Major Course Description

* All the information in this document is collected and translated into English by myself according to the school official transcript and text books and other materials teachers used in class.

Advanced Mathematics 1 & 2	
Terms: The first term & The second term of the first year (1st and 2nd semester)	
Credit: 6+6=12, **Major**	Hours: 96+96=192 hrs
Description: Advanced Mathematics is the most important basis course for majors of science and technology at Northwestern Polytechnical University. This subject concentrates on the basic concepts, theories and basic methods by limiting method. By studying the require contents, students will be able to analyze the mathematical problems and think critically.	
Contents: Functions, the definition of the limit and continuous functions; Derivative and Differential; Principles of differential and the application of differential; Indefinite integral; The definition of the definite integral and the application of the definite integral; The definition of the differential equation; Vector algebra and space analytic geometry; The theory of multivariable differential calculus; Principles of multiple integral; Curvilinear integral and curved area integral; Green formula, Gauss formula and Stokes formula; Infinite series; Improper integral and parameter improper integral.	

Linear Algebra	
Terms: The second term of the first year (3rd semester)	
Credit: 2.5, **Major**	Hours: 40 hrs
Description: This course covers matrix theory and linear algebra, emphasizing on theories that are useful in other disciplines such as physics, natural sciences and engineering.	
Contents: Theory of determinants; Principles of linear system of equations; Principles and application of matrix algebra; Vector spaces; Eigenvalues and Eigenvectors; Orthogonality and least squares problems; Principles of linear transformation; The definition of Euclidean space; N real elements quadric form.	

Functions of Complex Variables and Integral Transformation	
Terms: The first term of the second year (3rd semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: This course introduces the theory of complex function and integral transform theory.	
Contents: Complex numbers; Complex functions; Cauchy-Riemann equations; Analytic functions and harmonic functions; Contour integrals and Cauchy-Goursat theorem; Cauchy integral formula; Power series expansion for analytic functions; Singularities; Fourier transform; Laplace transform.	

Probability and Mathematical Statistics	
Terms: The first term of the second year (3rd semester)	
Credit: 3, **Major**	Hours: 48 hrs
Description: This course is to introduces students to the modeling, quantification, and analysis of uncertainty.	
Contents: An introduction to probability theory; Probabilistic models; Conditional probability; Discrete and continuous random variables; Expectation and conditional expectation; Limit Theorems; Bernoulli and Poisson processes; Bayesian estimation and hypothesis testing.	

Computational Method	
Terms: The second term of the second year (4th semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: Introduction to mathematical modeling of computational problems, as well as common algorithms, algorithmic paradigms, and data structures used to solve these problems. Emphasizes the relationship between algorithms and programming, and introduces basic performance measures and analysis techniques for these problems.	
Contents: Roundoff and truncation errors; Linear systems and matrices; Linear regression; Linear least squares; Fourier analysis; Interpolation; Numerical integration and differentiation; Optimization	

C++ Porgramming	
Terms: The second term of the first year (2nd semester)	
Credit: 2.5, **Major**	Hours: 40 hrs
Description: This course teaches C++ programming language. Introduce the basic syntax, program development procedure, data and file process, structural programming, and problem solving techniques.	
Contents: Basic theoretical knowledge of C++ programming	

Experiment of C++ Porgramming	
Terms: The second term of the first year (2nd semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: Experiments of C++ programming.	
Contents: Students are assigned to solve 100 POJ (Peking University Online Judge) problems using C++ programming techniques.	

Basis of Computer Engineering & Experiments for Basis Computer Engineering	
Terms: The first term of the first year (1st semester)	
Credit: 1.5+2= 3.5, **Major**	Hours: 56 hrs
Description: The most important software/hardware development and current applications in computers are introduced in this course.	
Contents: Number system; Data storage; Operations on data: Computer organization; Windows XP Operating systems; Computer networks; Programming languages introduction; Algorithms introduction; Experiments using MS Office and Visual programming techniques.	

College Physics 1&2 & Physics Experiment 1&2	
Terms: The second term of the first year and the first term of the second year (2nd and 3rd semester)	
Credit: 4+3.5+1.5+1.5= 10.5, **Major**	Hours: 168 hrs
Description: This freshman-level course of introductory physics. The focus is on basic theories of mechanics, thermology, electronics, electromagnetism and optics. Students are also required to conduct corresponding physics experiments for two semesters to practice and understand in depth of what they have learned in class.	
Contents: Classical mechanics; Dynamics; Kinetic theory; Basic thermodynamics; Introduction to electromagnetism and electrostatics; Magnetic materials; Basic electric circuits; Hamilton-Jacobi theory; Introduction to Electronics; Electromagnetic waves and Maxwell's equations; Introduction to the theory of relativity; Introduction to optics; Corresponding physics experiments.	

Introductory Circuit Analysis I&II & Experiment of Introductory Circuit Analysis I&II	
Terms: The first and the second terms of the second year (3rd and 4th semester)	
Credit: 3.5+3+1+1= 8.5, **Major**	Hours: 136 hrs
Description: This course introduces the fundamental concepts and analytic methods for electric circuits. The experiments are design to familiar students with basic circuit system and the application of circuit components and instrumentation.	
Contents: Basic concepts and laws of electric circuit; Resistance circuit equivalent transformation; The basic method of linear circuit analysis; Circuit theorem; the Orthodox steady-state circuit; Three-phase circuit; Coupling inductance and the ideal transformer; the Resonant circuit; Non-sinusoidal periodic current circuit and signal spectrum; Network graph theory and network equation; Two port network; Operational amplifier circuit; First-order circuit analysis in time domain; Second-order and higher order circuit analysis in time domain; the Complex frequency domain analysis method; Introduction to the network function and state variable analysis method.	

Fundamental of Analog Electronic Technology & Experiment of Analog Electronic Technology	
Terms: The second term of the second year (4th semester)	
Credit: 4+1.5= 5.5, **Major**	Hours: 88 hrs

Description: Introduction to the fundamentals of analog electronic circuit and semiconductor devices. Experiments on analog electronic circuit using semiconductor devices.
Contents: Introduction to the design, construction, and debugging of analog electronic circuits; The performance characteristics of semiconductor devices (diodes, BJTs, and MOSFETs) and functional analog building blocks including single-stage amplifiers, op amps, small audio amplifier, filters, converters, and sensor circuits; Experiments in analog electronic technology.

Hardware Description Languages	
Terms: The first term of the third year (5th semester)	
Credit: 3, **Major**	Hours: 54 hrs
Description: Introduction to hardware description languages. There are also compulsory laboratory experiments on FPGA board using Verilog programming techniques for approximately 45 hours.	
Contents: Introduction to hardware description languages; The combination of circuit design and the application of the Verilog grammar; Application of grammar in event-driven circuit system design and the sequential circuit design; The application verification and simulation tool of circuit; Circuit analysis model; The modularization design of the circuit system; The integration of the circuit system design.	

Design of Digital Systems	
Terms: The first term of the third year (5th semester)	
Credit: 3, **Major**	Hours: 54 hrs
Description: This course provide students with background knowledge that is necessary in digital system design.	
Contents: Introduction to Binary systems; Boolean algebra and logic gates; Gate-level minimization; Combinational logic; Synchronous sequential logic; Registers and counters; Memory.	

Signals and Systems	
Terms: The first term of the third year (5th semester)	
Credit: 3, **Major**	Hours: 54 hrs
Description: This course aims at providing students with general understanding of signal and system science. Students will be familiarity with properties of continuous and discrete time systems after taking this course.	
Contents: Introduction to signals and systems; Classification of signals and systems; Convolution of discrete time signals; Convolution of continuous time signals; Impulse response function; Laplace transform; Continuous-time signal and system analysis; Fourier series expansion; Fourier transform; Fast Fourier transform; Discrete-time signal and system analysis; Z transform; Stability	

of discrete time systems; Design of linear time invariant lumped systems; Applications of signals and systems.

Principles & Applications of Singlechip Computer	
Terms: The second term of the third year (6th semester)	
Credit: 4, **Major**	Hours: 64 hrs
Description: This course consists of 54 hours of lectures and 10 hours of lab work. The lecture part of this course introduce the principle and application of DSP controller TMS320LF2407A and the assembly language system. Students are required to complete experiments on DSP controller by programming in assemble language.	
Contents: Digital signal processing and digital signal processor; CPU function and structure of the DSP controller; DSP Memory and I/O space; Assembly language instructions system; DSP controller programming and debugging environment; Peripheral modules and internal units of DSP controller; Introduction to minimum system design.	

Electronic Working Practice	
Terms: The first term of the second year (3rd semester)	
Credit: 2, **Major**	Hours: Two weeks
Description: Introduce common-used electronic components. Students will master the welding techniques after accomplishing the task of assembling a radio.	
Contents: Introduction to common-used electronic components; Assembled a radio; Mastered welding technology using electronic soldering iron, learned basic debugging and maintenance methods of electronic products.	

Programmable Controller	
Terms: The second term of the third year (6th semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: This course consists of 24 hrs of lectures and 8 hrs of experiments. Introduce the development of PLC and the application of programming languages in B&R PLC.	
Contents: The development of Programmable Logic Controller; The principles, structures functions and working process of PLC; Programming languages used in PLC; Basic experiments on B&R PLC programming in ladder diagram and C language.	

Automation Control	
Terms: The first term of the third year (5th semester)	
Credit: 3, **Major**	Hours: 54 hrs

Description: The main goal of the course is to present the basic concept of feedback control for a dynamic system and offer the necessary mathematical background for system analysis.With the knowledge of this course, it is desired that the students can have the capability to design a real control system.
Contents: Sequencing control; Laplace transformation; Mathematical modeling; Time-domain analysis; Root-locu analysis and its applications in controller design; Frequency domain analysis; Compensator.

Control Engineering (Bilingual)	
Terms: The second term of the third year (6th semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: An introduction to computation intelligence in control engineering. Also focus on the application of MATLAB techniques in fuzzy control system and neural network system design. The lecture is given in both Chinese and English. All the study material for this course is in English.	
Contents: Introduction - Conventional vs Intelligent Control; Fuzzy control; Neural Network control; Expert Systems; MATLAB---Fuzzy control toolbox; MATLAB---Neural network toolbox	

Linear System	
Terms: The second term of the third year (6th semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: Students will learn from the course mathematical skills to analyze as well as design linear dynamical systems.	
Contents: Introduction to linear system; Mathematical description of control system; Methods to solve the state space equation of a system; The implementation of the state space system; System stability analysis; System controllability analysis; System observability analysis ; State feedback control.	

Design of Computer Control System	
Terms: The second term of the third year (6th semester)	
Credit: 2.5, **Major**	Hours: 40 hrs
Description: Introduce the basic knowledge and basic application of computer control system technology, the basic principle of discrete control system and the basic theory of digital sampling control.	
Contents: Introduction to the concept of sampling and quantification; A/D and D/A sampling circuit design; Deadbeat control system design; Discrete PID control algorithm; Feed forward controller design.	

Computer Process Control System
Terms: The second term of the third year (6th semester)

Credit: 2.5, **Major**	Hours: 40 hrs
Description: From the perspective of control theory, introduce electric control instrument, digital control instrument and computer control device. Cultivate the students' ability to analysis and solve problems independently.	
Contents: Introduction to transmitter, controller and actuator and their typical applications in computer process control; Methods of the establishment of mathematical model of controlled process; Principles of single-loop control system and complex process control system design; Principles of simple control system design and parameter setting methods; Dalin algorithm; Smith algorithm.	

Flight Mechanics and Flying Control	
Terms: The second term of the third year (6th semester)	
Credit: 6, **Major**	Hours: 96 hrs
Description: This course is mainly divided into two parts: methods to describe the movement of aircraft and flight dynamics; Principle of flight control system design.	
Contents: Introduction to aerodynamic; The aircraft aerodynamic force and its influencing factors; Aircraft aerodynamic torque and its influencing factors; Parameters used in describing the aircraft movement; Coordinate and equations of flight movement; The aircraft's movement mode and its stability; Principles and structures of the steering engine and the actuator loop; Actuator used in flight control system; Principles of typical flight control system; Damper and auto stability system; Three-axis attitude control system; Flight path control system; Airspeed control system; Method of flight control system design; Aircraft flying qualities and control law of basic control system; Selection of basic control parameters.	

The Flight Control System Design and Experiment	
Terms: The second term of the third year (6th semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: Experiments on quadrotor with the application of MATLAB/Simulink	
Contents: Establishing mathematical model of the quadrotor simulator; LQR regulator design and simulation; Quadrotor nine-state step response test.	

Intelligent Instrument	
Terms: The second term of the third year (6th semester)	
Credit: 2, **Major**	Hours: 32 hrs
Description: Introduce basic principle and design method of intelligent apparatus.	

Contents: Principle of intelligent apparatus; Fundamental of intelligent apparatus design; Introduction to man-machine interface design; Data acquisition technology and the I/O interface.

Mechanical Drawing	
Terms: The first term of the first year (1st semester)	
Credit: 3.5, **Major**	Hours: 56 hrs
Description: Students after taking this course will have the ability to use drawing tool proficiently and be familiar with engineering drawing standards and be able to draw mechanical drawings that meet the national standards.	
Contents: Basic knowledge in mechanical mapping; Fundamental of projection theory; Projection of point, line and plane; Stereo projection; Assembly and its projection; The notation of standard components and common-used components; Part drawing; Assembly drawing.	

The Fundamental of Mechanical Design	
Terms: The second term of the second year (4th semester)	
Credit: 3.5, **Major**	Hours: 56 hrs
Description: This course enables students to understand the common-used mechanism and the basic theory and knowledge of common-used components	
Contents: Principle of common-used mechanism; Movement characteristics and design method of common-used mechanism and components; Introduce the design idea and design method of the mechanical system.	

Theoretical Mechanics	
Terms: The first term of the second year (3rd semester)	
Credit: 3.5, **Major**	Hours: 56 hrs
Description: Through learning of this course, students will master the basic rules and research methods of particle, particle system and rigid mechanical motion.	
Contents: Basic properties of force; Force analysis; Various force systems simplification and their balance; Motion of spot and rigid body; The synthesis of the motion of spots; Rigid body plane motion; Basic equation of the particle dynamics; The momentum theorem; Center of mass movement theorem; Angular momentum theorem; Moment of inertia of rigid body; The fixed axis rotation dynamics equation of rigid body; The differential equation of rigid body plane motion; Kinetic energy and potential energy; Kinetic energy theorem; The virtual displacement principle; Introduction to mechanical vibration.	

General Chemistry
Terms: The first term of the first year (1st semester)

Credit: 3, **Major**	Hours: 48 hrs
Description: This course is concisely introduces the basic chemistry principles. Attach great importance to the production and scientific research practice while introducing theories.	
Contents: Chemical thermodynamics; Chemical equilibrium; Chemical reaction rate; Basic electrochemistry; Modern structure theory of material and other basic concepts and basic theories.	

Metalworking Practice	
Terms: The second term of the first year (2nd semester)	
Credit: 2, **Major**	Hours: Two weeks
Description: This course provides students with the basic knowledge of the production of mechanical material workblank, and the basic knowledge in processing process of mechanical components;	
Contents: Introduction to metal material; Exercise how to use measuring implement; Learn and practice lathing, benching, milling, planning and grinding; Accomplish all the production steps of producing a hammer.	

Fieldwork Cognition	
Terms: The second term of the second year (4th semester)	
Credit: 2, **Major**	Hours: Half Day
Description: The whole class visited the UAV Institution in Xi'an city which has a close relationship with Northwestern Polytechnical University. Students listened a lecture given by a UAV scientist, who is also a professor of NWPU. And then watched real automative control instruments and machines applied in aircraft. Students are required to write a report about what they learn from this visit back to school.	

CET-1, CET-2, CET-3 & CET-4	
Terms: The first year and the second year (1st, 2nd, 3rd and 4th semesters)	
Credit: 4+4+3.5+3.5=15, **Major**	Hours: 240 hrs
Description: College English Course. Students learn English Reading, Listening, Writing and Speaking skills in class for two years. In the second year students also practice IELTS writing part and speaking part in class.	

Primary Accounting	
Terms: The first semester of the third year (5th semester)	
Credit: 3, **Elective**	Hours: 48 hrs
Description: Basic accounting principles and methods. This course is also the major course of students majoring in Finance and Accounting.	

History of Western Philosophy	
Terms: The first semester of the third year (5th semester)	
Credit: 3, **Elective**	Hours: 48 hrs
Description: This course introduces ancient philosophers from Ancient Greece to modern times and their philosophy theories.	

Introduction of Life Science	
Terms: The second semester of the first year (2nd semester)	
Credit: 2, **Elective**	Hours: 32 hrs
Description: This course gives introduction to Life Science and also introduces some health care knowledge and methods.	

The World Famous Paintings Appreciation	
Terms: The second semester of the first year (2nd semester)	
Credit: 2, **Elective**	Hours: 32 hrs
Description: This course introduces lots of world famous paintings and also methods in appreciating paintings. Famous artists, famous painting styles and related history background are also introduced.	

Tang Poetry Selected Readings	
Terms: The first semester of the second year (3rd semester)	
Credit: 2, **Elective**	Hours: 32 hrs
Description: This course introduces some selected Tang poetry and Chinese poets of Tang Dynasty. Basic ancient Chinese language knowledge and related history are also introduced in class.	

Physical Education (Aerobics)	
Terms: The first year and the second year (1st, 2nd, 3rd and 4th semesters)	
Credit: 2.5+2.5+2+2=9, **Required**	Hours: 144 hrs
Description: Every student is required to choose one kind of physical education course and take it for two years. In Aerobics, students learn an different aerobics every semester and practice it in class.	

Cultivation of Ideological Morality & Law 1 & 2	
Terms: The first semester and the second semester of the first year (1st and 2nd semesters)	
Credit: 1.5+1.5=3, **Required**	Hours: 48 hrs
Description: The procedure and aim of this course is to improve the life value and raise students' spirit. Also some Chinese law and constitution is introduced.	

Situation & Policy 1,2,3,4

Terms: The first year and the second year (1st, 2nd, 3rd and 4th semesters)	
Credit: 0.5+0.5+0.5+0.5=2, **Required**	Hours: 32 hrs
Description: The domestic and international situations of China and related policies are introduced in this course.	

Military Theory	
Terms: The first semester of the first year (1st semester)	
Credit: 2, **Required**	Hours: 32 hrs
Description: This course gives an introduction of the current Chinese military situation and some current military affairs all around the world.	

Introduction to Mao Zedong's Thought and Theoretical System of Socialism with Chinese Characteristics	
Terms: The first semester of the second year (3rd semester)	
Credit: 4, **Required**	Hours: 64 hrs
Description: This course gives introduction to Mao Zedong's Thought and Theoretical System of Socialism with Chinese Characteristics. The course also introduces some current government policies and the history Communist Party of China.	

Fundamentals of Social Practice	
Terms: The first semester of the second year (3rd semester)	
Credit: 2, **Required**	Hours: 32 hrs
Description: The class is required to divided into several teams, with seven to eleven people each team, to design and organize a social practice activity. The activity should be related to social development research or social situation development. Each team is required to make a presentation in class to present what the activity is about and what the research results or conclusions are. Students are encouraged to use modern media technology to give the presentation.	

The Fundamental Principles of Marxism	
Terms: The second semester of the third year (6th semester)	
Credit: 3, **Required**	Hours: 48 hrs
Description: This is a course on Philosophy, especially the Marxism with Chinese characteristics.	