Curriculum for the Master of Software Engineering

(For International Students)

1. Objectives

The Software Engineering Master’s Program offers experience from industrial perspectives. Through challenging curricula, innovative courses, and a technical emphasis, students learn and apply practices, tools, and techniques in a real-world project environment.

The program emphasizes the best software engineering practices, current methodologies, emerging technologies, and their applications. It also emphasizes the development of communication and presentation skills in a team-based software development environment.

2. Study Terms

Full time students are expected to complete a Master’s Degree in Software Engineering in 1 year for coursework and in 1 year for internship and thesis.

3. Degree Requirements

The tutor is in charge of the cultivation of international students. The tutor guides the student to make personal cultivation program and curricula-variable, and supervises his thesis writing.

Student with the coursework must complete no less than 34 credits, out of which 30 credits are required courses and at least 4 credits are elective courses.

Students pursuing a master’s degree have to write thesis.

4. Language

1. Courses are taught in English.
2. Thesis proposal and thesis are required to be written in English.

5. Courses and Credits

Year 1 Semester I:

E1301: Survey of China	**32 hours**	**2 credits**	**Required**

Objectives:

- Cognize the real Chinese history, philosophical heritage and traditional arts
- Get to know the overview of the geographical environment and some famous landscapes in China
- Have a basic understanding of the China’s economic development and education system

Method:

We will have lectures, films, demonstrations, actual experiences (making Chinese dumpling s) etc. and will have plenty of opportunities to ask questions and to participate in discussions.

Skills acquired:

- Chinese history and culture

E1302:Communicative Chinese	**32 hours**	**2 credits**	**Required**

Objectives:

- Learn to communicate (listen, speak, read, write) accurately and appropriately in simple Chinese for common everyday purposes
- To lay a good foundation for further study of Chinese language at intermediate level

Method:

Our teaching emphasizes a lot on the practical using of the language. One to One Teaching and Learning is provided to all students. One student could communicate with one teacher alone to practice his or her language. During afternoons and weekends, students would be organized to take visits and cultural activities.

Skills acquired:

- Chinese language (listen, speak, read, write)

E1303:Operation System & Intensive Programming	**64 hours**	**4 credits**	**Required**

Objectives:

- To study and apply concepts relating to operating systems, such as concurrency and control of asynchronous processes, deadlocks, memory management, processor and disk scheduling, parallel processing, and file system organization
- Install and configure a UNIX/Linux server
- Manage user accounts, file systems, networking and system logs
- Bash and C programming in UNIX/Linux

Method:

Students will gain hands-on experience as they learn how to install, configure and administer a Linux server.   Also, this intensive course will rapidly train students to develop applications and programs in UNIX/Linux.

Skills acquired:

- UNIX/Linux (structure, process management and scheduling; interaction of concurrent processes; interrupts; I/O, device handling; memory and virtual memory management and file management.)
- Apply UNIX/Linux system interfaces for file I/O, terminal I/O, pipes, FIFO's, sockets, and process control.
- Write moderately complex programs in C using basic and advanced data structures

E1304: Object-Oriented Programming (Java)	32 hours	2 credits	Required

Objectives:

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development.
- Have the ability to write a computer program to solve specified problems.
- Be able to use the Java SDK environment to create, debug and run simple Java programs.

Method:

Learn the basics of Object-Oriented programming techniques through intensive education and training.

Skills acquired:

- Basic skills in programming in Java
- An understanding of the ideas of object oriented programming

E1305:Large Database Technology	32 hours	2 credits	Required

Objectives:

- Evolution of database management systems
- Entity Relationship Modeling and Design
- Relational Data Model and Relational Algebra
- Structured Query Language
- Transaction Processing, Concurrency Control and Recovery
- Client Server and large Distributed databases (Oracle)

Method:

Provide students with the background to design, implement, and use database management systems by means of theory lectures and case courses.

Skills acquired:

- Usage of database management systems for effective data management
- Analyze business requirements and produce a viable model and implementation of a database to meet such requirements

E1306:Java EE Application Development	48 hours	3 credits	Required

Objectives:

- Introduce JavaEE 6 along with the evolution from previous JavaEE versions (e.g., JaveEE 5).
- Provide insights on the main JavaEE APIs including Java Servlets, Java Service Faces, Java Server Pages, Enterprise Java Beans, JAX-WS, JAX-RS and the Java Persistence API (JPA).
- Explain the use of annotations within JavaEE applications.
- Illustrate novel JavaEE 6 concepts such as contexts and dependency injection.
- Present techniques for Web-Tier design and web based applications development.
- Present patterns and practices for building enterprise applications based on EJB

technology.
- Web Services development and deployment through either SOAP or RESTful approaches.

Method:

Training process includes theory lectures, code presentation/review, presentation of applications and hands-on exercises.

Skills acquired:

- Knowledge to build and deploy enterprise applications with Java EE

E1307: Mobile Application Development	**32 hours**	**2 credits**	**Elective**

Objectives:

- Independently manage all phases of mobile project development, including proposal, design, implementation, progress reports, debugging, evaluation, documentation, and presentation.
- Develop mobile applications using modern mobile development tools for either the Android or iOS platforms.
- Develop mobile applications for various platforms, including small communication devices (smart phones) and larger MIDs (mobile Internet devices).
- Develop applications that effectively combine mobile device capabilities such as communication, computing, and particularly sensing.
- Exhibit excellent oral and written communication skills.

Method:

A major component of this course will be a semester-long project in teams of 2-3 students. The instructors will provide a variety of possible projects to choose from. Detailed project descriptions (including details on the required application capabilities and constraints) will be provided, which will also be used to decide on the appropriate development environment (i.e., Android versus iOS). These projects are based on real-world challenges (e.g., in areas such as health, civil infrastructure monitoring, etc.) and the student teams are also expected to interact with our project sponsors from our industry and non-profit partners.

Skills acquired:

- Hands-on about mobile development environments, different mobile platforms and operating systems, and the constraints and challenges in mobile application development.

Year 1 Semester 2:

E1308: Algorithm Design	**32 hours**	**2 credits**	**Required**

Objectives:

- Present fundamental concepts and techniques for algorithm design
- Provide necessary background for writing algorithms in a formal way
- Present fundamental concepts and techniques for complexity analysis of algorithms
- Implementation of devised algorithms using programming languages

Method:

The course will contain practical works to implement the devised algorithms.

Skills acquired:

- Skills in applying algorithms to known types of problems, in designing algorithms and in solving new problems
- Basic algorithm analysis knowledge

E1309: Data Mining	**32 hours**	**2 credits**	**Required**

Objectives:

- Understand many of the techniques used to analyse large data set
- Have acquired skills and techniques widely used in modern data mining
- Have gained the ability to pursue further studies in this and related areas

Method:

Practical exercises include: a programming project, in which students design, implement, test, and evaluate data-mining techniques; 2-3 programming assignments using commercial data mining tools; a term paper on a topic selected in consultation with the instructor; and quizzes, which are given almost every week.

Skills acquired:

- Problem-solving skills (especially through tutorial exercises and assignments) including engaging with unfamiliar problems and identifying relevant strategies
- Analytical skills including the ability to construct and express logical arguments and to work in abstract or general terms to increase the clarity and efficiency of the analysis
- Ability to work in a team, through interactions with other students

E1310:Cloud Computing & Virtualization	**32 hours**	**2 credits**	**Elective**

Objectives:

- Understand the common terms and definitions of virtualization and cloud computing and be able to give examples.
- Understand the technical capabilities and business benefits of virtualization and cloud computing and how to measure these benefits.
- Describe the landscape of different types of virtualization and understand the different types of clouds.
- Illustrate how key application features can be delivered on virtual infrastructures.
- Explain typical steps that lead to the successful adoption of virtualization technologies.
- Understand the similarities and differences between cloud computing and outsourcing.
- Learn to migrate existing applications into the Cloud

Method:

Scenario-driven learning allows students to apply the principles of virtualization and cloud computing in a realistic setting. The role-playing activities included in this course present a real world connection using situations that occur in everyday life. In addition, activities including brainstorming sessions, quizzes, and discussions add to the interactive nature of this course.

Skills acquired:

- An overview of the concepts and the significance of virtualization and cloud computing

- Technical expertise and real-world knowledge to take advantage of this growing segment of the programming market

E1311:Software Engineering	**32 hours**	**2 credits**	**Required**

Objectives:

- Learn and gain practical experience with software engineering principles and techniques
- Designing and developing maintainable software and on the use of object-oriented techniques

Method:

The focus of this course is a term project in which the entire class works as a group to produce a software system for a customer. This gives students an opportunity to work in teams, to deal with a customer, and to experience the various stages in a systematic software development activity.

Skills acquired:

- Communication skills and become proficient in engineering design, particularly as it applies to software development and software systems

E1312: Computer Networks & Security	**32 hours**	**2 credits**	**Elective**

Objectives:

- Do network programming using TCP/IP
- Learn fundamentals of cryptography and its application to network security
- Acquire background on well-known network security protocols such as IPSec, SSL, WEP
- Gain hands-on experience with programming and simulation techniques for security protocols

Method:

- Each student is required to complete a mid-size project individually, which includes proposal, implementation, and final demo or paper

Skills acquired:

- TCP/IP
- security protocols such as IPSec, SSL, WEP
- Sniffing
- Spoofing
- DOS
- Security faults

E1313: Project Practice	**112 hours**	**7 credits**	**Required**

Objectives:

- Takeover a complete project for each team
- A team consisting of 4-6 students
- Respecting deadlines and the contract document
- The development of the product is divided into different phases, corresponding to requirements, high-level design, low-level design, and coding, testing and integration

Method:

▪ Choice of topic by the student and then validation made by a teacher in a wide range of fields such as: web applications, Mobile apps, etc. ▪ Project to be completed within 2 weeks ***Skills acquired:*** ▪ Prepare a specification ▪ Establish provisional scheduling ▪ Software development management ▪ Meet the customer's requirements		
Thesis proposal	**2 credits**	**Required**

Year 2

Internship	**9 months**	
Thesis	**3 months**	

6. Master's Thesis

Students pursuing a master's degree have to write thesis.

a. Basic requirements

The topic must have theoretic meaning and practical value. If it derives from an engineering or practical project, theoretic analysis and experimental results are needed. The thesis has to show that the writer grasps basic theory and systematic knowledge, and has the capability to do scientific research or technical work individually.

b. Thesis writing

After proposal in the guidance of the tutor, the student begins thesis writing with a period of more than one year. The thesis can be done with a format of basic research, engineering design or product development.

1. Thesis proposal

(1) Time. After choosing topics and reading quantitative literatures, students have to finish proposal report before the end of the third semester.

(2) Form. Thesis proposal has to be held in research laboratory publicly. An expert team, consisted of three associate professors of computer discipline or related (or experts of the same professional titles), gives evaluation results.

(3) Content. The proposal has to follow the requirement of Thesis Proposal Form which has to be handed in to the postgraduate teaching secretary of the school for records.

The thesis proposal has to be rewritten according to above instructions if the topic is changed for valid reasons.

2. Thesis writing

The thesis has to be written individually by the student in the guidance of the tutor following the *Style and Policy Manual for Theses* of Central South University.

c. Defense application, evaluation and defense of the thesis and degree awarding are done according to *Regulations for Postgraduate Degree Awarding* of Central South University.