



RIPHAH
INTERNATIONAL UNIVERSITY



Prospectus

**FACULTY OF
COMPUTING**

MISSION

To extend the mission of the university by keeping pace with the demands of the ever-changing Computing landscape, meeting the local and global educational standards and producing quality graduates who are capable of developing indigenous solutions for socio-economic development of the nation.

FACULTY OF COMPUTING

Faculty of Computing is a constituent unit of Riphah International University. It is responsible for academic quality management of all computing programs offered by Riphah. The faculty manages BS programs in the field of Software Engineering, Computer Science, Information Technology, Cyber security and Computer Arts and MS programs in Computer Science, Software Engineering, Information Technology, Information Security, and Data Science at various campuses of the university. Furthermore, it also offers PhD program in Computing.



Dr. Muhammad Zubair
Dean, Faculty of Computing,
Ph.D. – Electrical Engineering (IUI)

Dean's Message

The faculty of computing was established with the mission of developing strong academic programs and has been contributing towards swift development of technology to support the socio-economic development of the nation. The countries around the world have turned their attention to the universities as a driving force for development of innovative systems in an ever-changing, highly complex, and global environment. It is with this motivation we seek to prepare our graduates and researchers to contribute towards development of indigenous innovative systems. We also feel it is our responsibility to inspire students, equip them with sufficient analytical, design and computing skills and at the same time build their character so that they can play their role in the noble cause of nation building through dedication, diligence, and committed professionalism. The university course, Life and Living – based on eight modules, is designed to develop a character that is worthy of a dedicated professional, is mandatory for all the graduates.

Our degree programs are duly accredited and recognized by the Higher Education Commission of Pakistan. The innovation ecosystem that we have developed at the Faculty is based on bilateral relationship with the industry. Our faculty members are engaged in industrial training and consultancy, which not only enriches our academic programs but also brings industrial relevant problems for research and development of creative solutions. Our faculty members have trained hundreds of professional from the industry and provide consultancy to almost all industrial sectors including public organizations. We have developed strong industrial partnerships with leading national and international organizations. Our researchers are actively engaged in developing effective solutions in the field of information security and software engineering. The wide variety of courses at the graduate level, especially designed to address the industry requirements, offers a unique learning experience.

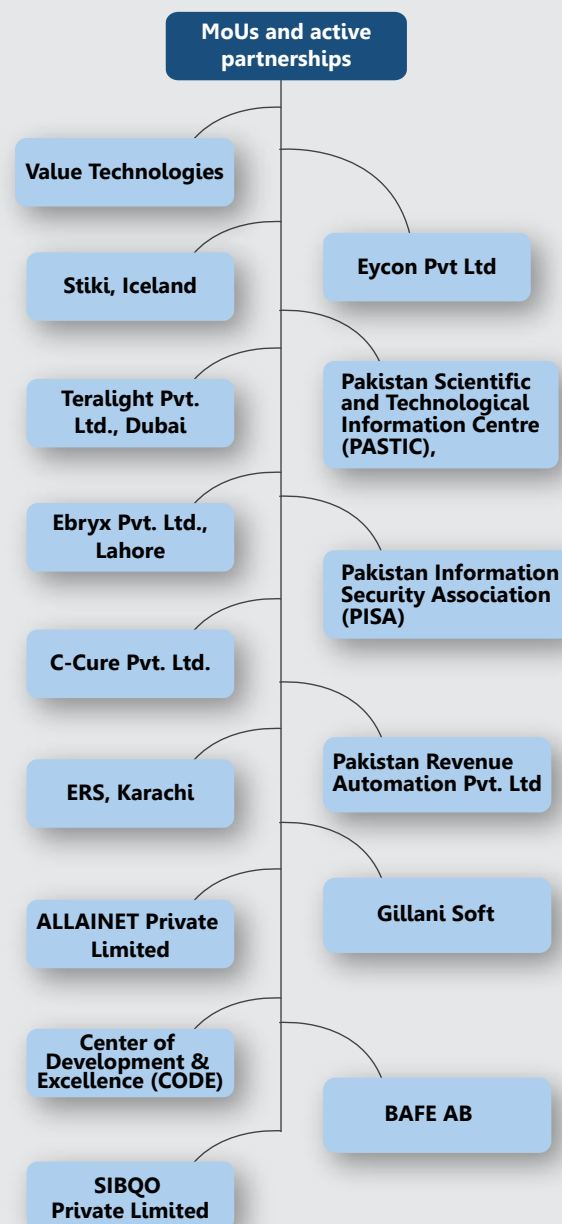
I would like to invite all the perspective students to explore the possibility of joining the Faculty of Computing programs and to take a deeper look beyond accreditation of our programs by National Computing Education Accreditation Council (NCEAC). I am confident that a unique learning experience that would have a long lasting impact on your personal and professional life awaits you.

FACULTY OF COMPUTING

We believe that education should transfer and develop knowledge more effectively such that it aids in the economic development of the country. The new knowledge should be commercialized in the form of innovations and novel high-tech products. This is possible when there is a robust interface between the university, entrepreneurs and small & large scale businesses. Our academic programs provide such a platform by leveraging research and development activities. The fundamental research along with industrial collaboration promotes training and consultancy, there by becoming a catalyst for creation of startups and technology-led economic development. The training and consultation feeds back to the academic programs in turn enriching it. This interaction between the academia, research and industry is continuous, and is crucial for the development of innovative solutions. Industrial collaborations feed the academia and research with industrially relevant curriculum and case studies as a result of which academia and research helps generate innovative and commercialization activities.

INDUSTRIAL COLLABORATION

As a first step towards the said concept, industrial collaboration has bore fruits in the form of active partnerships and MoUs with several national and international organizations.



ACADEMIC PROGRAMS

Faculty of computing offers divergent programs developed after extensive academic research and are shaped under the influence of broad experience. Currently we offer both undergraduate and graduate programs in the field of computing. These programs meet the national requirements as identified by the Higher Education Commission (HEC) and are in line with the international curriculum of IEEE / ACM.

UNDERGRADUATE PROGRAMS

BS SOFTWARE ENGINEERING (BSSE)

Our undergraduate program is designed to equip the students with technical knowledge of the fundamentals of computing, their mathematical foundations and applications. A sequence of courses is designed so that theoretical study is combined with practical on ground exercises. We believe that teaching should not be confined to the class room walls, rather it should be activity driven combining lectures, assigning real life projects and imparting soft skills. This experience of beyond class room education prepares the students with computing skills, ability to solve problems, and to face the challenges in team work environment.

Available Seats 50 per semester
Duration 8 Semesters (4 Years)

Eligibility:

The minimum requirements for admission in a Bachelor degree program in Software Engineering, is at least 50% or above marks in Intermediate (HSSC) examination with Mathematics or equivalent qualification.

The candidates for BS Software Engineering with at least 50% or above marks in Intermediate with Pre-Medical background (without Mathematics) will be required to pass deficiency courses of Mathematics of 6 credit hours within one year of their regular studies.

Admission Criteria:

Academic Qualification 60%
 Test / Interview 40%

Intake: Spring and Fall (Twice a year)

Class Timings:

(Monday – Friday)

Scholarships: Talent & need based scholarship (upto 100% on tuition fee)

Degree Completion:

For award of BS degree, a student must have:

- Passed courses totaling at least 130 credit hours, including six credit hours of Final Year Project.
- Obtained a CGPA of 2.0 or more.

Proposed Study Plan for BS (Software Engineering)

4-Year Program (8 Regular Semesters of 18 weeks each)



Proposed Study Plan for BS (Software Engineering)

Semester 1 16 Credit Hrs.	Semester 2 18 Credit Hrs.	Semester 3 18 Credit Hrs.	Semester 4 18 Credit Hrs.	Semester 5 17 Credit Hrs.	Semester 6 16 Credit Hrs.	Semester 7 15 Credit Hrs.	Semester 8 12 Credit Hrs.
Introduction to ICT (2+1)	Calculus and Analytical Geometry (3)	Data Structures and Algorithms (3+1)	Operating Systems (3+1)	University Elective-V (Introduction to the Hadith & Seerah (2))	SE Elective-IV (3)	Final Year Project-I (3)	Final Year Project-II (3)
Discrete Structures (3)	Object Oriented Programming (3+1)	Software Requirements Engineering (3)	Database Systems (3+1)	Software Construction and Development (2+1)	Computer Networks (3+1)	Software Re-Engineering (3)	SE Supporting-III (3)
Applied Physics (3)	Software Engineering (3)	SE Elective-I (3)	Probability & Statistics (3)	Web Engineering (3)	Software Quality Engineering (3)	SE Elective V (3)	Professional Practice (3)
English Composition and Comprehension (3)	Communication and Presentation Skills (3)	Linear Algebra (3)	Human Computer Interaction (3)	SE Elective-II (3)	Software Design and Architecture (3)	Software Project Management (3)	Information Security (3)
Programming Fundamentals (3+1)	University Elective-I (3)	University Elective-II (3)	University Elective-III (2)	SE Supporting-I (3)	SE Supporting-II (3)	Technical & Business Writing (3)	
	Pakistan Studies (2)	Islamic Studies (2)	University Elective-IV (Introduction to the Basic Teachings of the Qura'n (2))	SE Elective-III (3)			
Computing Core	Mathematics and Science Foundation (Core)	General Education (Core)	University Elective	SE Core	SE Elective	SE Supporting	130
39 Credit Hrs.	12 Credit Hrs.	19 Credit Hrs.	12 Credit Hrs.	24 Credit Hrs.	15 Credit Hrs.	9 Credit Hrs.	



BS COMPUTER SCIENCE (BSCS)

In this modern era of information age, the field of computing is advancing at an ultra-high speed. With the recent advancements in different areas of computing e.g. Internet of Things, Big Data, Cloud Computing, Cyber Security, although there has been a growing demand to excel in these particular areas, however, the importance of having a strong foundation of the core principles of computing has also got more attention. The need to build the core competency in the area of foundation of the computing, the underlying hardware and software platforms, programming interfaces, complex algorithms, trends in user interface designs, emergence of new businesses, has increased.

This program of BS Computer Science is aimed to fulfil this need of the new era. The Bachelor of Science in Computer Science program will try to produce the high-quality computer scientists who will have the necessary theoretical background to understand the computing problems, will be equipped with the necessary tools and techniques to design, develop and deliver the solutions for these problems and will have the necessary ethical values to apply this skill set in the appropriately right way.

Available Seats 50 per semester

Duration 8 Semesters (4 Years)

Eligibility:

The minimum requirements for admission in a Bachelor degree program in Computer Science, is at least 50% or above marks in Intermediate (HSSC)

examination with Mathematics or equivalent qualification.

The candidates for BS Computer Science with at least 50% or above marks in Intermediate with Pre-Medical background (without Mathematics) will be required to pass deficiency courses of Mathematics of 6 credit hours within one year of their regular studies.

Admission criteria:

Academic Qualification 60%

Test / Interview 40%

Intake: Spring and Fall (Twice a year)

Class Timings:

(Monday – Friday)

Scholarships:

Talent & need based scholarship (upto 100% on tuition fee)

Degree Completion:

For award of BS degree, a student must have:

- Passed courses totaling at least 130 credit hours, including six credit hours of Final Year Project.
- Obtained a CGPA of 2.0 or more.

Study Plan for BS (Computer Science)

4-Year Program (8 Regular Semesters of 18 weeks each)



Proposed Study Plan for BS (Computer Science)

Semester 1 16 Credit Hrs	Semester 2 16 Credit Hrs	Semester 3 18 Credit Hrs	Semester 4 18 Credit Hrs	Semester 5 18 Credit Hrs	Semester 6 17 Credit Hrs	Semester 7 15 Credit Hrs	Semester 8 12 Credit Hrs
Programming Fundamentals (3+1)	Calculus and Analytical Geometry (3)	Data Structures and Algorithms (3+1)	Design and Analysis of Algorithms (3)	University Elective-IV (Introduction to the Hadith & Seerah) (2)	CS Elective-III (3)	Final Year Project-I (3)	Final Year Project-II (3)
Discret Structures (3)	Object Oriented Programming (3+1)	Computer Organization and Assembly Language (4)	Database Systems (3+1)	Compiler Construction (3)	Computer Networks (3+1)	Parallel and Distributed Computing (3)	CS Supporting-III (3)
Applied Physics (3)	Digital Logic and Design (4)	University Elective-I (3)	Probability & Statistics (3)	CS Elective-I (3)	Artificial Intelligence (4)	Information Security (3)	Professional Practices (3)
English Composition and Comprehension (3)	Communication and Presentation Skills(3)	Linear Algebra (3)	University Elective-III (Introduction to the Basic Teachings of the Qura'n) (2)	CS Elective-II (3)	CS Elective-IV (3)	Technical & Business Writing (3)	University Elective-V (3)
Introduction to ICT (2+1)	Pakistan Studies (2)	University Elective-II (2)	Software Engineering (3)	CS Supporting-I (3)	CS Supporting-II (3)	CS Elective-V (3)	
		Islamic Studies (2)	Theory of Automata (3)	Operating Systems (3+1)			
Computing Core	Mathematics and Science Foundation (Core)	General Education (Core)	University Elective	Domain CS (Core)	Domain CS Elective	Domain CS Supporting	130
39 Credit Hrs.	12 Credit Hrs.	19 Credit Hrs.	12 Credit Hrs.	24 Credit Hrs.	15 Credit Hrs.	9 Credit Hrs.	



BACHELOR IN COMPUTER ARTS (BCA)

In the twenty first century, where gig economy constitutes a major portion in the world economy, Pakistan has its fair share by standing at the fourth position as per Online Labor Index. Besides software development and technology, creativity and multimedia has 1/3rd portion in terms of online jobs. To garner a work force for this sector, it is vital that the foundations of arts be built along with the latest computer graphic technologies. The need to inculcate the aesthetic sense in terms of art as well as the computations technologies for its production and reception is the core of the Bachelors of Computer Arts program. This program will fulfill the needs of the present highly digitized era by producing high-quality computer artists equipped with digital technological skills required for branding, printing, packaging and publishing Medias.

Available Seats 50 per semester

Duration 8 Semesters (4 Years)

Eligibility:

Intermediate or equivalent at least 45% marks in Intermediate (HSSC) examination with Arts/Science or equivalent qualification

Admission Criteria:

Academic Qualification 60%

Test / Interview 40%

Intake: Spring and Fall (Twice a year)

Class Timings:

(Monday – Friday)

Scholarships:

Talent & need based scholarship (upto 100% on tuition fee)

Degree Completion:

For award of bachelor degree, a student must have:

- Passed courses totaling at least 130 credit hours, including three credit hours of Internship and six credit hours of Final Year Project.
- Obtained a CGPA of 2.0 or more.

Study Plan for Bachelor in Computer Arts

4-Year Program (8 Regular Semesters of 18 weeks each)



Proposed Study Plan for Bachelor of Computer Arts

Semester 1 18 Credit Hrs.	Semester 2 17 Credit Hrs.	Semester 3 17 Credit Hrs.	Semester 4 15 Credit Hrs.	Semester 5 17 Credit Hrs.	Semester 6 15 Credit Hrs.	Semester 7 Credit Hrs. 14+3 (int)	Semester 8 14 Credit Hrs.
History of Arts (3 Cr. Hrs.)	Design II (2+1 Cr. Hrs.)	Introduction to Photography (3 Cr. Hrs.)	Color Theory (2+1 Cr. Hrs.)	Basic Animation (3 Cr. Hrs.)	Introduction to Game Development (2+1 Cr. Hrs.)	Pakistan Studies (2 Cr.Hrs)	Art Culture and Society (3 Cr. Hrs.)
Design-I (1+2Cr. Hrs.)	Drawing-II (2+1 Cr. Hrs)	Story Boarding (2+1 Cr. Hrs.)	Web design And development (2+1 Cr. Hrs.)	User Experience user interface (2+1 Cr. Hrs.)	Online Pedagogies (3 Cr. Hrs.)	Project Management (3 Cr. Hrs.)	Home Designing in AutoCAD (2+1 Cr. Hrs.)
English Composition & Comprehension (3 Cr. Hrs.)	Graphic Design (2+1 Cr. Hrs.)	Communication & Presentation Skills (3 Cr. Hrs.)	Introduction to Freelancing (3 Cr. Hrs.)	Marketing Principles (3 Cr. Hrs.)	Augmented Virtual and Mix reality (2+1 Cr. Hrs.)	Architectural Designing and AutoCAD (2+1 Cr. Hrs.)	Professional Ethics (2 Cr. Hr)
Drawing-I (1+2 Cr. Hrs.)	Islamic Studies (2 Cr.Hrs)	Introduction to the Basic Teachings of the Qura'n (2 Cr. Hrs.)	Process of Creativity (3 Cr. Hrs.)	Introduction to the Hadith & Seerah (2 Cr. Hrs.)	Advance Animation Techniques (3 Cr. Hrs.)	Project-I (3 Cr. Hrs.)	Foreign Language (3 Cr. Hrs.)
Introduction to Information and Communication Technology (2+1 Cr. Hrs.)	Creative Content Writing (3 Cr. Hrs.)	Basic Mathematics (3 Cr. Hrs.)	Introduction to Digital Video tools (2+1 Cr. Hrs.)	Entrepreneur- ship (3 Cr. Hrs.)	Desktop Publishing (3 Cr. Hrs.)	Camera and Lighting (2+1 Cr. Hrs.)	Projec-II (3 Cr. Hrs.)
Introduction to Graphic Tools (2+1 Cr. Hrs.)	Introduction to Programing (2+1 Cr. Hrs.)	Introduction to Psychology (3 Cr. Hrs.)		Introduction to Digital Audio tools (2+1 Cr. Hrs.)			
			Internship (3 Cr. Hrs.)				
Computer Arts Core	Computer Art Supporting	Computer Arts Electives	General Education	University Elective			130 Credit Hrs.
(45 Credit Hrs.)	(12 Credit Hrs.)	(45 Credit Hrs.)	(9 Credit Hrs.)	(19 Credit Hrs.)			



BS CYBER SECURITY (BS CySEC)

In this modern era of information age, the field of computing is advancing at an ultra-high speed. With the recent advancements in Cyber Security, there has been a growing demand to excel in these particular areas, however, the importance of having a strong foundation of the core principles of Cyber Security has also got more attention. The need to build the core competency in the area of foundation of the Cyber Security, the underlying hardware and software security platforms, programming interfaces, complex algorithms, trends in user interface designs, emergence of new businesses, has increased. This program of Bachelor of Science in Cyber Security (BS CySec) is aimed to fulfil this need of the new era. The BS Cyber Security program will try to produce the high-quality Cyber Security specialists who will have the necessary theoretical background to understand the computing problems, will be equipped with the necessary tools and techniques to design, develop and deliver the solutions for these problems and will have the necessary ethical values to apply this skill set in the appropriately right way. This program will equip to master the foundational goals of Cyber Security. This will apply current technical tools and methodologies to solve security problems. Upon completion, students will be able to evaluate security trends, recognize best practices, and understand IT security products and threats.

Available Seats 30 per semester

Duration 8 Semesters (4 Years)

Eligibility:

The minimum requirements for admission in a Bachelor degree program in Cyber Security, is at

least 50% or above marks in Intermediate (HSSC) examination with Mathematics or equivalent qualification.

The candidates for BS Cyber Security with at least 50% or above marks in Intermediate with Pre-Medical background (without Mathematics) will be required to pass deficiency courses of Mathematics of 6 credit hours within one year of their regular studies.

Admission Criteria:

Academic Qualification 60%

Test / Interview 40%

Intake: Spring and Fall (Twice a year)

Class Timings:

(Monday – Friday)

Scholarships:

Talent & need based scholarship (upto 100% on tuition fee)

Degree Completion:

For award of bachelor degree, a student must have:

- Passed courses totaling at least 130 credit hours, including six credit hours of Final Year Project.
- Obtained a CGPA of 2.0 or more.

Study Plan for BS (Cyber Security)

4-Year Program (8 Regular Semesters of 18 weeks each)



Proposed Study Plan for BS (Cyber Security)

Semester 1 16 Credit Hrs	Semester 2 17 Credit Hrs.	Semester 3 18 Credit Hrs.	Semester 4 17 Credit Hrs.	Semester 5 18 Credit Hrs.	Semester 6 17 Credit Hrs.	Semester 7 18 Credit Hrs.	Semester 8 09 Credit Hrs.
Programming Fundamentals (3+1)	Calculus & Analytic Geometry (3)	Data Structures and Algorithms (3+1)	Analysis of Algorithms (3)	Information Assurance (3)	Artificial Intelligence (3+1)	Final Year Project-I (3)	Final Year Project-II (3)
Discrete Structures (3)	Object Oriented Programming (3+1)	Digital Logic Design (3+1)	Database Systems (3+1)	Network Security (2+1)	Secure Software Design and Development (2+1)	University Elective-IV (3)	Professional Practices (3)
Probability & Statistics (3)	Information Security (3)	Introduction to Cybersecurity (3)	Software Engineering (3)	CySec Elective-II (Cryptanalysis) (3)	Vulnerability Assessment & Reverse Engineering (2+1)	Technical & Business Writing (3)	University Elective-V (3)
English Composition and Comprehension (3)	Communication and Presentation Skills (3)	Linear Algebra (3)	CySec Elective-I (Cyber Law & Cyber Crime) (3)	Operating Systems (3+1)	Computer Networks (3+1)	CySec Elective-III (Malware Analysis) (3)	
Introduction to ICT (2+1)	Pakistan Studies (2)	University Elective-I (2)	Computer Organization and Assembly Language (3+1)	Differential Equations (3)	Digital Forensics (2+1)	CySec Elective-IV (Penetration Testing) (3)	
	Islamic Studies (2)	University Elective-II (Introduction to the Basic Teachings of the Qura'n) (2)		University Elective-III (Introduction to the Hadith & Seerah) (2)		Parallel & Distributed Computing (2+1)	
Computing Core	Mathematics and Science Foundation (Core)	General Education (Core)	University Elective	Domain CySec (Core)	Domain CySec (Elective)	Computer Science Core Courses	130
39 Credit Hrs.	12 Credit Hrs.	19 Credit Hrs.	12 Credit Hrs.	18 Credit Hrs.	12 Credit Hrs.	18 Credit Hrs.	



POSTGRADUATE PROGRAMS

MS SOFTWARE ENGINEERING

The goal of our program is to take students with raw talent and intellect, nurture them in our environment through a thorough immersion in research and coursework, and produce well-educated researchers and future leaders in software engineers. Our program (duration approximately 2 years) is structured on the basis of minimum 32 credit hours. The program requirements involve minimum 26 credit hours of course work and 6 credit hours of research work. Our objective is to prepare students to pursue academia through research activities and Software industry through development activities and to impart knowledge of Software Engineering with team work skills in to our students. This enable the students to pursue career in related field using software Engineering skills such as requirement engineering, analysis and designing, source code writing, quality engineering, Engineering Management and through tools and technologies in the light of Islamic ethical values.

Our graduate students not only shall be able to design and develop indigenous software through tools and technologies but also perform research and development (R&D) in specialized areas of software engineering through oral and written communication skills.

Duration: 4 Semesters (2 Years)

Eligibility:

- BS-SE/CS/IT/CE (16 years), or its equivalent in the relevant discipline from HEC recognized university or degree awarding institute with at least 60% marks or CGPA of at least 2.0 (on a scale of 4.0)

Admission criteria: Interview and Admission Test

Intake: Spring (January) & Fall (July)

Class Timings:

05:30pm – 08:30pm (Monday – Friday)

Scholarships:

Talent & need based scholarship (upto 100% on tuition fee)

List of Core Courses:

Code	Course Name	Cr. Hrs
SE5063	Advanced Requirements Engineering	3
SE5033	Advanced Software System Architecture	3
SE5093	Software Testing and Quality Assurance	3
CM5001	Ethics in Practice - I	1
CM5011	Ethics in Practice - II	1

Some Elective Courses

Code	Course Name	Cr. Hrs
SE5153	Agile Software Development	3
SE5413	Advanced Software Project Management	3
SE5553	Usability Engineering	3
SE5213	Cloud Base Software Engineering	3
SE5134	Enterprise Resource Planning Systems	3
SE5253	Cloud Security in Software Engineering	3
SE5263	Machine Learning in Software Engineering	3
SE5243	Developments & Operations in Software Engineering	3

Degree Completion

For award of MS degree, a student must have:

- Passed courses totaling at least 32 credit hours, including four core courses.
- Obtained a CGPA of 2.5 or more.



MS INFORMATION SECURITY

The program aims to develop core competencies in various areas of information security like information security management, application security, computer networks security, and digital forensics. Students will have the opportunity of learning the technical aspects of information security by understanding current threats and vulnerabilities and examining ways of developing effective countermeasures. In order to cater for wide range of professional and academic interests, students have the option of selecting their course work according to their specific needs. Currently, RISE is offering three degree programs that are: i) MS (Information Security), ii) MS (Data Science), and iii) Ph.D. Computing with area of specialization as Information Security and Data Science.

Duration: 4 Semesters (2 Years)

Eligibility:

- 16-years of education in science/engineering discipline preferably with 4 years degree program of BS (SE/CS/IT/EE) or equivalent from HEC recognized university or degree awarding institute with at least 60% marks or CGPA of at least 2.0 (on a scale of 4.0). (NOTE: candidates may have to complete the deficiency coursework as determined by the admissions committee).
- Two years of relevant work experience is recommended.

Admission criteria:

- Qualify GRE General type admission test conducted by the university or a valid NTS GRE General test
- Qualify the admission interview.
- Admission will depend to the candidate's overall score in previous academic degree, admission test and performance in the interview.

Intake: Spring (January) & Fall (July)

Class Timings: 05:30pm – 08:30pm
(Monday – Friday)

Scholarships:

Talent & need based scholarship (upto 100% on tuition fee)

List of Core Courses

Code	Course Name	Cr. Hrs
IS5063	Cryptography	3
IS5073	Information Privacy and Security	3
CM5001	Ethics in Practice - I	1
CM5011	Ethics in Practice - II	1

Some Elective Courses

Code	Course Name	Cr. Hrs
IS6013	Information Systems Auditing	3
IS6023	Risk Management	3
IS6033	Information Security Management	3
IS6043	IT Governance	3
IS6063	Strategic Management, Leadership and Governance	3
IS5023	Network Security	3
IS6233	Wireless Networks Security	3
IS6203	Ethical Hacking	3
IS6213	Penetration Testing	3
IS6253	Distributed and Cloud Computing	3
IS6283	Security of Internet of Things	3
IS5053	Application Security	3
IS6403	Secure Software Development	3
IS6433	Malware Analysis	3
IS6443	Programming for Security Professionals	3
IS6453	Machine Learning for Security Applications	3
IS6463	Database Security	3
IS6473	Security Testing	3
IS6483	Trusted Computing	3
IS6633	Applied Cryptography	3
IS6663	Digital Forensics	3
IS6703	Data Analysis & Quantitative Techniques	3
IS6723	Ethics in Information Security	3
IS6803	Advanced Topics in Applied Cryptography	3
IS6813	Quantum Computing and Information Security	3
IS6823	Quantum Cryptography	3
CM5433	Research Methodology	3

Degree Completion

For award of MS degree, a student must have:

- Passed courses totaling at least 32 credit hours, including two core courses.
- Obtained a CGPA of 2.5 or more.

MS DATA SCIENCE

Data science is an interdisciplinary field of scientific methods, processes and systems for understanding the modern-age data sources, modelling the data behavior, extracting the business insight from that data, predicting the future behavior and delivering the useful data-driven business applications.

In 2013, IBM estimated that two and a half million terabytes of data are created every day. Some of the sources, generating the data are:

- a) Individuals (through social networks and smartphones for the reflection of society)
- b) Machines (through real-time, network connected sensors – “the internet of things”)
- c) Business and commerce (e.g. transaction records and financial data)
- d) Education (e.g. academics, literature, research)
- e) Medical / Healthcare (personal health records, health insurance)
- f) Justice (crime statistics for a city for the sake of efficient resource deployment)
- g) Transportation (Vehicle, pedestrians, trains, airlines, movement data)

The challenge is to make sense of this ever-increasing source of data for the use and benefit of society. A lot many companies and higher education institutions are already planning and implementing for this data tsunami. Data science has emerged as an interdisciplinary paradigm that draws upon the traditionally distinct areas of computer science, applied mathematics and statistics, applications from natural and social science, engineering, and business for developing solutions for gathering, cleaning, archiving, analyzing and visualizing data for the purposes of making informed decisions.

The Master of Science in Data Science (MS-DS) program aims to develop core competencies in various areas of data science like understanding data products, data extraction, data cleaning, data modeling, classification, clustering, predictions, etc. Students will have the opportunity of learning the technical aspects of data science by understanding the trends in the current data products and preparing for the required data analysis skillset for the upcoming information processing systems. To cater for wide range of professional and academic interests, students have the option of selecting their course work according to their specific needs. Riphah

Institute of Systems Engineering (RISE) is currently offering MS (Information Security) program and the proposed MS (Data Science) program is expected to not only complement the existing program but also it will open new opportunities for coping with the challenges of the near future.

Duration: 4 Semesters (2 Years)

Eligibility:

- 16-years of education in computing/science/ engineering discipline preferably with 4 years degree program of BS (Computer Science, Software Engineering, Information Technology, Applied Mathematics, Mathematics, Statistics, Computer Engineering, and Electrical Engineering) or equivalent from HEC recognized university or degree awarding institute.
- At least CGPA of 2.0 on the scale of 4.0 or 60% marks in the previous degree.
- Two years of relevant work experience is recommended.
- Candidates may have to complete the deficiency coursework as determined by the admissions committee. List of deficiency courses is:
 1. Programming Fundamentals
 2. Data Structures and Algorithms / Design and Analysis of Algorithms
 3. Database Systems

Admission criteria:

- Qualify GRE General type admission test conducted by the university or a valid NTS GRE General test.
- Qualify the admission interview.
- Admission will depend on the candidate’s overall score in previous academic degree, admission test and performance in the interview.

Intake: Spring (January) & Fall (July)

Class Timings:

05:30 pm – 08:30 pm (Monday – Friday)

Scholarships:

Talent & need based scholarship (upto 100% on tuition fee)

List of Core Courses

Code	Course Name	Cr. Hrs
DS5013	Statistical and Mathematical Methods for Data Science	3
DS5023	Tools and Techniques in Data Science	3
DS5033	Machine Learning	3
CM5001	Ethics in Practice - I	1
CM5011	Ethics in Practice - II	1

List of Specialization Courses

Choose any two from the following specialization courses of data science.

Code	Course Name	Cr. Hrs
DS5513	Big Data Analytics	3
DS5523	Deep Learning	3
DS5533	Natural Language Processing	3
DS5543	Distributed Data Processing	3

Some Elective Courses

Code	Course Name	Cr. Hrs
DS6113	Data Classification	3
DS6123	Data Clustering	3
DS6133	Predictive Analytics	3
DS6143	Data Visualization	3
DS6153	Advanced Database Systems	3
DS6163	Advanced Data Structures	3
DS6173	High-Performance Computing	3
DS6213	Data ware Housing	3
DS6223	Cloud Computing	3
DS6233	Datacenter Design	3
DS6313	Data Mining	3
DS6323	Distributed Machine Learning	3
DS6333	Time Series Analysis and Prediction	3
DS6343	Social Network Analysis	3
DS6353	Applied Text Analysis	3
DS6363	Modeling and Reasoning in Bayesian Networks	3
IS5043	Information Systems Security	3
IS6013	Information Systems Auditing	3
DS6433	Data Analytics for Security Applications	3
DS6513	Health Data Analytics	3
DS6613	Data Privacy Laws and Regulations	3
DS6623	Ethics for Data Scientists	3
DS6633	Optimization Methods in Data Science	3
CM5433	Research Methodology	3

Degree Completion

For award of MS degree, a student must have:

- Passed courses totaling at least 32 credit hours, including three core courses and two specialization courses.
- Obtained a CGPA of 2.5 or more.

PHD COMPUTING

The PhD program (duration approximately 3-8 years) is structured on the basis of minimum 50 credit hours. The program requirements involve minimum 20 credit hours of course work and 30 credit hours of research work. The candidate has to pass the comprehensive examination after successful completion of course work.

Eligibility criteria/Entry requirements:

MS/M.Phil or its equivalent degree with first class or with a CGPA of 3.0 or above in a relevant discipline from a recognized university / institution.



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