MASTER OF SOFTWARE ENGINEERING DEGREE TRACKS

Students seeking a professional focus in the Master of Software Engineering program may choose to follow a specific set of courses referred to as a “track,” that focuses on a particular area of interest. These tracks are informal and intended to help students customize their education by selecting specific core and elective courses which closely align with their professional goals.

There are 9 Software Engineering Degree Tracks:

1. Web Development/Java
2. Web Development/C# and C++
3. Enterprise Architecture and Development
4. Software Security
5. Mobile Development
6. Software Development Team Leader
7. Software Testing
8. Networking
9. Virtual Management

Students should work closely with their designated student advisor to outline course sequence and scheduling. Ten courses are required to receive a Master of Software Engineering degree. Some of the following tracks do not include ten courses, so additional electives should be selected to supplement the track.

1. WEB DEVELOPMENT/JAVA:

Software developers focusing on web development using Java typically work on websites, portals and web applications using a variety of web-based and Java-related technologies. The websites may range in size and complexity from small to enterprise-level. The development work can span the areas of user interface creation, application design with object-oriented methodologies, and programming using a variety of Java frameworks and technologies.

Typical job titles for specialists in this area include: software engineer, Java developer, web developer.

The following courses are recommended for this area:

**Required Course**
- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals**
- RSEG 127 Software Engineering Studio

**Design**
- RSEG 109 Object Oriented Design
2. **WEB DEVELOPMENT/C# AND C++:**

Software developers focusing on web development using C# typically work on websites, portals and web applications using a number of web-based, C#-related technologies. They create websites that range in size and complexity, with work spanning user interface creation, application design with object-oriented methodologies, and programming using C#-related frameworks and technologies.

Additionally, a variety of scientific, computationally intensive systems, as well as embedded systems use C++ language and related technologies to achieve computational speed and efficiency. Strong design and algorithms are important in this area, and programs range from small to computationally intensive and long-running, server-side applications.

Typical job titles for specialists in this area include: software engineer, C# developer, C++ developer, web developer.

The following courses are recommended for this area:

**Required Course**

- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals**

- RSEG 127 Software Engineering Studio

**Design**

- RSEG 109 Object Oriented Design
- RSEG 161 User Interface Design
- RSEG 165 Design Patterns

**Advanced Programming Course**

- RSEG 180 Advanced Programming in C#
- RSEG 103 Advanced Programming in C++
- RSEG 113 Advanced Programming in C++ (Level 2)
Electives

- RSEG 161 Web Development Technologies
- RSEG 178 Windows Communication Foundation Programming with C#

3. **ENTERPRISE ARCHITECTURE AND DEVELOPMENT**

Software developers that work on large software projects typically need to be familiar with a variety of technologies, design and architecture approaches, and development considerations that arise when working on projects that span multiple systems. Architectural and interaction frameworks, user interface design, enterprise-level technologies, cloud computing paradigm are important tools in the arsenal of a developer or an architect working on large projects.

Typical job titles for specialists in this area include: software architect, application architect, software engineer (senior levels), as well as specialists in the individual technologies used on enterprise-level projects.

The following courses are recommended for this area:

**Required Course**

- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals**

- RSEG 127 Software Engineering Studio

**Design**

- RSEG 161 User Interface Design
- RSEG 165 Design Patterns
- RSEG 167 Service Oriented Architecture

**Advanced Programming Course**

- RSEG 105 Java Enterprise Programming

**Electives**

- RSEG 177 Enterprise Application Development with Spring Framework
- RVTM 140 Enterprise Content Management
- RSEG 176 Cloud Computing
- RSEG 170 Database Management

4. **SOFTWARE SECURITY**

Software architects and engineers involved in security aspects of software systems focus on design and implementation of security infrastructure and protection from malicious attacks as well as access control for application users. With the increasing need to protect data, applications, and websites from hackers as well as provide controlled access and use of software systems to users, the software
security area is an expanding field that takes a comprehensive approach to the security needs of software systems.

Typical job titles for specialists in this area include: software security architect, software security engineer, network security engineer, information security software engineer.

The following courses are recommended for this area:

**Required Course**
- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals** *(Select 1 Fundamental course from the core cluster)*

**Design** *(Select 1 Design course from the core cluster)*

**Advanced Programming Course** *(Select 1 Advanced Programming course from the core cluster)*

**Electives**
- RSEG 160 Computer Networks and Data Communications
- RIAS 120 Securing Applications, Web Services and Software-As-A-Service (SaaS)
- RIAS 130 Software Security Testing and Code Assessment
- RIAS 172 Network Security
- RIAS 190 Special Topics in Information Assurance and Security: Virtualization and Cloud Security

5. **MOBILE DEVELOPMENT**

With many users accessing websites and applications through mobile devices, the area of mobile development and related technologies has been expanding strongly and has significant growth patterns for the future years. Software engineers and designers working with mobile systems adapt the design, user interface, web development and content principles to work well on mobile devices. Many large and enterprise projects have mobile development components as well.

Typical job titles for specialists in this area include: software engineer – mobile applications, software engineer – mobile development.

The following courses are recommended for this area:

**Required Course**
- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals**
- RSEG 127 Software Engineering Studio

**Design**
- RSEG 109 Object Oriented Design
- RSEG 161 User Interface Design
Advanced Programming Course

- RSEG 102 Advanced Programming in Java

Electives

- RSEG 161 Web Development Technologies
- RSEG 175 Mobile Computing
- RVTM 140 Enterprise Content Management

6. Software Development Team Leader

Software teams range in size from several people to tens and even hundreds of people. A software development team leader interacts with other parts of the software organization, coordinates various parts of the software development process, and ensures that the development initiatives are designed and implemented based on the commitments made by the team.

Typical job titles for specialists in this area include: software development leader, software team leader, software development manager.

The following courses are recommended for this area:

Required Course

- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

Software Engineering Fundamentals

- RSEG 131 Software Testing Techniques
- RSEG 126 Release Engineering and Configuration Management
- RSEG 127 Software Engineering Studio

Design

- RSEG 109 Object Oriented Design
- RSEG 165 Design Pattern

Advanced Programming (Select 1 Advanced Programming course from the core cluster)

Electives

- RPJM 101 Foundations of Project Management
- RPJM 130 Agile Project Management
- RVTM 101 Foundations of Virtual Management Across Cultures and Geographies
- RVTM 110 Management of Virtual and Global Teams

7. Software Testing

Software engineers working in the quality assurance and testing area focus on validating software and verifying a variety of quality characteristics. The software testing process spans all areas of
Software development lifecycle and is key to delivering quality software products. Software testing engineers work closely with many other members of the software projects, including project managers, release engineers, developers, marketing and training teams.

Typical job titles for specialists in this area include: software testing engineer, software quality assurance (QA) engineer, software tester.

The following courses are recommended for this area:

**Required Course**

- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals**

- RSEG 125 Foundations of Software Quality Assurance
- RSEG 131 Software Testing Techniques
- RSEG 126 Release Engineering and Configuration Management
- RSEG 127 Software Engineering Studio

**Design**

- RSEG 109 Object Oriented Design
- RSEG 161 User Interface Design

**Advanced Programming Course** *(Select 1 Advanced Programming course from the core cluster)*

**Electives**

- RIAS 130 Software Security Testing and Code Assessment
- RVTM 101 Foundations of Virtual Management Across Cultures and Geographies, or
- RVTM 110 Management of Virtual and Global Teams

### 8. Networking

Software engineers focusing on network employ technologies, frameworks, and operating system-level tools to enable software systems to run in a variety of computing platforms and communicate with each other. Networking and communication protocols form the foundation of public and private networks and allow users to work with applications that can be located and distributed in a variety of architectural approaches. Network security is also an important concept in this area, as networked applications and data need to be protected against unauthorized access.

Typical job titles for specialists in this area include: network engineer, network security engineer, software engineer – network systems, system administrator – networks.

The following courses are recommended for this area:

**Required Course**

- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals** *(Select 1 Fundamental course from the core cluster)*
Design *(Select 1 Design course from the core cluster)*

**Advanced Programming Course** *(Select 1 Advanced Programming course from the core cluster)*

**Electives**
- RSEG 160 Computer Networks and Data Communications
- RIAS 172 Network Security
- RSEG 110 Unix Tools
- RSEG 145 Linux Administration
- RSEG 290 Special Topics in Software Engineering: Transformation of the Internet: Software Defined Networking (SDN)
- RSEG 176 Cloud Computing

9. **Virtual Management**

Software engineering team members, team leaders and managers frequently work in virtual and globally distributed teams. The courses in this track provide students with a knowledge base and skills to manage and participate in software development projects at distance, the dynamic of communication within a distributed organization, the impacts of distance and diversity on business practices and activity, and culturally diverse business habits and practices in a worldwide environment.

Typical job titles for specialists in this area include: software team leader, software development manager, software developer, software architect, and other management, leadership and technology positions in software that work with geographically distributed team members.

**Required Course**
- RSEG 120 Software Development Methodologies or
- RSEG 122 Advanced Software Development Methodologies

**Software Engineering Fundamentals** *(Select 1 Fundamental course from the core cluster)*

**Design** *(Select 1 Design course from the core cluster)*

**Advanced Programming Course** *(Select 1 Advanced Programming course from the core cluster)*

**Electives**
- RVTM 101 Foundations of Virtual Management across Cultures and Geographies
- RVTM 110 Management of Virtual and Global Teams
- RVTM 125 Virtual Teams in Worldwide Environments
- RVTM 140 Enterprise Content Management