Department of Electrical and Electronic Engineering

Program of Automation for International Students (2022)

I. Introduction

Automation is an inter-disciplinary major that integrates automatic control, electronic engineering, computer technology, and artificial intelligence. It takes mathematics, information theory, control theory, system theory and other knowledge as the core, and aims to realize digitization, automation and intelligence of systems and management. The aim is to cultivate compound talents with international vision and competitiveness with equal emphasis on scientific innovation and engineering practice. As an important direction of information science, Automation focuses on intelligent systems and is widely used in the areas of national strategic development to promote the rapid development of society and economy. With the boost of modern science, the application field of automation technology will expand day by day, and the demand for automation professionals will continue to increase in the future. Graduates of automation will also take advantage of extensive applications of this cutting-edge technology to give full play to their professional advantages.

Academic subject areas: Automation

Program code: 080801

II. Objectives and Learning Outcomes

1. Objectives

Cultivate outstanding talents in automation and related fields with "international vision and native land emotion", who can abide by engineering ethics and professional ethics, and have a solid theoretical foundation and outstanding practical innovation ability.

Alumni of Automation (5 years after graduation) should demonstrate:

Technical Skills: technically competent to conduct research and development in industry and universities in Automation and related fields and able to discover new theories, new knowledge, and new technologies to solve complex engineering problems.

Engineering Ethos: able to think critically and creatively, able to use engineering principles to embrace challenging engineering and non-engineering problems encountered at work, able to apply an analytic mindset, make informed decisions and able to provide innovative solutions.

Attitude: self-motivated with a desire for lifelong learning to adapt to the fast changing environment, able to operate with integrity and responsibility, having optimism and composure under tight schedule, and committed to make a positive impact on society locally and globally.

Leadership: well-prepared to advance towards leadership positions with a good teamwork ability, able to capitalize the individual strengths of team members, and able to nurture the team to achieve goals.

2. Learning Outcomes

Student Outcomes (SOs) that prepare graduates to enter the professional practice of engineering:

SO 1, Engineering knowledge: an ability to apply knowledge of mathematics, natural science, automation, and other related engineering to solve complex engineering problems.

SO 2, Problem analysis: an ability to identify, formulate and analyze complex engineering problems through literature research in order to obtain effective solutions.

SO 3, Design/development solutions: an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

SO 4, Research: an ability to conduct research on complex engineering problems in automation-related fields based on scientific principles, including designing experiments, analyzing data, and obtaining reasonable conclusions.

SO 5, Up-to-date techniques: an ability to develop and use appropriate techniques, resources, and information technology tools for control engineering problems, including prediction and simulation of engineering problems.

SO 6, Environment and sustainability: an ability to understand and evaluate the impact of engineering practices in the field of automation on environmental and social sustainability.

SO 7, Professional: an ability to recognize ethical and professional responsibilities in engineering situations.

SO 8, Teamwork: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

SO9, Communication: an ability to effectively communicate with industry peers and the public on engineering issues in the field of automation, including writing reports and design manuscripts, making presentations, and expressing or responding to instructions.

SO 10, Project Management: an ability to apply the principles of project management and decision-making methods in a multidisciplinary environment.

SO 11, Life-long learning: an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

III. Study Length, Degree, and Graduation Requirements

1. Study length: 4 years. The academic credit system of SUSTech allows flexible study years, but not less than 3 years or more than 6 years

2. Degree conferred: Students who complete and meet the degree requirements of the undergraduate program will be awarded a bachelor's degree in Engineering

3. The minimum credit requirement for graduation: 155 credits. The specific requirements are as follows.

Module		Category	Minimum Credit Requirement
General Education Courses	Chinese Language and Culture Module	Chinese Language and Culture	16
	Arts and Physical Education Module	Physical Education	4
		Arts	2
	Competence Development Module	Computer Programming	3
		Writing	2
		Chinese Studies	2
		Foreign Languages	14
	Humanities and Social Sciences Module	Humanities	6
		Social Sciences	
	Mathematics and Natural Sciences Module	Mathematics	12
		Physics	10
		Chemistry	3
		Biology	3
	Introduction to Majors Module	Introduction to Majors	2
Major Courses	Major Required Courses	Major Foundational Courses	23
		Major Core Courses	15
		Practice-based Learning (Undergraduate Thesis, Internships)	14
	Major Elective Courses	Major Elective Courses	24
Total			155
Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module（Foreign Languages & Chinese Studies & Writing）, Humanities and Social Sciences Module, and Introduction to Majors Module.			

IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

Course	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.

Category						
Mathematics	MA117	Calculus I	4	1 Fall	None	MA
	MA127	Calculus II	4	1 Spring	MA117	
	MA113	Linear Algebra	4	1 Spring & Fall	None	
Physics	PHY105	College Physics I	4	1 Fall	None	PHY
	PHY106	College Physics II	4	1 Spring	PHY105	
	PHY104B	Experiments of Fundamental Physics	2	1-2 Spring & Fall	None	
Chemistry	CH105	Chemistry: The Central Science	3	1-2 Spring & Fall	None	CH
Biology	BIO102B	Introduction to Life Science	3	1-2 Spring & Fall	None	BIO
Computer Programming	CS111	Introduction to C programming	3	1-2 Spring & Fall	None	CS

Note:

1. The course of Calculus I and II can be replaced by Mathematical Analysis I and II.
2. The course of College Physics I and II can be replaced by General Physics I and II
3. The course of Linear Algebra can be replaced by Advanced Linear Algebra I.
4. The course of Introduction to C programming can be replaced by Introduction to Computer Programming.

V. Prerequisites for Major Declaration

Major Declaration Time	**Course Code**	**Course Name**	**Prerequisite**
Declare major at the end of the first academic year	MA117	Calculus I	None
	MA127	Calculus II	MA117
	MA113	Linear Algebra	None
	PHY105	College Physics I	None
	PHY106	College Physics II	PHY105
	PHY104B	Experiments of Fundamental Physics	None
	CS111	Introduction to C programming	None
Declare major at	MA117	Calculus I	None

the end of the second academic year	MA127	Calculus II	MA117
	MA113	Linear Algebra	None
	PHY105	College Physics I	None
	PHY106	College Physics II	PHY105
	PHY104B	Experiments of Fundamental Physics	None
	CS111	Introduction to C programming	None
	CH105	Chemistry: The Central Science	None
	BIO102B	Introduction to Life Science	None
	EE101	Electronic and Information Technology for Metaverse	None

Note:

1. **If the number of students entering a major at the end of the first academic year in the department is greater than or equal to the total number of the teaching-research faculty (PI)*2*60%, all majors in the department may implement the prerequisites for major declaration at the end of the second academic year.**
2. **If the number of students entering a major at the end of the first academic year in the department is less than the total number of the teaching-research faculty (PI)*2*60%, all majors in the department do not implement the prerequisites for major declaration at the end of the second academic year.**
3. **Suppose the number of students applying for a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), then the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).**
4. **For departments that do not implement prerequisites for major declaration at end of the second academic year, if the cumulative number of students applying for a major at the end of the second academic year and the number of students who have entered a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).**

VI: Major Course Arrangement

Table 1: Major Required Courses

Program of Automation

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Major Foundational Courses	EE104	Fundamentals of Electric Circuits	2	0	1 Spring	MA117 MA113	EE
	EE201-17	Analog Circuits	3	0	2 Fall	PHY106 EE104	EE

	EE201-17L	Analog Circuits Laboratory	1	1	2 Fall	EE201-17	EE
	EE205	Signals and Systems	3	1	2 Fall	MA117	EE
	EE207	Engineering Mathematics	4	0	2 Fall	MA127 PHY106 MA113	EE
	EE202-17	Digital Circuits	3	0	2 Spring	PHY106	EE
	EE202-17L	Digital Circuits Laboratory	1	1	2 Spring	EE202-17	EE
	MA212	Probability and Statistics	3	0	2 Spring	MA127	MA
	EE351	Microprocessors and Microsystems	3	1	3 Fall	EE201-17 EE202-17	EE
	Total		23	4			
Major Core Courses	EE271	Artificial Intelligence and Machine Learning	3	0	2 Fall	MA127 MA113	EE
	SDM271	System Modeling and Simulation	3	1	2 Spring	EE207	SDIM
	EE317	Advanced Electronic Science Experiment I	1	1	2 Spring	EE201-17 or EE202-17	EE
	EE318	Advanced Electronic Science Experiment II	1	1	3 Fall	EE317	EE
	SDM263	Feedback Control Theory	3	0	2 Spring	EE104	SDIM
	EE405	Advanced Electronic Science Experiment III	1	1	3 Spring	EE317	EE
	ME424	Modern Control and Estimation	3	0	4 Fall	EE371	ME
	Total		15	4			
Practice-based Courses	EE470	Internship	2	2	3 Summer	None	EE
	EE492	Undergraduate Thesis/Projects	12	12	4 Spring	None	EE
	Total		14	14			
Total			52	22			
Note: Students who have completed Comprehensive Design Ⅰ & Ⅱ are not required to take the Graduation Projects/Thesis.							

Table 2: Major Elective Courses

Program of Automation

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Module A	EE272	Intelligent Sensors and Signal Processing	3	1	2 Spring	EE104	SDIM
	EE326	Digital Image Processing	3	1	2 Spring	EE205	EE
	EE315	Data communications and networking	3	1	3 Fall	None	EE
	MEE5105	Fundamentals of Engineering Optimization	3	0	3 Fall	MA113 MA117	ME
	EE332	Digital System Design	3	1	3 Spring	EE202-17	EE
	EE340	Statistical Learning for Data Science	3	0	3 Spring	MA113	EE
	EE368	Robotic Motion and Control	3	1	3 Spring	EE205	EE
	EEE5501	Digital Control	3	0	3 Spring	EE270 EE371	EE
	EE372	System Identification and Adaptive Control	3	0	3 Spring	EE371	EE
	EE471	Advanced Control Theory	3	0	4 Fall	EE371	EE
Module B	EE108	Optoelectronics Intellisense	3	0	1 Spring	None	EE
	EE203	Solid-state Electronics	3	0	2 Fall	PHY106	EE
	CS203B	Data Structures and Algorithm Analysis B	3	1	2 Fall	CS109	CS
	EE204	Introduction to Semiconductor Devices	3	1	2 Spring	EE203	EE
	EE206	Communication Principles	3	1	2 Spring	EE205	EE
	EE210	Fundamentals of Optics	3	0	2 Spring	None	EE
	CS208	Algorithm Design and Analysis	3	1	2 Spring	CS109 CS203B	CS
	EE303	Fundamentals of Optoelectronic Technology	3	1	3 Fall	PHY106	EE

	EE305	Introduction to VLSI Technology	3	1	3 Fall	EE203	EE
	EE309	Introduction to Semiconductor Optics	3	0	3 Fall	None	EE
	EE311	Optical Design	3	1	3 Fall	None	EE
	EE313	Wireless Communications	3	1	3 Fall	EE206	EE
	EE316	Microwave Engineering	3	1	3 Fall	EE201-17 EE208	EE
	EE323	Digital Signal Processing	3	1	3 Fall	EE205	EE
	EE335	Liquid crystal optoelectronics	3	1	3 Fall	EE210	EE
	EE342	Sensors and Applications	3	0	3 Fall	None	EE
	EE345	Introduction of Wide Bandgap Semiconductors	3	0	3 Fall	EE203 or EE204	EE
	EE346	Mobile Robot Navigation and Control	3	1	3 Fall	EE205 MA212	EE
	CS303B	Artificial Intelligence B	3	1	3 Fall	CS203B CS109 MA212	CS
	CS307	Principles of Database Systems	3	1	3 Fall	None	CS
	MA305	Numerical Analysis	3	0	3 Fall	MA203A 或 MA213	MA
	EE307	Antennas and Radio Propagation	3	1	3 Spring	EE208 EE104	EE
	EE308	Fiber Communication Principles and Techniques	3	1	3 Spring	None	EE
	EE310	Principles and Technologies of Lasers	3	0	3 Spring	None	EE
	EE312	Design of Modern Communication Systems	3	1	3 Spring	EE206 EE313	EE
	EE322	Optoelectronics Devices Fabrication Laboratory	2	1	3 Spring	EE204	EE
	EE328	Speech Signal Processing	3	1	3 Spring	EE323	EE
	EE336	Fundamentals of Photovoltaics	3	1	3 Spring	EE204	EE
	EE411	Information Theory and Coding	2	0	4 Fall	MA212	EE

	EE417	Communications System Design II	2	2	4 Fall	EE316 EE206 EE307	EE
	EE433	Modern Electric Vehicle Technologies	2	0	4 Fall	EE208	EE
	EE435	Semiconductor Information Display Technologies	3	0	4 Fall	EE203 EE204	EE
	CS405	Machine Learning	3	1	4 Fall	MA212 MA113	CS
	EE404	Organic Electronics	2	0	4 Spring	None	EE
Total			127	29			
Note: At least 24 credits are required , and at least five courses from Module A are required.							

Table 3: Overview of Practice-based Learning

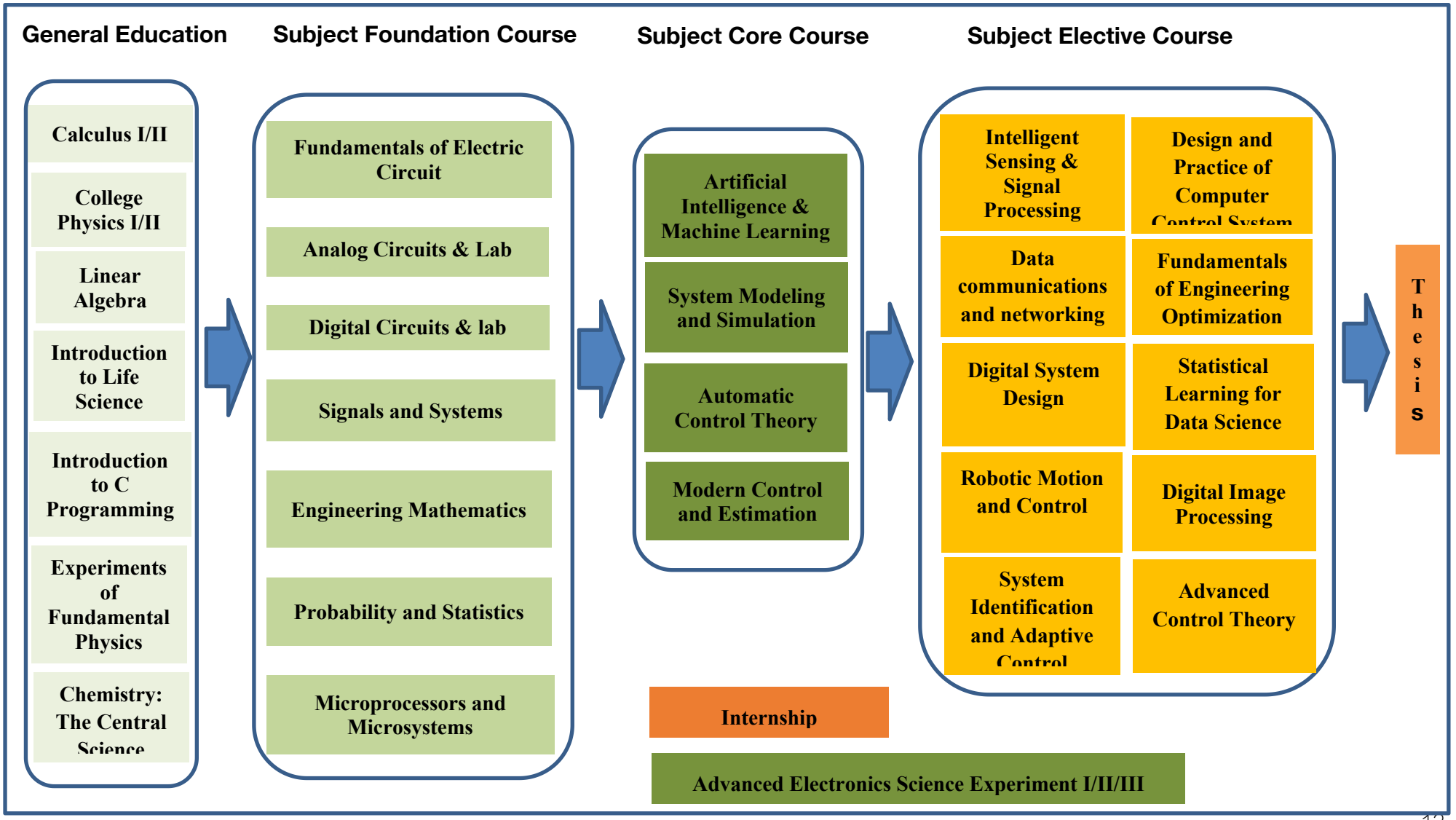
Program of Automation

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
EE201-17L	Analog Circuits Laboratory	1	1	2 Fall	EE201-17	EE
EE205	Signals and Systems	3	1	2 Fall	MA117	EE
CS203B	Data Structures and Algorithm Analysis B	3	1	2 Fall	CS109	CS
EE202-17L	Digital Circuits Laboratory	1	1	2 Spring	EE202-17	EE
EE204	Introduction to Semiconductor Devices	3	1	2 Spring	EE203	EE
EE206	Communication Principles	3	1	2 Spring	EE205	EE
SDM271	System Modeling and Simulation	3	1	2 Spring	EE207	SDIM
SDM273	Intelligent Sensors and Signal Processing	3	1	2 Spring	EE104	SDIM
EE317	Advanced Electronic Science Experiment I	1	1	2 Spring	EE201-17 or EE202-17	EE
EE326	Digital Image Processing	3	1	2 Spring	EE205	EE

CS208	Algorithm Design and Analysis	3	1	2 Spring	CS109 CS203B	CS
EE303	Fundamentals of Optoelectronic Technology	3	1	3 Fall	PHY106	EE
EE305	Introduction to VLSI Technology	3	1	3 Fall	EE203	EE
EE311	Optical Design	3	1	3 Fall	None	EE
EE313	Wireless Communications	3	1	3 Fall	EE206	EE
EE315	Data communications and networking	3	1	3 Fall	None	EE
EE316	Microwave Engineering	3	1	3 Fall	EE201-17 EE208	EE
EE318	Advanced Electronic Science Experiment II	1	1	3 Fall	EE317	EE
EE323	Digital Signal Processing	3	1	3 Fall	EE205	EE
EE335	Liquid crystal optoelectronics	3	1	3 Fall	EE210	EE
EE346	Mobile Robot Navigation and Control	3	1	3 Fall	EE205 MA212	EE
EE351	Microprocessors and Microsystems	3	1	3 Fall	EE201-17 EE202-17	EE
CS303B	Artificial Intelligence B	3	1	3 Fall	CS203B CS109 MA212	CS
CS307	Principles of Database Systems	3	1	3 Fall	None	CS
EE307	Antennas and Radio Propagation	3	1	3 Spring	EE208 EE104	EE
EE308	Fiber Communication Principles and Techniques	3	1	3 Spring	None	EE
EE312	Design of Modern Communication Systems	3	1	3 Spring	EE206 EE313	EE
EE322	Optoelectronics Devices Fabrication Laboratory	2	1	3 Spring	EE204	EE
EE328	Speech Signal Processing	3	1	3 Spring	EE323	EE

EE332	Digital System Design	3	1	3 Spring	EE202-17	EE
EE336	Fundamentals of Photovoltaics	3	1	3 Spring	EE204	EE
EE368	Robotic Motion and Control	3	1	3 Spring	EE205	EE
EE405	Advanced Electronic Science Experiment III	1	1	4 Fall	EE317	EE
EE470	Internship	2	2	3 Summer	None	EE
EE417	Communications System Design II	2	2	4 Fall	EE316 EE206 EE307	EE
CS405	Machine Learning	3	1	4 Fall	MA212 MA113	CS
EE492	Undergraduate Thesis/Projects	12	12	4 Spring	None	EE
Total		110	51			

Curriculum Structure of Automation



Note: The Subject Elective course lists include only part of the courses, see more in Program.