

FTK Centre for Information Technology
Faculty of Natural Sciences, Jamia Millia Islamia

PhD Programme Course Work
Syllabus

SN	Course Code	Course Title	Marks (I.A. + Sem)
1	PhDITo1	Research Methodologies in Information Technology (RMIT)	100 (25 + 75)
2	PhDITo2	Cloud Computing & Cloud Security (CCCS)	100 (25 + 75)
3	PhDITo3	Computer Network and Network Security (CNNS)	100 (25 + 75)
4	PhDITo4	Bibliography and Literature Review of Research Papers (BLRRP)	50 (15 + 35)

Prof. S. M. K. Quadri
Hony. Director

I | The Coursework Syllabus was approved by Committee of Studies of the FTK-CIT in its meeting held on 28th February, 2019 FTK Centre for Information Technology
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Paper- I

PhDITo1: Research Methodology in Information Technology (RMIT)

UNIT I: Introduction to Research Methodology and Problem Identification & Formulation

Meaning and Objectives of Research, Motivations in Research, Types of Research , Research Methods v/s Methodology, Research and Scientific Methods, Research Process and Stages of Research, Defining and formulating the research problem, Technique involved in defining a Problem, Importance of literature review in defining a problem, Role of Literature review, Ways to Perform Literature review, Methods to find open problem and Research Problems, Critical literature review, Identifying gap areas from literature review, Development of working hypothesis.

Unit-II - Research Design and Data Collection & Analysis

Meaning and Need of Research Design, Important Concepts related to Research Design, Different Research Designs, Developing a Research Plan, Basic Principles of Experimental Design & Set-up. Collection of Primary Data, Observation Method, Interview method, Collection of Data through questionnaire and Schedules, Collection of Secondary Data, Selection of appropriate method for data collection, Case Study Method, Guidelines for developing questionnaire, successful interviewing, Survey v/s experiment, Processing and Analysis of Data, Data Analysis with Statistical Packages, Measures of Asymmetries and other measures.

Unit-III - Probability Distribution and Hypothesis Testing

Sampling Distribution and Probability Distribution, Definition & Basic Concepts of Hypothesis Testing, procedures of Hypothesis Testing, Flow Diagram for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Tests of Hypotheses, Important Parametric Tests, Hypothesis Testing of mean, proportion, tests for equality of mean and variances of two populations, confidence interval, Z test and χ^2 test for goodness of fit, Limitations of Tests of hypothesis.

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Unit- IV. Analysis of Variance and Covariance

Basic Principle of Analysis of Variance (ANOVA), ANOVA Technique, Setting up Analysis of Variance Table, Short-cut Method for One-way ANOVA, Coding Method, Two-way ANOVA, ANOVA in Latin-Square Design, Analysis of Co-variance (ANOCOVA), ANOCOVA Technique, Assumptions in ANOCOVA.

UNIT V: Academic Ethics and Technical Writing

Academic Writings, Sources of Information, Assessment of Quality of Journals and Articles, Writing Scientific Report, Structure and Components of Research Report, Types of report – Technical reports and thesis, Different steps in the preparation – Layout, structure and Language of typical reports, Writing Project Proposal, Items of Research Proposals, Writing Research Paper, Citation Counting and Impact Factor, Science Citation Index(SCI), Science Citation Index Expanded(SCIE), H-Index, Academic Ethics and Plagiarism, Exposures on Anti-plagiarism Tools, MATLAB, SPSS and any other advance tools of future to be adopted as and when desired.

References:

1. Montgomery, D. C., G.C. Runger, “Applied Statistics and Probability for Engineers”. 5th ed. New Delhi: Wiley-India, 2011.
2. Ken Black, “Business Statistics for contemporary decision making”, Wiley India, 5th edition, 2009
3. Donald Cooper, Pamela Schindler, “Business Research Methods”, McGraw-Hill publication, 2005.
4. Montgomery, Douglas C. , “Design and Analysis of Experiments”, 5th Ed. ,Wiley India, 2007.
5. Larry B. Christensen et all “Research Methods, Design, and Analysis”, 12th Edition, Pearson Publications, 2014.
6. Kothari, C R, “Research Methodology: Methods and Techniques”, New Age International Publications, New Delhi, 2004.
7. C. K. Sharma, “Research Methodology”, Shree Publication, New Delhi.

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Paper II

PhDITo2: Cloud Computing & Cloud Security (CCCS)

UNIT-I: Cloud Computing Fundamentals

Introduction to Cloud Computing, The Evolution of Cloud Computing, Essential Characteristics of Cloud, Benefits and challenges of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Cloud Computing Architecture, Cloud Service Models (XaaS), Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS). Cloud Deployment Models, Public cloud, Private cloud, Hybrid cloud, Community cloud, Limitation and Issues of cloud computing.

UNIT II: Cloud Computing Software Security Fundamentals

Cloud Information Security Objectives: Confidentiality, Integrity and Availability, Cloud Security Services: Authentication, Authorization, Auditing, Accountability, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Secure Development Practices, Approaches to Cloud Software Requirements Engineering, Cloud Security Policy Implementation and Decomposition, Secure Cloud Software Testing, Cloud Computing and Business Continuity Planning, Disaster Recovery.

UNIT III: Cloud Computing Security Risk Issues & Challenges

The CIA Triad: Confidentiality, Integrity, Availability, Privacy and Compliance Risks, Information Privacy and Privacy Laws, Threats to Infrastructure, Data, and Access Control, Common Threats and Vulnerabilities, Cloud Access Control Issues, Cloud Service Provider Risks. Security Policy Implementation, Virtualization Security Management, Virtual Threats: Hypervisor Risks, Increased Denial of Service Risk , VM Security Recommendations , Best Practice Security Techniques , VM-Specific Security Techniques, Hardening the Virtual Machine, Securing VM Remote Access.

UNIT IV : Data Security in Cloud Computing and Identity & Access Management (IAM)

Overview of Data Security in Cloud Computing, Control over Data, Common Risks with Cloud Data Security, Data Encryption, Overview of Cryptographic Techniques, Cloud Data Security: Sensitive Data Categorization, Authentication and Identity,

Access Control Techniques, Deletion of Data, Data Masking, Cloud Data Storage. Identity & Access Management (IAM): Definitions & Challenges, Architecture & Practice, Standards & Protocols for Cloud Services. OpenID, Federated Identity (SSO), Cloud Authorization Management, Cloud Service Provider IAM Practice & Responsibilities, Customers IAM Responsibilities.

UNIT V : Security Management in the Cloud

Cloud Security Risk Management: Stages and Activities, Framework for Managing Security risks, Overview of security Controls, Trusted Cloud Computing, Trusted Computing Characteristics, Secure Execution Environments and Communications, Security Management Standards, The Distributed Management Task Force (DMTF), The International Organization for Standardization (ISO) standards, The Organization for the Advancement of Structured, Information Standards (OASIS), Storage Networking Industry Association (SNIA), Open Grid Forum (OGF), The Open Web Application Security Project (OWASP), Incident Response, NIST Special Publication 800-61, Computer Security and Incident Response Teams.

References:

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy" First Edition , O'Reilly Media, 2009
2. Vic (J.R.) Winkler , " Securing the Cloud : Cloud Computer Security Techniques and Tactics" : Syngress (Elsevier) , 2011
3. Erl, "Cloud Computing: Concepts, Technology & Architecture", First Edition, Pearson Education India, 2014.
4. Ronald L. Krutz, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing" , Wiley Publishing , 2010.
5. John W. Rittinghouse , James F. Ransome , " Cloud Computing : Implementation, management and Security", CRC Press . 2009.
6. Rajkumar Buyya , James Broberg , "Cloud Computing : Principles , Systems and paradigm" , Andrzej M. Goscinski , Wile, 2011
7. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010

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Paper III

PhDITo3: Computer Network and Network Security (CNNS)

UNIT I : Computer Network Fundamentals

Computer Networks and the Internet, OSI, TCP/IP and other networks models, Network Hardware: LAN, MAN, WAN, Wireless Networks, Physical Layer and Media: Analog and Digital Signals, Digital Transmission, Analog Transmission, Multiplexing, Guided Transmission Media, Wireless Transmission, Switching : Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks; Asynchronous communications, Asynchronous Transfer Mode (ATM).

UNIT-II : Network , Transport & Application Layer

Network Layer: Routing Algorithms: Shortest Path Routing, Flooding, Hierarchical Routing, Broadcast Routing, Multicast Routing, Distance Vector Routing. Congestion, Congestion Control Algorithms: General Principles, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets, Internetworking, The Network layer in the internet. Transport Layer: Transport Services, Transport Protocols, The Internet Transport Protocols: UDP, TCP; Application Layer: Domain Name System (DNS), Simple Network Management Protocol (SNMP), Electronic Mail, World Wide Web, Multimedia.

UNIT-III : Computer Network Security

Computer Network Security, Security Challenges, Security Attacks, Security Threats, Security Threat Motives, Security Threat Management, Security Threat Correlation, Security Threat Awareness, Security Services and Mechanisms, Common Security components, Security Standards, Computer Network Vulnerabilities: Sources of Vulnerabilities, Vulnerability Assessment. Cyber Crimes and Hackers: Cyber Crimes, Hackers, Dealing with the Rising Tide of Cyber Crimes, A Model for Network Security.

UNIT-IV : Cryptography

Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, Private key cryptography, Public key cryptography, Key Management and Distribution, One-Time Pads, End-to-End and Link Encryption, Basic Cryptographic Protocols: Key

Exchange, Authentication, Analysis of Authentication and key Exchange Protocols, Secret splitting, Secret sharing, Secure elections, Electronic money. Symmetric-Key Algorithms, The Data Encryption Standard (DES), The Advanced Encryption Standard (AES), Cipher Modes , Other Ciphers, Cryptanalysis, Public-Key Algorithms, RSA Algorithm, Diffie-Hellman, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT-V : Digital Signatures & Security Management

Digital Signatures and Authentication Protocols, Symmetric-Key Signatures, Public-Key Signatures, Message Digests, The Birthday Attack, Management of Public Keys: Certificates, X.509, Public Key Infrastructures, Authentication Protocols, Kerberos. Communication Security, IPsec, Firewalls, Virtual Private Networks, Wireless Security, E-Mail Security, Pretty Good Privacy, Privacy Enhanced Mail, S/MIME , IP Security Architecture, Web Security : Threats, Secure Naming, The Secure Sockets Layer, Transport Layer Security, Secure Electronic Transaction.

References:

1. Andrew S. Tanenbaum, et al, "Computer Networks", Fifth Edition, Pearson Education India, 2013
2. Jeffery S. Beasley, "A Practical Guide to Advanced Networking", Third Edition, Pearson IT Certification, 2012.
3. Stallng, "Cryptography and Network Security: Principles and Practice", Sixth Edition, Pearson Education India, 2013.
4. C Siva Ram Murty & BS Manoj , "Ad HOC Wireless Networks: Architectures & Protocols" 2nd Ed, Pearson Education.
5. S. Keshav , "An Engineering Approach to Computer Networks", 2nd Edition, Pearson Education
6. Behrouz A. Forouzan , Data Communications and Networking , Third Edition TMH.

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Paper- IV

**PhDITo4: Bibliography and Literature Review of Research Papers
(BLRRP)**

Literature Review of Research Papers related to Research Topic

