



Malad Kandivli Education Society's
NAGINDAS KHANDWALA COLLEGE
 OF COMMERCE, ARTS & MANAGEMENT STUDIES
 AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE

(Re-accredited (3rd cycle) by NAAC with 'A' Grade)
 ISO 9001 : 2015 Certified

Autonomous (2016-17)

Educational Excellence Award By Indus Foundation, U.S.A.
 IMC Ramkrishna Bajaj National Quality Commendation Certificate

Providing Syllabus copy of the courses highlighting the focus on employability/
 entrepreneurship/ skill development along with their course outcomes.

Sr. No.	Courses	2016-17	2017-18	2018-19	2019-20	2020-21	Total
1	Bachelor of Commerce (B.COM)	✓	✓	✓	✓	✓	5
2	Bachelor of Arts (B.A)	✓	✓	✓	✓	✓	5
3	Bachelor in Management Studies- (BMS)	✓	✓	✓	✓	✓	5
4	Bachelor of Commerce (Accounts and Finance)- BAF	✓	✓	✓	✓	✓	5
5	Bachelor of Commerce (Banking and Insurance)-BBI	✓	✓	✓	✓	✓	5
6	Bachelor of Commerce (Financial Markets)- BFM	✓	✓	✓	✓	✓	5
7	Bachelor of Science - Information Technology (B.Sc IT)	✓	✓	✓	✓	✓	5
8	Bachelor of Science- Computer Science(B.Sc CS)	✓	✓	✓	✓	✓	5
9	Bachelor of Arts- Multimedia and Mass Communication (B.A.MMC)	✓	✓	✓	✓	✓	5
10	Bachelor of Management Studies- Sports Management (BMS-SM)	X	X	✓	✓	✓	3
11	B. Com. Honours in Actuarial Studies	X	X	X	✓	✓	2
12	B.A. Honours in Apparel Design and Construction	X	X	X	✓	✓	2
13	B. Com. Honours in International Accounting	X	X	X	✓	✓	2
14	Bachelor of Management Studies- E commerce operations	X	X	X	X	✓	1
15	B.Sc. (Honours) in Integrative Nutrition & Dietetics	X	X	X	X	✓	1
16	BBA in Tourism and Travel Management	X	X	X	X	✓	1
17	B.Sc. in Interior Design	X	X	X	X	✓	1
18	Master Of Commerce-(M.COM)- Accountancy	✓	✓	✓	✓	✓	5
19	Master Of Commerce-(M.COM)- Management	✓	✓	✓	✓	✓	5
20	Master of Arts (Economics)	✓	✓	✓	✓	✓	5
21	Master of Arts (Geography)	✓	✓	✓	✓	✓	5
22	Master of Arts (Psychology)	X	X	X	✓	✓	2
23	Master of Science (Information Technology) (M.Sc IT)	✓	✓	✓	✓	✓	5
24	Master's Degree - Sports Management (MSM)	X	X	✓	✓	✓	3
25	Master of Science (Geo-informatics) (M.Sc GeoInformatics)	X	X	X	X	✓	1
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Moushumi Datta

Prof. (Dr.) Moushumi Datta
 I/c. Principal

Nagindas Khandwala College (Autonomous)



Syllabus Of Course of Master of Science Information Technology (MSC IT) Programme

Part I

Semester I

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2016-2017)


PRINCIPAL

**NAGINDAS KHANDWALA COLLEGE OF COMMERCE
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NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 084**

Core 1: Advanced Database Systems

Course Objectives:

1. Understand the basic concepts and the applications of database systems.
2. Master the basics of SQL and construct queries using SQL.
3. Understand the relational database design principles.
4. Familiar with the basic issues of transaction processing and concurrency control.
5. Familiar with database storage structures and access techniques.

Learning Outcome:

Upon completion of this course, learner should be able to:

CO1: Acquire knowledge on parallel and distributed databases and its applications. (Level: Understand)

CO2: Explain the usage and applications of Object-Oriented databases (Level: Evaluate)

CO3: Describe the principles of intelligent databases (Level: Evaluate)

CO4: Explain the usage of advanced data models (Level: Evaluate)

CO5: Learn emerging databases such as XML, Cloud and Big Data (Level: Analze)

Sr. No.	Modules / Units
1	UNIT 1 The Extended Entity Relationship Model and Object Model: The ER model revisited, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.
2	UNIT 2 Object-Oriented Databases: Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control, Example of ODBMS
3	UNIT 3 Object Relational and Extended Relational Databases: Motivation for complex data types, User defined abstract data types and structured types, Database design for an ORDBMS - Nested relations and collections; Storage and access methods, Query processing and Optimization; An overview of SQL3, Implementation issues for extended type; Systems comparison of RDBMS, OODBMS, ORDBMS
4	UNIT 4 Parallel and Distributed Databases and Client-Server Architecture:

	Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins; Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed databases; Concurrency control and Recovery in distributed databases. An overview of Client-Server architecture
5	UNIT 5
	Databases on the Web and Semi Structured Data: Web interfaces to the Web, Overview of XML; Structure of XML data, DTD, XML Schema, XQuery, XSLT, Storage of XML data, XML applications, XML DOM, The semi structured data model, Implementation issues, Indexes for text data Enhanced Data Models for Advanced Applications: Active database concepts. Temporal database concepts.; Spatial databases, Concepts and architecture; Deductive databases and Query processing; Mobile databases, Geographic information systems, Introduction to data warehousing.

Reference Books

Advanced Database Systems

Reference books:

1. Elmasri and Navathe, "Fundamentals of Database Systems", Pearson Education
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGrawHill
3. Korth, Silberchatz, Sudarshan , "Database System Concepts", McGraw-Hill.

Practical (1611PITPR)

(Skill development & Employability)

1. Horizontal fragmentation of database.
2. Vertical fragmentation of database
3. Creating Replica of database.
4. Create Temporal Database.
5. Inserting and retrieving multimedia objects in database (Image / Audio /Video).
6. Implement Active database using Triggers
7. Create ORDBMS Application
8. Implement and retrieve records from a Spatial Database
9. Working with XML
10. Prolog programming (Deductive Database)


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Core 3: Data Analysis Tools

Course Objectives:

1. To provide students with a framework that will help them choose the appropriate descriptive methods in various data analysis situations.
2. To analyse distributions and relationships of real-time data.
3. To apply estimation and testing methods to make inference and modelling techniques for decision making.

Learning Outcome:

Upon completion of this course, learner will be able to:

CO1: Explain the fundamental concepts in Data Mining. (Level: Create)

CO2: Analyze the functionalities of various clustering and association approaches. (Level: Analyze)

CO3: Outline the estimation methods for regression and time series in mining. (Level: Evaluate)

CO3: Gain knowledge on various computational statistical methods. (Level: Evaluate)

CO4: Formulate the evaluation procedure for statistical analysis. (Level: Create)

CO5: Evaluate association, classification and clustering methods (Level: Analyze)

Sr. No.	Modules / Units
1	UNIT 1 Introduction to R: R Basics, Download R and RStudio, Structure of R, R help, Using R functions, Common mistakes of R beginners. Arithmetic with R, Variable assignment, Basic data types in R. Vectors: What is a vector, create vector, naming a vector, vector selection. Matrix: What is a matrix, Naming a matrix, adding row/column, selection of matrix elements, arithmetic with matrices
2	UNIT 2 Factor: introduction to factors, summarizing a factor, ordered factors. Lists: Need, creation, selecting elements from a list. Plotting Graphs: R Datasets and Data Frames, Importing CSV files, R Base graphs
3	UNIT 3 PART II : STATISTICS Statistics in Modern day: Application of statistics in different fields. Distributions for description: Moments, Sample distributions, Using the sample distributions, Non-parametric description. Linear projections: Principal component analysis, OLS and friends, Discrete variables, Multilevel modeling
4	UNIT 4 Hypothesis testing with the CLT: The Central Limit Theorem, Meet the Gaussian family, Testing a hypothesis, ANOVA, Regression, Goodness of fit.
5	UNIT 5 Maximum likelihood estimation: Log likelihood and friends, Description:

Maximum likelihood estimators, Missing data, Testing with likelihoods Monte Carlo : Random number generation, Description: Finding statistics for a distribution, Inference: Finding statistics for a parameter, Drawing a distribution, Non-parametric testing

Reference Books

Data Analysis Tools

Reference books:

1. Computational Statistics, James E. Gentle, Springer
2. Computational Statistics, Second Edition, Geof H. Givens and Jennifer A. Hoeting, Wiley Publications
3. <https://www.rstudio.com/online-learning/>

Practical (1613PITPR)

(Skill development & Employability)

1. Implementing matrix and vectors
2. Summarize a factor
3. Graph Plotting
4. Implement the statistical distributions
5. Implement regression and goodness of fit
6. Implement testing with likelihood
7. Generate random numbers using Monte Carlo method
8. Implementing Non-Parametric testing
9. Drawing an Inference
10. Implement Non-parametric Testing



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Core 2: Distributed Systems

Course Objectives:

1. To introduce the fundamentals of distributed computing architectures and paradigms.
2. To understand the technologies, system architecture, and communication architecture that propelled the growth of parallel and distributed computing systems.
3. To develop and execute basic parallel and distributed application using basic programming models and tools.

Learning Outcome:

Upon completion of this course, learner should be able to:

CO1: Analyse various issues in the design and implementation of distributed computing systems (Level: Analyse)

CO2: Categorize the various system models, communication between client and server (Level: Understand)

CO3: Apply the knowledge of deadlock methods and its algorithms (Level: Apply)

CO4: Understand the significance of distributed file system with real time applications (Level: Understand)

CO5: Design and develop distributed programs using sockets and RPC/RMI. (Level: Create)

CO6: Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constraints. (Level: Create)

Sr. No.	Modules / Units
1	UNIT 1 Characterization Of Distributed Systems: Introduction, Examples of Distributed Systems, Trends In Distributed Systems, Focus On Resource Sharing, Challenges, Case Study: The World Wide Web. System Models: Physical Models, Architectural Models, Fundamental Models
2	UNIT 2 Networking And Internetworking: Types Of Network, Network Principles, Internet Protocols, Case Studies: Ethernet, Wifi And Bluetooth. Interprocess Communication: The Api For The Internet Protocols, External Data Representation And Marshalling, Multicast Communication, Network Virtualization: Overlay Networks, Case Study: MPI JAVA RMI : Creating Distributed Applications Using RMI and JDBC: Understanding Remote Method Invocation (RMI), Creating a Multitier Database Application Using RMI.
3	UNIT 3 Name Services: Name services and the Domain Name System

	Directory services, Case study: The Global Name Service, Case study: The X.500 Directory Service. Time And Global States: Clocks, events and process states, Synchronizing physical clocks , Logical time and logical clocks, Global states, Distributed debugging Coordination And Agreement: Distributed mutual exclusion Elections Coordination and agreement in group communication, Consensus and related problems
4	UNIT 4
	Transactions and Concurrency Control: Introduction, Transactions, Nested transactions, Locks Optimistic concurrency control. Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Introduction, Flat and nested distributed transactions, Atomic commit process, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: Introduction, System model and group communication, Fault-tolerant services. Case study: The gossip architecture, CODA.
5	UNIT 5
	PEER TO PEER SERVICES AND FILE SYSTEM: Peer-to-peer Systems – Introduction – Napster and its legacy – Peer-to-peer – Middleware – Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems – Introduction – File service architecture – Andrew File system. File System: Features-File model -File accessing models – File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP. PROCESS & RESOURCE MANAGEMENT Process Management: Process Migration: Features, Mechanism – Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

Reference Books

Distributed Systems

Text book:

1. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair , Distributed Systems - Concepts and Design (Unit I-Unit 5)
2. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.(Unit 5)
3. Dynamic web programming : using Java, JavaScript, and Informix / Graham Harrison. 2000 ISBN: 0130861847.
4. <http://catalogue.pearsoned.co.uk/samplechapter/0130861847.pdf> (Unit 2)

References :

1. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
2. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
3. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.



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Practical (1612PITPR)
(Skill development & Employability)

1. Write a program for implementing Client Server communication model.
2. Write a program to show the object communication using RMI.
3. Show the implementation of Remote Procedure Call.
4. Write a program to execute any one mutual exclusion algorithm.
5. Write a program to implement any one election algorithm.
6. Show the implementation of any one clock synchronization algorithm.
7. Write a program to implement two phase commit protocol.
8. Database handling using RMI
Design and develop a distributed Hotel booking application using Java RMI.
A distributed hotel booking system consists of the hotel server and the client machines. The server manages hotel rooms booking information. A customer can invoke the following operations at his machine
 - i) Book the room for the specific guest
 - ii) Cancel the booking of a guest
 - iii) Enquire the check in date for the specified customer/guest.
9. Show the distributed file system implementation with manets in Write NS2 simulator



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Part I Semester I

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Core 4: Software Testing

Course Objectives:

1. To introduce the essential software engineering concepts involved
2. To impart skills in the design and implementation of efficient software systems across disciplines
3. To familiarize engineering practices and standards used in developing software products and components
4. To discuss the distinctions between validation testing and defect testing.
5. To describe the principles of system and component testing
6. To describe strategies for generating system test cases.

Learning Outcome:

Upon completion of this course, learner should be able to:

CO1. Explain the principles of the engineering processes in software development and testing. (Level: Understand, Analyze)

CO2. Develop the software projects through activities such as planning and scheduling. (Level: Create)

CO3. Classify and specify the requirements for the software projects. (Level: Create)

CO4. Distinguish characteristics of structural testing methods. (Level: Analyze)

CO5. Implement the software development processes activities from requirements to validation and verification. (Level: Apply)

CO6. Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. (Level: Analyze)

Sr. No.	Modules / Units
1	UNIT 1 Test Basics: Introduction, Testing in the Software Lifecycle, Specific Systems, Metrics and Measurement, Ethics Testing Processes: Introduction, Test Process Models, Test Planning and Control, Test Analysis and Design, Non-functional Test Objectives, Identifying and Documenting Test Conditions, Test Oracles, Standards, Static Tests, Metrics, Test Implementation and Execution, Test Procedure Readiness, Test Environment Readiness, Blended Test Strategies, Starting Test Execution, Running a Single Test Procedure, Logging Test Results, Use of Amateur Testers, Standards, Metrics, Evaluating Exit Criteria and Reporting, Test Suite, Defect Breakdown, Confirmation Test Failure Rate, System Test Exit Review, Standards, Evaluating Exit Criteria and Reporting Exercise, System Test Exit Review, Test Closure Activities
2	UNIT 2 Test Management: Introduction, Test Management Documentation, Test Plan Documentation Templates, Test Estimation, Scheduling and Test Planning, Test

	Progress Monitoring and Control, Business Value of Testing, Distributed, Outsourced, and Insourced Testing, RiskBased Testing, Risk Management, Risk Identification, Risk Analysis or Risk Assessment, Risk Mitigation or Risk Control, Risk Identification and Assessment Results, Risk-Based Testing throughout the Lifecycle, Risk-Aware Testing Standards, Risk Based Testing Exercise, Project Risk By-Products, Requirements Defect By-Products, Test Case Sequencing Guidelines, Failure Mode and Effects Analysis, Test Management Issues
3	UNIT 3
	Test Techniques Introduction, Specification-Based, Equivalence Partitioning, Avoiding Equivalence Partitioning Errors, Composing Test Cases with Equivalence Partitioning, Equivalence Partitioning Exercise, Boundary Value Analysis, Examples of Equivalence Partitioning and Boundary Values, Non-functional Boundaries, Functional Boundaries, Integers, Floating Point Numbers, Testing Floating Point Numbers, Number of Boundaries, Boundary Value Exercise, Decision Tables, Collapsing Columns in the, Combining Decision Table Testing with Other Techniques, Nonexclusive Rules in Decision Tables, 4 Decision Table Exercise, Decision Table Exercise Debrief, State-Based Testing and State Transition Diagrams, Superstates and Substates, State Transition Tables, Switch Coverage, State Testing with Other Techniques, State Testing Exercise, State Testing Exercise Debrief, RequirementsBased Testing Exercise, Requirements-Based Testing Exercise Debrief, Structure-Based, Control-Flow Testing, Building Control-Flow Graphs, Statement Coverage, Decision Coverage, Loop Coverage, Hexadecimal Converter Exercise, Hexadecimal Converter Exercise Debrief, Condition Coverage, Decision/Condition Coverage, Modified Condition/Decision Coverage(MC/DC), Multiple Condition Coverage, Control-Flow Exercise, Control-Flow Exercise Debrief, Path Testing, LCSAJ, Basis Path/Cyclomatic Complexity Testing, Cyclomatic Complexity Exercise, Cyclomatic Complexity Exercise Debrief, Final Word on Structural Testing, Structure-Based Testing Exercise, Structure-Based Testing Exercise Debrief, Defect- and Experience-Based, Defect Taxonomies, Error Guessing, Checklist Testing, Exploratory Testing, Test Charters, Exploratory Testing Exercise, Software Attacks, An Example of Effective Attacks, Other Attacks, Software Attack Exercise, Software Attack Exercise Debrief, Specification-, Defect-, and Experience-Based Exercise, Specification-, Defect-,and Experience-Based Exercise Debrief, Common Themes, Static Analysis, Complexity Analysis, Code Parsing Tools, Standards and Guidelines, Data-Flow Analysis, Set-Use Pairs, Set-Use Pair Example, Data-Flow Exercise, Data-Flow Exercise Debrief, Data-Flow Strategies, Static Analysis for Integration Testing, Call-Graph Based Integration Testing, McCabe Design Predicate Approach to Integration Testing, Hex Converter Example, McCabe Design Predicate Exercise, McCabe Design Predicate Exercise Debrief, Dynamic Analysis, Memory Leak Detection, Wild Pointer Detection, API Misuse Detection.
4	UNIT 4
	Tests of Software Characteristics Introduction, Quality Attributes for Domain Testing, Accuracy, Suitability, Interoperability, Usability, Usability Test Exercise, Usability Test Exercise Debrief, Quality Attributes for Technical Testing, Technical Security, Security Issues, Timely Information, Reliability, Efficiency, Multiple Flavours of Efficiency Testing, Modelling the System, Efficiency Measurements, Examples of Efficiency Bugs, Exercise: Security, Reliability and Efficiency, Exercise: Security, Reliability, and Efficiency

	<p>Debrief, Maintainability, Subcharacteristics of Maintainability, Portability, Maintainability and Portability Exercise.</p> <p>Reviews Introduction, The Principles of Reviews, Types of Reviews, Introducing Reviews, Success Factors for Reviews, Deutsch's Design Review Checklist, Marick's Code Review Checklist, The Open Laszlo Code Review Checklist, Code Review Exercise, Deutsch Checklist Review Exercise.</p> <p>Incident Management Introduction, When Can a Defect Be Detected? Defect Lifecycle, Defect Fields, Metrics and Incident Management, Communicating Incidents, Incident Management Exercise.</p>
5	UNIT 5
	<p>Standards and Test Process Improvement Introduction, Standards Considerations, Test Improvement Process, Improving the Test Process, Improving the Test Process with TMM, Improving the Test Process with TPI, Improving the Test Process with CTP, Improving the Test Process with STEP, Capability Maturity Model Integration, CMMI, Test Improvement Process Exercise.</p> <p>Test Techniques Introduction, Test Tool Concepts, The Business Case for Automation, General Test Automation Strategies, An Integrated Test System Example, Test Tool Categories, Test Management Tools, Test Execution Tools, Debugging, Troubleshooting, Fault Seeding, and Injection Tools, Static and Dynamic Analysis Tools, Performance Testing Tools, Monitoring Tools, Web Testing Tools, Simulators and Emulators, Keyword-Driven Test Automation, Capture/Replay Exercise, Capture/Replay Exercise Debrief, Evolving from Capture/Replay, The Simple Framework Architecture, Data-Driven Architecture, Keyword-Driven Architecture, Keyword Exercise, Performance Testing, Performance Testing Exercise.</p> <p>People Skills and Team Composition Introduction, Individual Skills, Test Team Dynamics, Fitting Testing within an Organization, Motivation, Communication.</p>

Reference Books

Software Testing

Reference books:

1. Advanced Software Testing—Vol. 3 by Rex Black and Jamie L. Mitchell, Rocky Nook Publication
2. Advanced Software Testing Vol. 2 by Rex Black, Rocky Nook Publication, 2008
3. Foundations of Software Testing ISTQB Certification by Rex Black, Erik van Veenendaal, Dorothy Graham


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Practical (1614PITPR)
(Skill development & Employability)

1. Evaluating Test Exit Criteria and Reporting
2. Static testing using tool
3. Rate Quality Attributes for Domain and Technical Testing
4. Perform Review
5. Incident Management
6. Black Box Testing Technique
7. White Box Testing Technique
8. Performance Testing
9. Using Testing Tool Selenium
10. Using Selenium Webdriver
11. Using Testing Tool ZAPTEST



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Syllabus Of Course of Master of Science Information Technology (MSC IT) Programme

Part I

Semester II

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Core 6: Advanced Computer Networks

Course Objectives:

1. Describe how routing protocols work.
2. Implement a simple LAN with hubs, bridges and switches.
3. Analyze the contents in a given data link layer packet, based on the layer concept.
4. Describe how routing protocols work.
5. Decide routing entries given a simple example of network topology

Learning Outcome:

Upon completion of this course, learner should be able to:

CO1: Evaluate the general principles of data communication. (Level: Create)

CO2: Apply how computer networks are organized with the concept of layered approach. (Level: Apply)

CO3: Analyze what classless addressing scheme is. (Level: Apply)

CO4: Evaluate the usage of Packet filtering techniques and network proxy security in enterprise (Level: Evaluate)

CO5: Analyze the contents in a given data link layer packet, based on the layer concept. (Level: Analyze)

Sr. No.	Modules / Units
1	UNIT 1 TCP/IP Review, Static Routing, Dynamic Routing Protocols- Interior Gateway Protocol & Exterior Gateway Protocol
2	UNIT 2 OSPF Overview and Neighbour Relationships, OSPF Topology, Routes and Convergence, OSPF Route Summarization, Filtering and Default Routing OSPF Virtual Links and Frame Relay Operations
3	UNIT 3 Policy-Based Routing and IP Service Level Agreement Internet Connectivity and BGP, External BGP, BGP Path Control Network Address Translation, IP Multicast Routing, IP Version 6 IPv6 overview, IPv4 and IPv6 Coexistence, Static Point-to-Point IPv6 Tunnels, Dynamic Multipoint IPv6 Tunnels
4	UNIT 4 Enterprise Campus Network Design, Developing an Optimum Design for Layer 3, Advanced WAN Services Design Considerations
5	UNIT 5 IPsec and SSL VPN Design, Enterprise Data Center Design, SAN Design Considerations, Software defined networking (SDN)- concept, the need for a new network architecture. Architectural components, Applications.



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Reference Books

Advanced Computer Networks

1. CCIE Professional Development Routing TCP/IP: Volume I by Jeff Doyle, Jennifer DeHaven Carroll, Cisco Press
2. CCIE Professional Development Routing TCP/IP: Volume II by Jeff Doyle, Jennifer DeHaven Carroll, Cisco Press
3. Designing Cisco Network Service Architectures ARCH Foundation Learning Guide, 3rd Edition by John Tiso, Cisco Press

Practical (1622PITPR)

(Skill development & Employability)

1. Static routing
2. Simulating RIP
3. Simulating OSPF
4. Simulating OSPF with STUB AREA, NSSA, Restricting LSA's
5. Simulating BGP
6. Simulating Routing Redistributions
7. Simulating IBGP
8. Simulating EBGP
9. Configuring IP Multicast Routing
10. Design Data Centre
11. Design Remote Access VPNs



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Core 7: Cloud Computing and Ubiquitous System

Course Objectives:

1. Explain necessary layered abstraction of a Distributed system
2. Provide an understanding of the fundamentals of Parallel Computing
3. Introduce the concepts of Virtualization
4. Identify the technical foundations of cloud systems architectures.
5. Analyze the problems and solutions to cloud application problems.
6. Apply principles of best practice in cloud application design and management.

Learning Outcome:

Upon completion of this course, learner should be able to:

CO1: describe the fundamentals of cloud computing and Distributed Systems (Level: Understand)

CO2: Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures. (Level: Analyze)

CO3: Illustrate various data security methods in cloud computing. (Level: Analyze)

CO4: explore security controls and monitoring in cloud computing. (Level: Understand)

CO5: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms. (Level: Analyze)

Sr. No.	Modules / Units
1	UNIT 1 Distributed System Models and Enabling Technologies: Scalable Computing Service over the Internet: The Age of Internet Computing, scalable computing Trends and New Paradigms, Internet of Things and Cyber-Physical Systems. System Models for Distributed and Cloud Computing: Clusters of Cooperative Computers, Grid Computing Infrastructures, Peer-to-Peer Network Families, Cloud Computing over the Internet. Software Environments for Distributed Systems and Clouds: Service-Oriented Architecture (SOA), Trends towards Distributed Operating Systems, Parallel and Distributed Programming Models. Performance, Security, and Energy-Efficiency: Performance Metrics and Scalability Analysis, Fault-Tolerance and System Availability, Network Threats and Data Integrity, Energy-Efficiency in Distributed Computing.
2	UNIT 2 Computer Clusters for scalable parallel computing: Clustering for massive parallelism: Cluster Development Trends, Design Objective of Computer Clusters, Fundamental Cluster Design issues. Virtual machines and Virtualization of clusters and Data centers: Implementation levels of virtualization: levels of virtualization Implementation, VMM Design requirements and providers, Virtualization support at the OS level, Middleware Support for Virtualization. Cloud Platform Architecture over Virtualized Data Centers: Cloud computing and Service Models: Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as-a-Service (IaaS), Platform- and Software-as-a-Service (PaaS, SaaS). Architectural Design of Compute and Storage Clouds: A Generic Cloud Architecture Design, Layered Cloud Architectural development, Virtualization Support and Disaster Recovery, Architectural Design Challenges

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3	UNIT 3
	<p>Public Cloud Platforms: GAE, AWS, and Azure: Public Clouds and Service Offerings, Google App Engine (GAE), Amazon Web Service (AWS), Microsoft Windows Azure. Inter -cloud Resource Management: Extended Cloud Computing Services, Resource Provisioning and Platform Deployment, Virtual Machine Creation and Management. Cloud Security and Trust management: Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques. Cloud Programming and Software Environments: Features of Cloud and Grid Platforms: Cloud Capabilities and Platform Features, Traditional Features Common To Grids and Clouds, Data Features and Databases, Programming and Runtime Support. Parallel and Distributed Programming Paradigms: Parallel Computing and Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache</p>
4	UNIT 4
	<p>Programming Support of Google App Engine: Programming the Google App Engine, Google File System (GFS), Bigtable, Google's NOSQL system, Chubby, Google's Distributed Lock service.</p> <p>Programming on Amazon AWS and Microsoft Azure: Programming on IV Amazon EC2, Amazon Simple Storage Service S3, Amazon Elastic Block Store EBS and SimpleDB, Microsoft Azure programming support. Emerging Cloud Software Environments: Open Source Eucalyptus and Nimbus, OpenNebula, Sector/Sphere, and OpenStack, Manjrasoft Aneka Cloud and Appliances</p>
5	UNIT 5
	<p>Ubiquitous Clouds and the Internet of Things: Performance of Distributed Systems and the Cloud: Data-intensive Scalable Computing (DISC), Quality of Service in Cloud computing, Benchmarking MPI, Azure, EC2, MapReduce, and Hadoop. Online social and Professional Networking: Online Social Network Characteristics, Graph-Theoretic Analysis of Social networks, Communities and Applications of Social Networks, Facebook: The World's Largest Content-Sharing Network, Twitter for Microblogging, News and Alert Services.</p>



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Reference Books

Cloud Computing and Ubiquitous System

1. Kai Hwang, Jack Dongarra, Geoffrey Fox: Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, MK Publishers, 2012.
2. Michael Miller, Cloud Computing: Web-Based Applications that change the Way you work and collaborate Online, Pearson Publication, 2012. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Hill, 2010

Practical (1623PITPR) (Skill development & Employability)

1. Performing clustering in windows
2. Implementing VMWare ESXi Server
3. Implementing Xen Server
4. Developing app for Windows Azure
5. Developing app for Google App Engine
6. Implementing Open Nebula Sandbox
7. Implementing IaaS with Eucalyptus
8. Implementing Hyper-V
9. Programming in Hadoop for Map Reduce



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Syllabus Of Course of Master of Science Information Technology (MSC IT) Programme

Part I

Semester II

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2016-2017)

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Core 8: Data Mining

Course Objectives:

1. Introduction of different soft computing techniques, their integration and applications.
2. To identify the scope to study spatial and web data mining,
3. To develop research interest towards advances in data mining.

Learning Outcome:

Upon completion of this course, learner should be able to:

CO1: Explain the fundamental concepts in Data Mining. (Level: Understand)

CO2: Analyze the functionalities of various clustering and association approaches. (Level: Analyze)

CO3: Outline the estimation methods for regression and time series in mining. (Level: Analyze and Apply)

CO3: Gain knowledge on various computational statistical methods. (Level: Understand)

CO4: Discuss the evaluation procedure for statistical analysis. (Level: Analyze)

Sr. No.	Modules / Units
1	UNIT 1 Introduction: Basics of data mining, related concepts, Data mining Techniques. Data: Introduction, Attributes, Data Sets, and Data Storage, Issues Concerning the Amount and Quality of Data, Knowledge Representation: Data Representation and their Categories: General Insights, Categories of Knowledge Representation, Granularity of Data and Knowledge Representation Schemes, Sets and Interval Analysis, Fuzzy Sets as Human- Centric Information Granules, Shadowed Sets, Rough Sets, Characterization of Knowledge Representation Schemes, Levels of Granularity and Perception Perspectives, The Concept of Granularity in Rules
2	UNIT 2 Data Preprocessing: Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation. Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining
3	UNIT 3 Classification and Prediction: What Is Classification?, What Is Prediction?, Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back-propagation, Support Vector Machines, Associative Classification: Classification by Association Rule Analysis, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods Increasing the Accuracy, Model Selection.
4	UNIT 4

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	Cluster Analysis: What Is Cluster Analysis?, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis
5	UNIT 5
	Graph Mining, Social Network Analysis, and Multi relational Data Mining: Graph Mining, Social Network Analysis, Multi relational Data Mining. Mining Object, Spatial, Multimedia, Text, and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Reference Books	
Data Mining	
Text Books:	
<ol style="list-style-type: none"> 1. M. H. Dunham. Data Mining: Introductory and Advanced Topics. Pearson Education. 2010. 2. Krzysztof J. Cios, W. Pedrycz, R. W. Swiniarski, L.A. Kurgan, "Data Mining" A Knowledge Discovery Approach", Springer 3. J. Han and M. Kamber, "Data Mining: Concepts and Techniques", Second Edition, Elsevier, Reprinted 4. Davy Cielen Arno D.B. Meysman and Mohamed Ali, "Introducing Data Science", Dreamtech press 	
References:	
<ol style="list-style-type: none"> 1. Dr. Carolyn K. Hamm, "Oracle Data Mining", Rampant Tech Press, SPD. 2. C. Ballard, Dynamic Warehousing and Data Mining Made Easy, Redd Books, IBM (SPD) 3. H. Witten and E. Frank. Data Mining: Practical Machine Learning Tools and Techniques. Morgan Kaufmann. 2005. 4. D. Hand, H. Mannila and P. Smyth. Principles of Data Mining. Prentice-Hall. 2001. 5. Z. Tang and J MacLennan, "Data Mining with SQL Server 2005", Wiley 6. Jason Nell, "Machine Learning for Big Data", Wiley 	

Practical (1624PITPR)	
(Skill development & Employability)	
1. Show the implementation of Naïve Bayes algorithm.	
2. Show the implementation of Decision Tree.	
3. Show the implementation of Time Series Algorithm.	
4. Show the implementation of Clustering Algorithm.	
5. Show the implementation of k-nearest neighbor.	
6. Show the implementation of Apriori Algorithm	
7. Show the implementation of Association Algorithm.	
8. Show the implementation of Text Mining.	
9. Show the implementation of Multimedia Mining.	
10. Show the implementation of Spatial Mining.	



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Core 5: Mobile Computing

Course Objectives:

1. Learners can create both web apps and native apps for Android using Eclipse and the Android SDK, for both platforms.
2. Additional topics covered include application deployment and availability on the corresponding app stores and markets, application security, efficient power management, and mobile device security
3. To enable students to compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.

Learning Outcome:

CO1: Explore the differences between mobile based application and conventional application. (Level: Understand)

CO2: Design UI in the context of mobile application (Level: Create)

CO3: Develop mobile applications for Android (Level: Create)

CO4: Write Android application involving connectivity to database, etc. (Level: Create)

CO5: Exposed to characterization and architecture of mobile applications. (Level: Evaluate)

Sr. No.	Modules / Units
1	UNIT 1 Introduction: Applications, A short history of wireless communication Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems. Medium Access Control: Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.
2	UNIT 2 Telecommunication Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, Security, New data services; DECT: System architecture, Protocol architecture; TETRA, UMTS and IMT-2000: UMTS Basic architecture, UTRA FDD mode, UTRA TDD mode. Satellite Systems: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover, Examples
3	UNIT 3 Broadcast Systems: Overview, Cyclic repetition of data, Digital audio broadcasting: Multimedia object transfer protocol; Digital video broadcasting. Wireless LAN: Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development; HIPERLAN: Protocol architecture, Physical layer, Channel access control. Sublayer, Medium access control Sublayer, Information bases And Networking; Bluetooth: User scenarios, Physical layer, MAC layer, Networking. Security, Link management



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4	UNIT 4
	<p>Wireless ATM: Motivation for WATM, Wireless ATM working group, WATM services, Reference model: Example configurations, Generic reference model; Functions: Wireless mobile terminal side, Mobility supporting network side; Radio access layer: Requirements, BRAN; Handover: Handover reference model, Handover requirements, Types of IV handover, Handover scenarios, Backward handover, Forward handover; Location management: Requirements for location management, Procedures and Entities; Addressing, Mobile quality of service, Access point control protocol. Mobile Network Layer: Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing, Destination sequence distance vector, Dynamic source routing, Hierarchical algorithms, Alternative metrics</p>
5	UNIT 5
	<p>Mobile Transport Layer: Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time-out freezing, Selective retransmission, Transaction oriented TCP. Support for Mobility: File systems: Consistency, Examples, World Wide Web: Hypertext transfer protocol, Hypertext markup language, Some approaches that might help wireless access, System architectures; Wireless application protocol: Architecture, Wireless datagram protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Wireless markup language, WML script, Wireless telephony application, Examples Stacks with Wap, Mobile databases, Mobile agents</p>

Reference Books

Mobile Computing

- Jochen Schiller, "Mobile communications", Addison wisely, Pearson Education William Stallings, "Wireless Communications and Networks", Rappaort, "Wireless Communications Principals and Practices"
- YI Bing Lin, "Wireless and Mobile Network Architectures", John Wiley P. Nicopolitidis, "Wireless Networks", John Wiley
- K Pahlavan, P. Krishnamurthy, "Principles of Wireless Networks"
- M. Richharia, "Mobile Satellite Communication: Principles and Trends", Pearson Education


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Practical (1621PITMC)
(Skill development & Employability)

1. Develop UI with different controls on Mobile using Android.
2. Develop UI with different controls on Mobile using Windows.
3. Using buttons, radiobuttons, checkboxes on Mubile using Android / Windows.
4. Create a simple temperature converter application using Android.
5. Design a simple calculator using Windows / Android.
6. Program for simple quiz competition.
7. Program to insert and display data from database Windows / Android.
8. Program to generate Calendar using Windows / Android.
9. Design a simple to-do list using Windows/ Android.
10. Program to demonstrate simple Animation.


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