

# MS Information Security (MSIS)

## Riphah Institute of Systems Engineering (RISE)

Riphah International University, Islamabad, Pakistan

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### 1. Program Overview:

The program aims to develop core competencies in the fields of computer networks security, application security, and information security management. The students will learn the technical aspects of information security by understanding current threats and vulnerabilities and examining ways of developing effective countermeasures. To cater for wide range of professional and academic interests, students have the option of selecting fifty percent of their course work according to their specific needs.

### 2. Program Objectives:

The overall program objectives are:

- i. To fulfill the growing national need of well trained professionals to work in a wide range of roles to protect information systems in all types of organizations, including research and academia.
- ii. To contribute towards need of protecting national information infrastructure from all kinds of threats.
- iii. To play an effective role in international efforts to make the cyberspace safe, secure and reliable for the national and international communities.

### 3. Program Structure:

The MS Information Security program is designed to cater for two distinct needs: (1) professionals wishing to pursue a professional career in the field of information security, and (2) candidates wishing to prepare themselves for doctoral level study or embark on a research based career.

The students enrolled in MSIS program will have to complete 12 credit hours (typically 4 courses) of core courses. The core courses are carefully designed to cover the breadth of information security theory and practice. The students will also have to complete another 12 credit hours (typically 4 courses) of elective courses. These courses can be selected based on the students' interest and the areas of specialization they are wish to follow.

Additionally, the students are required to either complete an industrial project or complete a research thesis of 9 credit hours (typically spanning two semesters).

Category	Credit Hours
Core	12
Electives	12
Thesis/Project	9
<b>Total Credit Hours</b>	<b>33</b>

#### 4. Program Eligibility:

- BS (SE/CS/IT) 4 years degree program (or equivalent),  
OR  
16-years of education science/engineering degree (NOTE: candidates may have to complete the deficiency coursework as determined by the admissions committee);
- Two years of relevant work experience
- Professional Certifications in the field of Information Security may be substituted for some of the course work requirements as determined by the admissions committee on case by case basis.

#### 5. Program Compliance and Accreditation:

The program is structured to meet the requirements of Higher Education Commission (HEC), Pakistan for Master of Science (MS) degree program. The program is offered by Riphah International University, which is a Federally Chartered University based in Islamabad, Pakistan. The program is approved by the relevant university authorities.

#### 6. Core Course (12 Credit Hours)

##### i. IS-5100 Information Security Essentials (3 Credit Hours)

*Pre-requisites: None*

Description: The basic concepts and techniques used in the field of information security are covered in this course. The course builds on the basic concepts of confidentiality, integrity, availability, authentication, authorization, anonymity and non-repudiation. It also covers the fundamental issues related to security of web-based applications, network security, digital forensics, etc. The course also covers the applied concerns of information security in various domains, such as business, healthcare, nursing, sociology and law.

##### ii. IS-5102 Network Security (3 Credit Hours)

*Pre-requisites: None*

Description: This course will cover the basic concepts of network security by focusing on its critical services, like confidentiality and integrity of data, authentication, firewalls, web security and routing. An overview of email security, intrusion detection systems and wireless LAN security will also be the part of the course contents.

##### iii. IS-5101 Application Security (3 Credit Hours)

*Pre-requisites: Adequate programming experience (to be assessed by the instructor)*

Description: This course will make students learn defensive strategies and technical details of the selected programming framework and learn, as a developer, how to leverage defensive technologies in the framework and learn various techniques to build security into software applications. The course will examine the typical security threats in web-based and traditional applications and identify strategies for mitigating these threats.

##### iv. IS-5103 Information Security Management (3 Credit Hours)

*Pre-requisites: none*

Description: This course will focus on improving the security management concepts of students. It will cover security management requirements; Internal control, Audit

and strategy; role of Risk analysis and management, IT Management Practices, IT professional soft skills and IT professional management.

## 7. Electives (12 Credit Hours)

**i. IS-6310 Ethical Hacking (3 Credit Hours)**

*Pre-requisites: IS-5100, IS-5102, or Instructor's Permission*

Description: This course will teach students how to secure systems from intruders. This will include the following topics in this course: social engineering, intrusion detection, DoS attacks, virus creation and buffer overflows.

**ii. IS-6320 Penetration Testing (3 Credit Hours)**

*Pre-requisites: IS-6310*

Description: The basic focus of this course will be to make students understand the *penetration testing*. The course contents will include the introduction of penetration testing; legal and customer agreements; planning and scheduling of penetration testing; intrusion detection penetration testing; social engineering penetration testing and how to write reports and perform documentation of penetration testing.

**iii. IS-6330 Intrusion Detection (3 Credit Hours)**

*Pre-requisites: IS-5100, IS-5102*

Description: This course will focus on how to prevent and detect malicious activity by teaching students various techniques and tools used for monitoring networks and computer systems. It will cover vulnerability analysis, management of intrusion detection systems, denial of service and designing recovery solutions.

**iv. IS-6340 Information Systems Auditing (3 Credit Hours)**

*Pre-requisites: IS-5100, IS-5103*

Description: This course is a blend of audit process, compliance regulations and IT Governance. It will cover the following topics: the information systems audit process; Audit frameworks; regulations and compliance, the business process and IT risks and auditing business application systems.

**v. IS-6350 Risk Management (3 Credit Hours)**

*Pre-requisites: IS-5100, IS-5103*

Description: This course will cover how to manage risks to secure the IT systems. This course will include the basic concept of Risk Management, qualitative and quantitative analysis and evaluation of risks, Risk treatment and Risk Reporting.

**vi. IS-6360 Business Continuity Planning and Disaster Recovery (3 Credit Hours)**

*Pre-requisites: IS-5100, IS-5103*

Description: This course will teach students the techniques and methods of how to continue to business even in case of disaster and how to overcome the disaster. The course contents will be: Business impact analysis, strategies of business continuity planning, strategies for recovery, maintenance and execution phases.

**vii. IS-5200 Project Management (3 Credit Hours)**

*Pre-requisites: IS-5100, or Instructor's Permission*

Description: This course will focus on the important principles of Project Management. This course will cover the software development lifecycle phases with project roles and responsibilities, plan of user resources for IT projects, estimation, planning and scheduling, change and quality management.

**viii. SE-6410 Secure Software Development (3 Credit Hours)**

*Pre-requisites: IS-5100, IS-5101*

Description: This course will teach students how to develop a secure information system. The course will first introduce what does secure software mean? It will continue by explaining the secure SDLC phases, modelling threats in requirements and design phases, reviewing code in implementation phase, testing security after development and deployment concerns.

**ix. SE-6420 Security Requirements Engineering (3 Credit Hours)**

*Pre-requisites: IS-5100*

Description: This course will instill the concepts of Requirements Engineering into students while having a strong focus on security. It will emphasize why security is important at this SDLC phase. This course will make students learn different methodologies such as SQUARE and others.

**x. SE-5440 Formal Methods (3 Credit Hours)**

*Pre-requisites: IS-5100*

Description: The course will focus on formal methods in security. The role of formal methods in security requirements, risk analysis, access control models, trust models, specification and analysis of security properties, requirements refinement, policy specification, techniques for verification and static analysis, analysis of security-critical systems, and design and analysis of security protocols will be covered in the course.

**xi. IS-6336 Data Security and Encryption**

*Pre-requisites: IS-5100, IS-5102*

Description: This course covers the methods, algorithms, techniques, and tools of data security and cryptography. The theoretical aspects of cryptographic algorithms and protocols along with their practical applications to solve communication security are covered in this course. The focus is on imparting skills necessary for embedding security into an information system to meet the desired integrity, confidentiality, and authenticity requirements.

**xii. IS-7100 Advanced Topics in Information Security**

*Pre-requisites: Permission of instructor*

Description: Special advanced and emerging topics related to information security that are not occurring in the regular IS courses are covered in this course.

## **8. Thesis or Project**

All students enrolled in the MS-IS program course are expected to complete either a thesis or a project. In very rare cases 9 credit hours of course work may be substituted for thesis or project.

**i. IS-7500 Project**

*Pre-requisites: 24 credit hours of course work or supervisor's permission*

Description: Project is a problem solving experiences of students that result from applying theoretical knowledge accumulated during the course work to solve *real-world* problems under supervision of graduate faculty member or approved industrial supervisor. The projects may be conducted in groups after approval from

the project supervisor. The project experience results in a project report, which is appropriate for MS level.

ii. **IS-7501 Thesis**

*Pre-requisites: 24 credit hours of course work or supervisor's permission*

Description: Thesis is original or expository work chosen and completed under direct supervision of graduate faculty member, which results in a research report, which is appropriate for MS/MPhil level. The report must also be defended in oral presentation.

Description: Original work supervised by a post-graduate faculty member.

**9. Recommended Streams**

- i. Information Security Management
- ii. Secure Software Development
- iii. Network Security