

BEIJING JIAOTONG UNIVERSITY

Master of Electronic Information (Software Engineering)

School of Software Engineering • Course Outline 2026–2027

DURATION

2 Years (Full-time)

TOTAL CREDITS

≥ 32 Credits

LANGUAGE

English & Chinese

DEGREE

Master's Degree



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A Programme Objective

The **Master of Electronic Information (Software Engineering)** is a full-time postgraduate programme awarded by Beijing Jiaotong University (BJTU), accredited by the Chinese Ministry of Education.

The programme aims to cultivate elite software engineers who master the theoretical foundations of software engineering and are capable of engaging in software development, project management, and technical services in scientific research institutions, government agencies, and enterprises.

With a core training orientation in **intelligent software engineering**, the programme deeply integrates software engineering with cutting-edge artificial intelligence technologies.

Key Learning Outcomes

AI+AI-INTEGRATED
CURRICULUM**16** Courses

CORE & ELECTIVE

6+ Months

INDUSTRY PRACTICE

2 Years

FULL-TIME STUDY

Career Pathways

Graduates are expected to serve as senior software development engineers, software architects, product managers, and project managers in the software engineering field.

Core Competencies

Excellent engineering competence, innovative thinking, and the ability to lead multidisciplinary teams in cross-cultural environments.

Programme Highlights: Deep learning • Large language models & AI agents • Edge intelligence • Intelligent software engineering • Complex system architecture • Kernel analysis (openEuler)

B Course Structure

Programme Overview

Semester 1 • Fall

Academic Studies — 15 Credits

On-campus learning: Chinese language, mathematics foundation, deep learning, data science, edge computing, OS kernel analysis.

Semester 2 • Spring

Academic Studies — 15 Credits

On-campus learning: Software architecture, intelligent SE, LLM & agents, agentic SE project, culture & ethics.

Semester 3

Professional Practice & Thesis Preparation — 7 Credits

Industry internship (≥ 6 months), thesis proposal, mid-term inspection, regular academic meetings.

Semester 4

Thesis & Graduation

Thesis writing, defence, and degree conferral upon successful completion.

Credit Distribution

Quality Enhancement Platform	6 Credits
Ability Enhancement Platform	7 Credits
Professional Advancement Platform	14 Credits
Academic & Practical Innovation	7 Credits

Note: The basic study duration is **2 years** (4 semesters). The extension duration shall not exceed 2 years beyond the basic study duration. Students must complete a minimum of **32 credits** to be eligible for thesis defence and graduation.

The Academic Semesters

Lectures, tutorials, lab work, practical work, projects, and seminars make up the academic semesters. Evaluation, in the form of tests, quizzes, exams, assignments, and project presentations, is conducted on a regular basis.

Teaching Format



Faculty

Faculty members are from Beijing Jiaotong University, partner companies, and partner universities in China or abroad.



Delivery Mode

All modules are delivered face-to-face on campus. Modules may be delivered partially or totally online when necessary.



Lab & Projects

Hands-on lab sessions, coding exercises, and team-based capstone projects are integrated throughout the curriculum.



Language

Courses are taught in English and Chinese, preparing students for global collaboration.

Assessment Methods

Method	Description	Weight
Exams	Written examinations at end of semester	Core courses
Assignments	Regular coursework and problem sets	All courses
Project Presentations	Team-based project deliverables & defence	Capstone
Practical Check	Lab work & hands-on assessment	Selected

Professional Practice Semester

Students must complete **no less than 6 months** of professional practice during their studies, typically arranged in industry enterprises through joint training bases, customized training projects, or enterprise tutor arrangements.

Practice Content

The practice content may involve one or more stages of actual software engineering projects, including:

- **Planning** — Project scoping, requirement analysis, feasibility assessment
- **Analysis & Design** — System architecture, database design, API specification
- **Implementation** — Coding, version control, CI/CD pipeline
- **Testing** — Unit testing, integration testing, performance testing
- **Operation & Maintenance** — Deployment, monitoring, DevOps practices

Assessment & Requirements

Practice Plan

Students must submit a professional practice plan before starting the internship.

Summary Report

Students write a professional practice summary report documenting their experience.

Defence Panel

Assessment defence held at the end of Semester 3, evaluated by a panel of 3–5 qualified teachers or enterprise tutors.

Enterprise Mentorship

Each student is paired with an enterprise tutor for guidance throughout the practice period.

Key Requirement: Professional Practice accounts for **4 credits** and is a mandatory component for graduation eligibility.

E Course Snapshot

Course Module	No.	Course Name	Cr.	Fall	Spring	Assessment	Mini-Credit
Quality Enhancement Platform							
National Conditions	A212004B	Introduction to China	2	✓		Exam	3
National Conditions	A212005B	Chinese Culture	1		✓	Exam	
Comprehensive Quality	A210001B	Engineering Ethics	1		✓	Check	1
Comprehensive Quality	A210003B	Career Planning & New Tech	1	✓	✓	Check	1
Quality Practice	H200501B	Int'l Student Quality Practice	1			—	1
Ability Enhancement Platform							
Language Ability	C328020B	Elementary Chinese Comprehensive I	3	✓		Exam	3
Math Ability	C308104B	Optimization Methods I	2	✓		Exam	≥2
Math Ability	C308103B	Matrix Analysis I	2	✓		Exam	
Professional Advancement Platform — Core Discipline							
Core Courses	M510017B	Principles & Applications of Deep Learning	2	✓		Exam	≥14
Core Courses	M510025B	Complex Software System Architecture	2		✓	Exam	
Core Courses	M510026B	Intelligent Software Engineering Tech.	2		✓	Exam	
Core Courses	M510027B	Principles & Practice of LLM & Agents	2		✓	Exam	
Core Courses	M510028B	Data Science & Knowledge Engineering	2	✓		Exam	
Core Courses	M510029B	Network Computing & Edge Intelligence	2	✓		Exam	
Professional Advancement Platform — Professional Expansion							
Professional Expansion	M510003B	Kernel Analysis of openEuler OS	2	✓		Exam	≥2
Professional Expansion	TBD	Agentic Software Engineering Project	5		✓	Pres.	
Academic & Practical Innovation Platform							
Academic Meetings	H200101B	Regular Academic Meetings	1			—	1
Thesis Proposal	H200301B	Thesis Proposal	1			—	1
Mid-term Inspection	H200408B	Mid-term Inspection of Thesis	1			—	1
Professional Practice	H200722B	Professional Practice	4			—	4

F Curriculum & Syllabus

M510017B • Fall • 2 Credits • 32h

Principles & Applications of Deep Learning

Credits: 2 Hours: 32 Exam

Objectives: Introduce basic concepts, principles, and main applications of deep learning.

Topics: Deep feedforward NNs, optimization & regularization, CNNs, RNNs, GANs & auto-encoders.

M510028B • Fall • 2 Credits • 32h

Data Science & Knowledge Engineering

Credits: 2 Hours: 32 Exam

Objectives: Introduce research objects and application scenarios from network data science perspective.

Topics: Network data representation, community detection, knowledge graphs, GNNs, LLMs & AI agents.

M510029B • Fall • 2 Credits • 32h

Network Computing & Edge Intelligence

Credits: 2 Hours: 32 Exam

Objectives: Equip students with principles and key technologies of network computing and edge intelligence.

Topics: Cloud/edge/fog computing, federated learning, large-small model collaboration, edge AI agents.

M510027B • Spring • 2 Credits • 32h

Principles & Practice of Large Models and Agents

Credits: 2 Hours: 32 Exam

Objectives: Develop practical capabilities in designing, implementing, evaluating, and governing LLM- and agent-based systems.

Topics: Transformer architectures, training & alignment, PEFT, RAG, AI agents design & implementation.

M510025B • Spring • 2 Credits • 32h

Complex Software System Architecture Design

Credits: 2 Hours: 32 Exam

Objectives: Enable students to solve complex software engineering problems using architecture theories.

Topics: Architecture concepts, quality attributes, design patterns, software product lines, case studies.

M510026B • Spring • 2 Credits • 32h

Intelligent Software Engineering Technology

Credits: 2 Hours: 32 Exam

Objectives: Teach deep integration of AI technologies with the full software engineering lifecycle.

Topics: Intelligent requirements analysis, AI-assisted design & coding, intelligent testing & operations.

TBD • Spring • 5 Credits • 80h

Agentic Software Engineering Project

Credits: 5 Hours: 80 Pres.

Objectives: Complete a full-cycle application software development project using AI agents as collaborative assistants.

Topics: AI agent architecture & workflow, full SDLC, team collaboration, deliverables: prototype + report + presentation.

M510003B • Fall • 2 Credits • 32h

Kernel Analysis of openEuler Operating System

Credits: 2 Hours: 32 Exam

Objectives: Conduct detailed analysis of Linux kernel code and exercise advanced OS programming skills.

Topics: Kernel architecture & booting, process scheduling, memory management, VFS, kernel & driver programming.

A210001B • Spring • 1 Credit • 16h

Engineering Ethics

Credits: 1

Hours: 16

Check

Objectives: Cultivate ethical awareness and decision-making ability in engineering practice.

Topics: Engineering & ethics concepts, responsibility ethics, benefit distribution, environmental ethics, professional ethics.

C308103B • Fall • 2 Credits • 32h

Matrix Analysis I

Credits: 2

Hours: 32

Exam

Objectives: Deepen understanding of matrix theory beyond basic linear algebra.

Topics: Vector & matrix norms, eigenvalue perturbation, QR/SVD/Jordan decompositions, matrix functions, applications.

C308104B • Fall • 2 Credits • 32h

Optimization Methods I

Credits: 2

Hours: 32

Exam

Objectives: Provide fundamental optimization methods for engineering problem-solving.

Topics: Linear & nonlinear programming, convex optimization, gradient-based methods, applications in SE & AI.

C328020B • Fall • 3 Credits • 48h

Elementary Chinese Comprehensive I

Credits: 3

Hours: 48

Exam

Objectives: Build basic Chinese language proficiency for daily communication and academic life.

Topics: Pronunciation, vocabulary & grammar, daily conversation, preparation for HSK Level 2.

A212004B • Fall • 2 Credits • 32h

Introduction to China

Credits: 2

Hours: 32

Exam

Objectives: Provide a comprehensive introduction to China's history, culture, politics, economy, and society.

Topics: Chinese history & heritage, modern society & economy, government structure, cross-cultural communication.

A212005B • Spring • 1 Credit • 16h

Chinese Culture

Credits: 1

Hours: 16

Exam

Objectives: Offer an immersive exploration of traditional Chinese culture.

Topics: Traditional architecture, medicine & health cultivation, tea culture, wisdom of Chinese characters.

A210003B • Fall/Spring • 1 Credit • 16h

Career Planning & New Technology Topics

Credits: 1

Hours: 16

Check

Objectives: Prepare students for career development in the rapidly evolving technology landscape.

Topics: Industry trends, career path planning, resume writing, interview skills, company visits & expert talks.

H200501B • Year-round • 1 Credit

Comprehensive Quality Practice Module

Credits: 1

Hours: —

Check

Objectives: Enhance students' comprehensive qualities through extracurricular practice activities.

Topics: Entrance education, "Perceiving China" social practice, academic lectures, mental health, volunteer service.

Note: Students in the Comprehensive Quality Practice Module select no fewer than 5 sub-modules, totalling at least 8 projects.

Shape the Future of Software Engineering

Join the Master of Electronic Information (Software Engineering) Programme at Beijing Jiaotong University

Address

School of Software Engineering
No. 3 Shangyuancun, Haidian District
Beijing 100044, P.R. China

Contact

School: sse.bjtu.edu.cn/cms/
Email: bjtu-sse-intl@bjtu.edu.cn
University: www.bjtu.edu.cn

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