	Inst. of Epidemiology and Preventive Medicine	Available
602 23900	Statistics	3	Dept. of Engineering for Sustainable Environment	Available
601 20020		3	Dept. of Agronomy	Available
611 20020		3	Dept. of Bio-Industrial Mechatronic Engineering	Available
606 20020		3	Dept. of Animal Science and Technology	Available
605 26210		3	Sch. of Forestry and Resource Conservation	Available

607 20011	Statistics (1)	3	Dept. of Agricultural Economics	Available
B01 34000	Biostatistics	3	Dept. of Life Science	Available
801 21310	Biostatistics (I)	3	Dept. of Public Health	Available
126 U0680	Database Management System	3	Dept. of Library and Information Science	Available
631 U1260	Practical Data Structures and Algorithms	3	Dept. of Bio-Industrial Mechatronic Engineering	Available
631 U3140	Structural Bioinformatics	3	Dept. of Bio-Industrial Mechatronic Engineering	Available
525 U6060	Database Systems	3	Dept. of Engineering Science and Ocean Engineering	Available
622 U2750		3	Dept. of Engineering for Sustainable Environment	

(f) Professional Courses (Select at least 3 courses.)

Curriculum Identity Number	Course Title	Credits	Designated for	Availability	Remarks
420 U2100	Cell Biology	3	Inst. of Biochemical Science and Technology	Available	
B01 21110		3	Dept. of Life Science	Available	
633 U1330		3	Dept. of Plant Pathology and Microbiology	Available	
632 U1160		3	Dept. of Entomology	Available	
631 U7860	Biological System Modeling and Analysis	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
631 M8210	Principles and Applications of	3	Inst. of Bio-Industrial Mechatronic Engineering	Available	

	Digital Image Processing				
548 M0430	Medical Image Analysis	3	Inst. of Biomedical Engineering	Available	
106 47000	Information Retrieval	3	Dept. of Library and Information Science	Available	
P05 U3230	Protein Structure and Function	2	Inst. of Biochemical Science and Technology	Available	
420 U4800	Molecular Biology and Techniques	4	Inst. of Biochemical Science and Technology	Available	
606 64110	Genomics and the Tools of Bioinformatics	3	Dept. of Animal Science and Technology	Available	
631 U7330	Bioprocessing Engineering	3	Dept. of Bio-Industrial Mechatronic Engineering	Available	
543 U6960	Lab on a Chip	3	Inst. of Applied Mechanics	Available	
627 U0710	Advanced Statistics (I)	3	Dept. of Agricultural Economics	Available	
627 U0720	Advanced Statistics (II)	3	Dept. of Agricultural Economics	Available	
611 18200	Computer Programming Language	2	Dept. of Bio-Industrial Mechatronic Engineering	Available	

Figure 3. Application Form for the Bio-Industrial Automation Program

School year:

Date:

Student Number		Name	
Major & Year-level	College		
	Department		
	Division		
	Year-level		
Opinions from the Home Department Chair			

(Please express your approval or disapproval considering whether the applicant is competent enough to be accepted into the Program.)	
Opinions from the Home College Dean	
Opinions from the Education and Research Center of Bio-Industrial Automation	
Opinions from the Dean of the College of Bioresources and Agriculture	
Remarks	<ol style="list-style-type: none"> 1. Please submit a copy of complete academic transcript. 2. Please apply during the period of course selection. 3. The Education and Research Center of Bio-Industrial Automation will verify your application within 3 days and pass the application to the Dean of the College of Bioresources and Agriculture, who reports to the Office of Academic Affairs.

Address:

Phone: