Undergraduate Program for Specialty in Automation

College of Control Science and Engineering
Zhejiang University

I. Program Objectives

This program is designed to produce students with sound personality, consolidated knowledge of natural science as well as overall capacity of humanity and social science. They are expected to acquire 1) consolidated basic theory, specialized knowledge and technology of automation and related fields; 2) the ability to propose questions and solve problems in automation and related fields; 3) the ability to track and develop new theory, knowledge and technologies in automation and related fields; 4) good ability in independent work and lifelong learning; 5) good ability in communication and teamwork; and 6) good international perspective and innovative spirit, who are internationally competitive talents in automation and related fields. About five years after graduation, the graduates are expected to become the backbone of engineering applications or scientific research in automation, instruments and related fields.

II. Learning Outcomes

Graduates are expected to acquire the following knowledge or skills:

1. To acquire a sound personality with good sense of social responsibility and assuming responsibility;
2. To acquire consolidated knowledge of natural science as well as overall capacity of humanity and social science, with good professional qualities;
3. To establish a solid foundation of mathematics and expertise, with the ability to find, analyze and solve problems as well as a sense of independent learning and lifelong learning;
4. To establish a comprehensive system concept and strong basic capabilities in the design, development and application of automation and related systems;
5. To acquire the basic ability to conduct scientific research, knowledge or technological innovation;
6. To acquire relatively strong career adaptability with good independent research, teamwork and organizational management skills;
7. To acquire a good international vision with the basic ability to track and develop new professionally-related theories, knowledge and technologies.

III. Main Courses in Major

Principles of Automatic Control, Sensing and Measurement, Embedded System, Process Dynamics, Process Control Engineering, Design and Practice of Computer Control System, Introduction of Robot, Robotics, Design and Practice of Robot

Ⅳ．Program Length, Degree

Program Length: Four years

Degrees Conferred: Bachelor of Engineering

Main discipline: Control Science and Engineering

Ⅴ． Credits

Minimum Credits of Curriculum (Comprising course system and intensified internship practical training): 156

Minimum Extracurricular Credits: 8

VI. Curriculum and Credits

1. General Education Core Curriculum   62+6 credits

(1) Ideology and Politics   11.5+2 credits

Course Code	Course Name	Credits	hrs/week	Semester
021E0010	Morals & Ethics & Fundamentals of Laws	2.5	2.0-1.0	1
021E0020	Survey of Modern Chinese History	2.5	2.0-1.0	1
371E0010	Situation and Policy I	+1.0	0.0-2.0	1-2
021E0040	Basic Principles of Marxism	2.5	2.0-1.0	3/4
031E0031	General Introduction to Mao Zedong Thought and Socialist Theory with Chinese Characteristics	4.0	3.0-2.0	5/6
371E0020	Situation and Policy II	+1.0	0.0-2.0	8

(2) Military and Physical Education   5.5+3 credits

Course Code	Course Name	Credits	hrs/week	Semester
03110021	Military Training	+2.0	+2	1
031E0020	Physical Education I	1.0	0.0-2.0	1
031E0030	Physical Education II	1.0	0.0-2.0	2
031E0010	Military Theory	1.5	1.0-1.0	3/4
031E0040	Physical Education III	1.0	0.0-2.0	3
031E0050	Physical Education IV	1.0	0.0-2.0	4
03110080	Physical Test I	+0.5	0.0-1.0	5/6
03110090	Physical Test II	+0.5	0.0-1.0	7/8

(3) Foreign Language   6+1 credits

   1) Required   +1 credit

Course Code	Course Name	Credits	hrs/week	Semester
051F0600	English Proficiency Test	+1.0	0.0-2.0	

   2) Elective   6 credits

    Or other foreign language courses

Course Code	Course Name	Credits	hrs/week	Semester
051F0020	College English III	3.0	2.0-2.0	1
051F0030	College English IV	3.0	2.0-2.0	1/2

(4) Computer Science (elective)   5 credits

Course Code	Course Name	Credits	hrs/week	Semester
211G0250	Fundamentals of Programming	3.0	2.0-2.0	1
211G0260	Program Design Project	2.0	1.0-2.0	2

(5) Natural Science   20 credits

Course Code	Course Name	Credits	hrs/week	Semester
821T0010	Calculus(A) I	4.5	4.0-1.0	1
821T0050	Linear Algebra (A)	2.5	2.0-1.0	1
761T0010	College Physics(A) I	4.0	4.0-0.0	2
821T0020	Calculus(A) II	3.5	2.5-2.0	2
761T0020	College Physics(A) II	4.0	4.0-0.0	3
761T0060	College Physics Experiment	1.5	0.0-3.0	3

(6) Innovation and Entrepreneurship   3.5 credits

1) Required   2 credits

Course Code	Course Name	Credits	hrs/week	Semester
031P0010	Introduction to Entrepreneurship	2.0	+2	2

2) Elective   1.5credits

elect 1 course in the type of Innovation and Entrepreneurship Education at least

(7) General Elective Curriculum   10.5 credits

1) elect 1 course in the type of General Core Curriculum at least

2) elect 1 course in the type of Communication and Leadership at least

3) elect 4.5 credits in the type of Social Science at least

4) elect the rest credits in the type of General Elective Curriculum

2. Specialty Curriculum   78 credits

(1) Basic courses in discipline   36 credits

Course Code	Course Name	Credits	hrs/week	Semester
081C0130	Engineering Graphics	2.5	2.0-1.0	1
86120010	Introduction of Automation	1.0	1.0-0.0	1
061B0010	Ordinary Differential Equations	1.0	1.0-0.0	2
081C0251	Engineering Training	1.5	0.0-3.0	2
061B0020	Complex Variable Functions & Integral Transformation	1.5	1.0-1.0	3
061B9090	Probability and Mathematical Statistics	2.5	2.0-1.0	3
101C0350	Electric Circuit and Analog Electronic Technology	5.5	5.5-0.0	3

101C0360	Electric Circuit and Analog Electronic Technology Experiment	1.5	0.0-3.0	3
101C0251	Digital Circuit Analysis and Design	2.5	1.5-2.0	4
11120310	Principles of Automatic Control Ⅰ	4.0	4.0-0.0	4
11120320	Principles of Automatic Control Ⅱ	2.5	2.0-1.0	5
86120020	Sensing and Measurement	4.0	3.0-2.0	5
86120030	Embedded System	4.0	3.0-2.0	5

(2) Specialty Direction Courses   10.5 credits

1) Direction of Robot

Course Code	Course Name	Credits	hrs/week	Semester
86120070	Introduction of Robot	3.5	2.5-2.0	4
86120080	Robotics	3.5	3.5-0.0	5
86120090	Design and practice of robot	3.5	1.0-5.0	6

2) Direction of Control Engineering

Course Code	Course Name	Credits	hrs/week	Semester
86120040	Process Dynamics	3.5	2.5-2.0	4
86120080	Process Control Engineering	3.5	2.5-2.0	5
86120090	Design and Practice of Computer Control System	3.5	1.0-5.0	6

(3) Specialty Elective Courses   16.5 credits

A) Algorithm System

Course Code	Course Name	Credits	hrs/week	Semester
68190140	Mathematical Modeling & Simulating	2.0	1.5-1.0	4
68190190	Data Structure	2.0	1.5-1.0	4
68190130	Signals & Systems	2.0	2.0-0.0	4
68120200	Numerical Method	2.0	1.5-1.0	4
68190170	Object-oriented Programming Technology(JAVA)	2.0	1.5-1.0	4
68190180	Object-oriented Programming Technology(C++)	2.0	1.5-1.0	4
11191150	Introduction to Artificial Intelligence	2.0	2.0-0.0	5
11191240	Digital Signal Processing	2.0	2.0-0.0	5
10187031	Techniques of Electrical Control	2.5	2.0-1.0	5
11191141	Computer Simulation of Control System	2.0	1.5-1.0	6
86190010	Operation Research and System Engineering	3.0	3.0-0.0	6

B) Control Engineering

Course Code	Course Name	Credits	hrs/week	Semester
86190040	Computer Network and Fieldbus Control System	2.0	1.5-1.0	5
86190020	Data Analysis and System Identification	2.0	2.0-0.0	5
11121500	DSP System Design	2.0	1.5-1.0	6
86190030	Fault Diagnosis and Fault-tolerant Control	2.0	2.0-0.0	6
68190150	Fundamentals of Advanced Control	1.5	1.5-0.0	7

Course Code	Course Name	Credits	hrs/week	Semester
86190050	Optimization and optimal control	3.0	3.0-0.0	7

C) Robotics

Course Code	Course Name	Credits	hrs/week	Semester
86190070	Computer Network and Wireless Sensing	2.0	1.5-1.0	5
86190060	Machine Vision and Machine Learning	3.0	2.5-1.0	5
68190090	Aircraft Navigation and Control	2.0	2.0-0.0	6
86190080	Flying Robot	2.5	1.5-2.0	7
68120050	Robot Design	1.5	1.5-0.0	7
68120060	Robot Implementation	1.5	0.0-3.0	8

(4) Practical Training Courses　　　　　7 credits
1) Required　　　　　1 credits

Course Code	Course Name	Credits	hrs/week	Semester
86188010	Major Cognition	0.5	+1	1st Summer Vacation
86188050	Enterprise Cognitive Practice	0.5	+1	2nd Summer Vacation

2) Elective
(A) either-or elective　　　　　1.5 credits

Course Code	Course Name	Credits	hrs/week	Semester
851C0020	Electronic Engineering Training（A）	1.5	0.0-3.0	2
11188240	Experimental Technique Training	1.5	+2	2nd Summer Vacation

(B) other elective　　　　　4.5 credits

Course Code	Course Name	Credits	hrs/week	Semester
86188020	Practice of Measurement and Control System	1.5	+1.5	3rd Summer Vacation
86188030	Advanced Experiment of Embedded System	1.5	+3	3rd Summer Vacation
86188040	Research Training	1.5	+3	5-6
68188090	Integrative Experiment of Automation	1.5	+1.5	7
86188060	Enterprise Advanced Practice	3.0	+8	7

(5) Graduation Thesis（Project）　　　　　8 credits

Course Code	Course Name	Credits	hrs/week	Semester
86189010	Graduation Project (Thesis）	8.0	+16	7-8

3. Personalized Curriculum　　　　　10 credits

Course Code	Course Name	Credits	hrs/week	Semester
11120152	Software Technology	2.0	1.5-1.0	3
68120010	Control Engineering Science Frontiers	1.5	1.5-0.0	5
68120091	Introduction to Internet of Things Technology	1.5	1.5-0.0	7
68120021	Introduction of Logistics Automation	1.5	1.5-0.0	7
68120030	Biosensors and Their Applications	2.0	2.0-0.0	7
68190080	Intelligent Control	1.5	1.5-0.0	7
68190260	Public Security Detection Technology	1.5	1.5-0.0	8

4. 2nd Extracurricular Courses   **+4 credits**

5. 3rd Extracurricular Courses   **+2 credits**

6. 4th Extracurricular Courses   **+2 credits**