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
Educational Excellence Award By Indus Foundation, U.S.A.
IMC Ramkrishna Bajaj National Quality Commendation Certificate
Autonomous (2016-17)

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 19	Master Of Commerce-(M.COM)-Accountancy 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
							84

MDatta.

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

Bhavishya Bharat Campus, S. V. Road, Malad (W), Mumbai - 400 064.
Tel : 022-2807 2262 / 2808 5424 / 2801 3433 / 2808 6427 | Telefax : 2865 0461
E-mail : nagindaskhandwala@hotmail.com | principal@nkc.ac.in
Website : www.nkc.ac.in

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1714PITST	Software Testing	3	2 ½ hrs	25	75	100	4

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)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

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 Debrief, Maintainability, Subcharacteristics of Maintainability, Portability, Maintainability and Portability Exercise. **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. **Incident Management** Introduction, When Can a Defect Be Detected? Defect Lifecycle, Defect Fields, Metrics and Incident Management, Communicating Incidents, Incident Management Exercise.
5	**UNIT 5**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	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. **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. **People Skills and Team Composition** Introduction, Individual Skills, Test Team Dynamics, Fitting Testing within an Organization, Motivation, Communication.

Reference Books
Software Testing
Reference books: 1. Advanced SoftwareTesting—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

Practical (1714PITPR) (Skill development & Employability)
Evaluating Test Exit Criteria and Reporting Static testing using tool Rate Quality Attributes for Domain and Technical Testing Perform Review Incident Management Black Box Testing Technique White Box Testing Technique Performance Testing Using Testing Tool Selenium Using Selenium Webdriver Using Testing Tool ZAPTEST

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1713PITDA	Data Analysis Tools	3	2 1/2 Hours	25	75	100	4

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**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

	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 (1713PITPR) (Skill development & Employability)
Implementing matrix and vectors Summarize a factor Graph Plotting Implement the statistical distributions Implement regression and goodness of fit Implement testing with likelyhood Generate random numbers using Monte Carlo method Implementing Non-Parametric testing Drawing an Inference Implement Non-parametric Testing

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1711PITDM	Description: Data Mining with Introduction to Data Science	3	2 ½ hrs	25	75	100	4

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: Understand)

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

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

CO5: Perform appropriate statistical tests using R and visualize the outcome (Level: Create)

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**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	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 Item set 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 **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
4	**UNIT 4**
	Graph Mining, Social Network Analysis, and Multirelational Data Mining: Graph Mining, Social Network Analysis, Multirelational 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.
5	**UNIT 5**
	Introduction to Data Science: Data science in Big Data world, Data Science process , Machine Learning

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books
Description: Data Mining with Introduction to Data Science

Text Books:

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:

1. Dr.CarolynK.Hamm,"Oracle Data Mining",RampantTechPress, SPD.
2. C.Ballard, Dynamic Warehousing and Data Mining Made Easy,ReddBooks,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

Jason Nell, "Machine Learning for Big Data", Wiley

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Practical (1711PITPR) (Skill development & Employability)

Show the implementation of Naïve Bayes algorithm.

Show the implementation of Decision Tree.

Show the implementation of Time Series Algorithm.

Show the implementation of Clustering Algorithm.

Show the implementation of k-nearest neighbor.

Show the implementation of Apriori Algorithm

Show the implementation of Association Algorithm.

Show the implementation of Text Mining.

Show the implementation of Multimedia Mining.

Show the implementation of Spatial Mining.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1712PITDS	Distributed Systems	3	2 ½ hrs	25	75	100	4

Course Objectives:

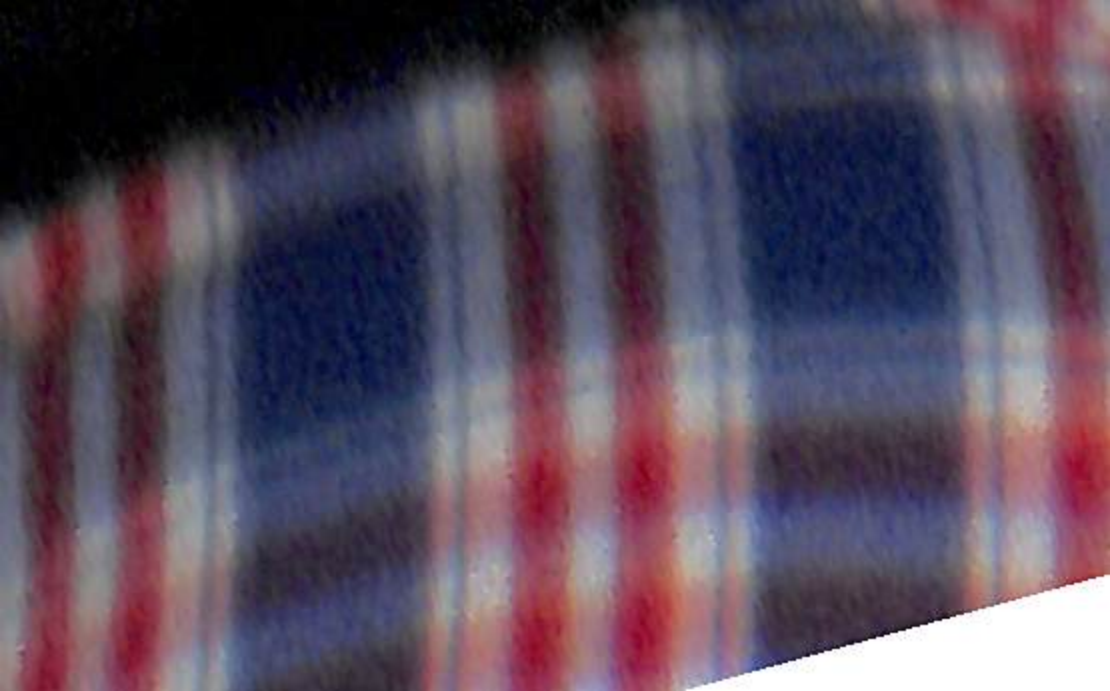
1. To introduce the fundamentals of distributed computing architectures and paradigms.
2. To understand the technologies, system architecture, and communication architecture that propelled the growth of parallel and distributed computing systems.
3. To develop and execute basic parallel and distributed 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 Multitiers Database Application Using RMI.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064



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.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

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.

Practical (1712PITPR)
(Skill development & Employability)

Write a program for implementing Client Server communication model.
Write a program to show the object communication using RMI.
Show the implementation of Remote Procedure Call.
Write a program to execute any one mutual exclusion algorithm.
Write a program to implement any one election algorithm.
Show the implementation of any one clock synchronization algorithm.
Write a program to implement two phase commit protocol.
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. Book the room for the specific guest
Cancel the booking of a guest. Enquire the check in date for the specified customer/guest.
Show the distributed file system implementation with manets in NS2 simulator

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1722PITAN	Advanced Computer Networks	3	2 ½ hrs	25	75	100	4

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

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

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.

Reference Books
Advanced Computer Networks
Reference books: 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 (1722PITPR) (Skill development & Employability)
Static routing Simulationg RIP Simulating OSPF Simulating OSPF with STUB AREA,NSSA, Restricting LSA's Simulating BGP Simulating Routing Redistributions Simulating IBGP Simulating EBGP Configuring IP Multicast Routing Design Data Centre Design Remote Access VPNs

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1724PITDB	Advanced Database Systems	3	2 ½ hrs	25	75	100	4

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: Analyze)

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**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	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.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Practical (1724PITPR)

(Skill development & Employability)

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

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1723PITCC	Cloud Computing and Ubiquitous System	3	2 1/2 Hours	25	75	100	4

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

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	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
3	**UNIT 3**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	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
4	**UNIT 4**
	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. 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
5	**UNIT 5**
	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.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books
Cloud Computing and Ubiquitous System

Reference books:

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.
3. John Krumm, Ubiquitous Computing Fundamentals,CRC Press.

Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Fill, 2010

Practical (1723PITPR) (Skill development & Employability)
Performing clustering in windows
Implementing VMWare ESXi Server
Implementing Xen Server
Developing app for Windows Azure
Developing app for Google App Engine
Implementing Open Nebula Sandbox
Implementing Iaas with Eucalyptus
Implementing Hyper-V
Programming in Hadoop for Map Reduce

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1721PITMC	**Mobile Computing**	3	2 ½ hrs	25	75	100	4

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

4	**UNIT 4**
	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
5	**UNIT 5**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	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

Reference Books
Data Mining with Introduction to Data Science
Reference books: 1. Jochen Schiller, "Mobile communications", Addison wisely , Pearson Education Wiiliam Stallings, "Wireless Communications and Networks" 2. Rappaort, "Wireless Communications Principals and Practices" 3. YI Bing Lin , "Wireless and Mobile Network Architectures", John Wiley P. Nicopolitidis , "Wireless Networks", John Wiley 4. K Pahlavan, P. Krishnamurthy , "Principles of Wireless Networks" 5. M. Richharia , "Mobile Satellite Communication: Principles and Trends", Pearson Education

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Practical (1721PITPR)

(Skill development & Employability)

Develop UI with different controls on Mobile using Android.

Develop UI with different controls on Mobile using Windows.

Using buttons, radiobuttons, checkboxes on Mubile using Android / Windows.

Create a simple temperature converter application using Android.

Design a simple calculator using Windows / Android.

Program for simple quiz competition.

Program to insert and display data from database Windows / Android.

Program to generate Calendar using Windows / Android.

Design a simple to-do list using Windows/ Android.

Program to demonstrate simple Animation.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

Course Code :	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1731PITES	Embedded Systems	3	2 ½ hrs	25	75	100	4

Course Objectives:

1. To have knowledge about the basic working of an embedded system, components, and its development life cycle.
2. To provide experience to integrate hardware and software for microcontroller applications systems.
3. To introduce Basics of Real time operating system
4. To understand in detail the design of memory systems and different families of microcontrollers.
5. To write programs in Embedded C language for development of embedded system

Course Outcome:

After successful completion of course, learner will be able to:

CO1: Explain the internal architecture of memory and interfacing of different peripheral devices with Microcontrollers. (Level: Evaluate)

CO2: Identify the need and role of embedded systems in industry. (Level: Analyze)

CO3: Write the programs for 8051 microcontroller using C/Assembly Programming language. (Level: Create)

CO4: Demonstrate the usage of Embedded Systems in real life applications such as traffic signals, elevators, and so on. (Level: Create)

CO5: Create Embedded Projects for industries. (Level: Create)

Sr. No.	Modules / Units
1	**UNIT 1**
	Introduction What is an Embedded System, Embedded System Vs, General Computing System. **The Typical Embedded System** Core of Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware. **Characteristic and quality attributes of Embedded System** Characteristics of an Embedded System, Quality Attributes of Embedded System. **Embedded product development life cycle** What is EDLC, Why EDLC? Objectives of EDLC, Different Phases of EDLC.
2	**UNIT 2**
	Hardware Software Co-design and Program Modelling Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modelling Language (UML), Hardware Software Trade-offs. **Embedded Hardware design and development** Analog Electronic Components, Digital Electronic Components, Electronic design

	Automation (EDA) Tools, The PCB Layout design.

	Embedded Firmware design and development Embedded Firmware Design Approaches, Embedded Firmware Development Languages **Real Time Operating System(RTOS)** Operating System Basics, Types of Operating Systems, Device Drivers, How to choose an RTOS
3	**UNIT 3**
	Memories and Memory Subsystem Introduction, Classifying Memory, A general Memory Interface, ROM Overview, Static RAM Overview, Dynamic RAM Overview, Chip Organization, A SRAM Design, A DRAM Design, The DRAM Memory Interface, The Memory Map, Memory Subsystem Architecture, Basic Concepts of Caching, Design a cache system, Dynamic Memory Allocation, Testing Memories.
4	**UNIT 4**
	Programming Concept and Embedded Programming in C/C++ and Java Software programming in Assembly Language (ALP) and in High-level Language 'C'., C program Elements: Header and Source Files and Pre- processor Directives, Program Elements: Macros and Functions, Program Elements: Types, Data Structures, Modifiers, Statements, Loops and Pointers, Object-Oriented Programming, Embedded Programming in C++, Embedded Programming in Java.
5	**UNIT 5**
	Trends in the Embedded Industry Processor trends in Embedded System, Embedded OS Trends, Development Language Trends, Introduction of PIC Family of Microcontrollers, Introduction of ARM Family of Microcontrollers, Introduction of AVR Family of Microcontrollers .

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books

Embedded Systems

Text Books:

1. Introduction to embedded systems Shibu K. V 2nd Edition Tata McGraw-Hill
2. Embedded Systems Architecture, Programming and Design Raj Kamal 2nd Edition Tata McGraw-Hill
3. Embedded Systems: A Contemporary Design Tool. James K. Peckol 1st Edition Wiley Edition

Practical (1735PITES)

(Skill development & Employability)

1. Compulsory.

Study of hardware components

1. 8051 Microcontroller
2. Resistors (color code, types)
3. Capacitors
4. ADC, DAC
5. Operational Amplifiers
6. Transistors, Diode, Crystal Oscillator
7. Types of Relays
8. Sensors
9. Actuator
10. Types of connectors

2. WAP to blink an LED
3. WAP block transfer of data
4. WAP to serial data interface
5. WAP for the keypad and LCD interface
6. Implement mouse driver program using MSDOS interrupt
7. WAP to implement ADC0808 with 8051 microcontroller
8. WAP to simulate elevator functions
9. WAP to interface stepper motor controller
10. WAP to simulate traffic signals.

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1732PITIS	Information Security Management	3	2 ½ hrs	25	75	100	4

Course Objectives:

1. To provide an understanding of principal concepts, major issues, technologies and basic approaches in information security.
2. To master information security governance, and related legal and regulatory issues.
3. To be familiar with how threats to an organization are discovered, analyzed, and dealt with.
4. To be familiar with network security threats and countermeasures
5. To use different tools used for network monitoring and security.

Course Outcomes:

On successful completion of the course, learner will be able to:

CO1: Explain advanced security issues and technologies (such as DDoS attack detection and containment, and anonymous communications,) (Level: Understand)

CO2: Gain familiarity with prevalent network and distributed system attacks, defences against them and forensics to investigate the aftermath. (Level: Apply)

CO3: Develop a basic understanding of cryptography, how it has evolved and some key encryption techniques used today. (Level: Evaluate)

CO4: Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges. (Level: Apply)

CO5: Use different tools used for network monitoring and security. (Level: Create)

Sr. No.	Modules / Units
1	**UNIT 1**
	Security Risk Assessment and Management: Introduction to Security Risk Management. Reactive and proactive approaches to risk management. Risk assessment, quantitative and qualitative approaches and asset
	classification - Security Assurance Approaches: Introduction to OCTAVE and COBIT approaches

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

2	**UNIT 2**
	Security Management of IT Systems: Network security management. Firewalls, IDS and IPS configuration management. Web and wireless security management. General server configuration guidelines and maintenance. Information Security Management Information classification. Access control models, role-based and lattice models. Mandatory and discretionary access controls. Linux and Windows case studies. Technical controls, for authentication and confidentiality. Password management and key management for users. Case study: Kerberos
3	**UNIT 3**
	Key Management in Organizations: Public-key Infrastructure. PKI Applications, secure email case study(S/ MIME or PGP). Issues in public-key certificate issue and lifecycle management - Management of IT Security Infrastructure; Computer security log management, malware handling and vulnerability management programs. Specifying and enforcing security policies
4	**UNIT 4**
	Auditing and Business continuity Planning: Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage.
5	**UNIT 5**
	Computer forensics: techniques and tools. Audit Tools: NESSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books
Information Security Management
Text book: 1. IT Security and Risk Management (Main reference) Slay, J. and Koronios, A., 2006 Wiley 2. Incident Response and Computer Forensics. Chris Prosise and Kevin Mandia, 2003. McGraw-Hill 3. Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Nina Godbole Wiley, 2009 4. Information Security Policies, Procedures, and Standards: Guidelines for Effective Information Security Management (Paperback) 1st edition Auerbach, 2001

Practical (1736PITIS) (Skill development & Employability)
1. Working with Sniffers for monitoring network communication (Ethereal) 2. Using open SSL for web server - browser communication 3. Using GNU PGP 4. Performance evaluation of various cryptographic algorithms 5. Using IP TABLES on Linux and setting the filtering rules 6. Configuring S/MIME for e-mail communication 7. Understanding the buffer overflow and format string attacks 8. Using NMAP for ports monitoring 9. Implementation of proxy based security protocols in C or C++ with features like confidentiality, integrity and authentication Socket programming 10. Exposure to Client Server concept using TCP/IP, blowfish, Pretty Good Privacy.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1733PITNN	Elective 2 Artificial Neural Network	3	2 1/2 Hours	25	75	100	4

Course Objectives:

1. To introduce the neural networks for classification and regression.
2. To give design methodologies for artificial neural networks.
3. To offer neural network implementations in R Programming
4. To demonstrate neural network applications on real-world tasks.
5. To understand fuzzy systems

Course Outcomes:

After successful completion of the course, learner will be able to:
CO1: Explain the differences between networks for supervised and unsupervised learning; (Level: Understand)
CO2: Design single and multi-layer feed-forward neural networks. (Level: Apply)
CO3: Analyze Program linear and nonlinear models for data mining; (Level: Analyze)
CO4: Analyze the performance of neural networks. (Level: Analyze)
CO5: Describe the fuzzy systems (Level: Create)

Sr. No.	Modules / Units
1	**UNIT 1**
	The Brain Metaphor, Basics of Neuroscience, Artificial Neurons, Neural Networks and Architectures
2	**UNIT 2**
	Geometry of Binary Threshold Neurons and Their Networks , Supervised Learning I: Perceptrons and LMS, Supervised Learning II: Backpropagation and Beyond
3	**UNIT 3**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Neural Networks: A Statistical Pattern Recognition Perspective , Statistical Learning Theory, Support Vector Machines and Radial Basis Function Networks
4	**UNIT 4**
	Dynamical Systems Review, Attractor Neural Networks, Adaptive Resonance Theory
5	**UNIT 5**
	Towards the Self-organizing Feature Map, Fuzzy Sets and Fuzzy Systems , Evolutionary Algorithms

Reference Books
Artificial Neural Network
Reference books: 1. Neural Networks, A Classroom Approach Satish Kumar 2nd Edition **McGraw Hill** 2. Artificial Neural Networks Robert Schalkoff **McGraw Hill** 3. Introduction to Neural Networks using MATLAB S Sivanandam,S Sumathi **McGraw Hill**

Comment [1]: Focusses on employability

Practical (1737PITNN) (Skill Development & Employability)
1. Show the Functioning of artificial neural network (Implement all hidden layer functions). 2. Demonstrate non-separable two input perceptron cannot be classified using: P=[-0.8 -0.8 0.3 1.0 0.7; -0.8 0.8 -0.4 -1.0 -0.7]; and Target T=[1 0 1 0 1] 3. Use perceptro learning rule to find final weights of a neural network using fixed input vectors and a fixed target vector. 4. Prediction using neural network. 5. Implement Radial Basis Function. 6. Implement Least Mean Square Algorithm. 7. Implement Support Vector Machine Algorithm. 8. Create and train a feed forward back propagation network with a supplied Input P and Target T. 9. Design a Hopfield network consisting of two neutrons with two stable equilibrium points. 10. Perform defuzzification using the following methods: Centroid Bisector Smallest of Maximum Largest of Maximum All practicals can be done using R / Matlab

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1734PITIP	**Elective 2: Digital Image Processing**	3	2 ½ hrs	25	75	100	4

Course Objective:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures.
5. To introduce fundamentals of image processing

Course Outcomes:

After successful completion of course, learners will be able to:

CO1: Review the fundamental concepts of a digital image processing system. (Level: Understand)

CO2: Analyze images in the frequency domain using various transforms. (Level: Analyze)

CO3: Evaluate the techniques for image enhancement and image restoration. (Level: Evaluate)

CO4: Categorize various compression techniques. (Level: Create)

CO5: Able to apply geometrical transformation on 2D and 3D objects (Level: Create)

Sr. No.	Modules / Units
1	**UNIT 1**
	Introduction to image processing, Example of fields that uses image processing, Steps of image processing, Components, Applications, Image sensors and image formats
	Visual Preliminaries Brightness adaptation and contrast, Acuity and contour, Texture and pattern discrimination, Shape detection and recognition, perception of colour, Computational model of perceptual processing, Image sampling and quantization, Basic relationships between pixels
2	**UNIT 2**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Intensity transformations Introduction, Some basic intensity transformation functions, Histogram equalization, local histogram processing, Using histogram statistics for image enhancement, **Spatial filtering** Fundamentals of spatial filtering, Smoothing and Sharpening spatial filters, Combining spatial enhancement methods, Using fuzzy techniques for intensity transformations and spatial filtering
3	**UNIT 3**
	Colour image processing Colour fundamentals, Colour models, Pseudocolour image processing, Basic of full-colour image processing, Colour transformations, Smoothing and Sharpening, Image segmentation bases on colour, Noise in colour images, Colour image compression **Image Compression** Fundamentals, Some basic methods, Digital image watermarking, Full motion video compression
4	**UNIT 4**
	Morphological Image Processing Introduction, Erosion and Dilation, Opening and Closing, The Hit-or-Miss transformation, Some basic morphological algorithms, Gray scale morphology **Segmentation** Fundamentals, Point, Line, and Edge detection, Thresholding, Region based segmentation, Segmentation using morphological watersheds, The use of motion in segmentation- Spatial techniques.
5	**UNIT 5**
	Representation and Description Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Relational Descriptors **Object Recognition** Patterns and pattern classes, Recognition based on decision theoretic methods, Structural methods

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books
Digital Image Processing

Reference books:

1. Digital Image Processing Gonzalez and Woods **3rd Edition Pearson Education**
2. Digital Image Processing and Analysis Bhabatosh Chanda, Dwijesh Dutta Majumder **2nd Edition PHI**
3. Fundamentals of Digital Image Processing Anil K. Jain **1st Edition PHI**

Practical (1738PITIP) (Skill development & Employability)

Note:

1. All the practical can be done in C, C++, Java or Matlab, R
2. The use of built-in functions in image processing toolbox in Matlab except the following is not allowed.
   Imshow, Imread, Imdilate, Imerode
3. The use of all other built-in functions for matrix operations and mathematical operations are allowed.
4. Use grey level and color images or image matrices as input to all the programs.

1. WAP to study the effects of reducing the quantization values and spatial resolution
2. Image enhancement
   A. Thresholding
   B. Contrast Adjustment
   C. Brightness adjustment
   D. Grey level slicing
3. Basic Transformation
   A. Log Transformation
   B. Power law transformation
   C. Negation
4. Different Filters (LPF,HPF, Lapalcian, LOG etc.)
   To generate mask for LOG use the following formula
   A. Write a program to apply a mask on the image

a. Accept the size of mask from the user.
b. Check whether the mask is of odd size.
c. The program should work for any high pass and low pass mask.
d. Check the sum of all the elements of the mask. For low pass filter the sum should be one and zero for high pass filter.
e. Compare the output for different size of masks

5. A. Write a program to plot a Histogram
   B. Write a program to apply Histogram equalization

6. Write a program to apply Gaussian filter on an image.

a. Write a code to generate a Gaussian mask and then apply the mask on the image.

b. Accept the size of mask and the sigma value from the user to generate a mask.

7. Apply following morphological operations on the image:
   - Opening
   - Closing
   - Morphological gradient
   - Top-hat transformation

   Write a program for boundary detection

8. WAP to show RGB planes

9. WAP to convert
   - RGB to NTSC
   - RGB to YCbCr
   - RGB to CMY
   - RGB to HIS

10. WAP to achieve Pseudo coloring

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1734PITEH	**Elective 2: Ethical Hacking**	3	2 ½ hrs	25	75	100	4

Course Objectives:

1. To understand the technical foundation of cracking and ethical hacking, aspects of security, importance of data gathering, foot printing and system hacking.
2. To perform evaluation of computer security
3. To understand the meaning of different virus attacks.
4. To reinforce and apply theory to encourage an analytical and problem-based approach to ethical hacking
5. To perform Cryptography

Course Outcome:

After successful completion of course, learners will be able to do:

CO1: Identify and analyze the stages an ethical hacker requires to take in order to compromise a target system. (Level: Understand)

CO2: Identify tools and techniques to carry out penetration testing. (Level: Understand)

CO3: Critically evaluate security techniques used to protect system and user data. (Level: Apply)

CO4: Describe various virus attacks (Level: Evaluate)

CO5: Perform Cryptography on given data (Level: Evaluate)

Sr. No.	Modules / Units
1	**UNIT 1**
	Introduction to Ethical Hacking, Footprinting and Reconnaissance, Scanning Networks, Enumeration
2	**UNIT 2**
	System Hacking, Trojans and Backdoors, Viruses and Worms, Sniffing
3	**UNIT 3**
	Social Engineering, Denial of Service, Session Hijacking, Hacking

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Webservers
4	**UNIT 4**
	Hacking Web Applications, SQL Injection, Hacking Wireless Networks, Hacking Mobile Platforms
5	**UNIT 5**
	Evading IDS, Firewalls and Honeypots, Buffer Overflows, Cryptography, Penetration Testing

Reference Books
Ethical Hacking
Reference books: 1. Ethical Hacking Review Guide Kimberly Graves **Wiley Publishing** 2. Ethical Hacking Ankit Fadia 2nd Edition Macmillan India Ltd, 2006 3. Insider Computer Fraud Kenneth C.Brancik 2008 Auerbach Publications Taylor & Francis Group

Practical (1738PITEH) (Skill development & Employability)
Using the tools for whois, traceroute, email tracking, google hacking. Using the tools for scanning network, IP fragmentation, war dialing countermeasures, SSL Proxy, Censorship circumvention. Using NETBIOS Enumeration tool, SNMP Enumeration tool, LINUX/ UNIX. enumeration tools, NTP Enumeration tool, DNS analyzing and enumeration tool. Using System Hacking tools. Study of backdoors and Trojan tools Study of sniffing tools Study of Denial of Service attack tools Study of Hijacking tools Study of webserver attack tools. Study of SQL injection and Web server tools Study of wireless hacking tools Using cryptanalysis tool. Study of different security tools.

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester III

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE,
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1733PITVR	Elective 1 Virtualization	3	2 1/2 Hours	25	75	100	4

Course Objectives:

1. To understand the basics of virtualization, and types of virtualizations.
2. To understand and implement Server Virtualization
3. To understand and implement Network Virtualization
4. To understand and implement Storage Virtualization
5. To have knowledge about next generation techniques - blades virtualization.

Course Outcomes:

After successful completion of this course, learners will be able to:
CO1: Explain the concepts of virtualization along with its types. (Level: Analyze)
CO2: Create different types of server virtualization like ESXi, Xen and so on. (Level: Create)
CO3: Explain and implement blade server with Cisco UCS/HP eva simulator (Level: Apply)
CO4: Describe the functionalities of Firewalls (Level: Understand)
CO5: Describe the Blade Virtualization Technique and its architecture. (Level: Understand)

Sr. No.	Modules / Units
1	**UNIT 1** OVERVIEW OF VIRTUALIZATION Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or Operating Virtualization – Application Virtualization-Virtualization Advantages – Virtual Machine Basics – Taxonomy of Virtual machines - Process Virtual Machines – System Virtual Machines – Hypervisor - Key Concepts
2	**UNIT 2**

	SERVER CONSOLIDATION Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation – Planning for Development –Selecting server Virtualization Platform
3	**UNIT 3**
	NETWORK VIRTUALIZATION Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design – WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFIs Virtual Firewall Contexts Network Device Virtualization - Data-Path Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation - IPsecL2TPv3 Label Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.

4	**UNIT 4**
	VIRTUALIZING STORAGE SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables –Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries
5	**UNIT 5**
	Blades and Virtualization — Building Blocks for Next-Generation Data Centers,Evolution of Computing Technology — Setting the Stage,Evolution of Blade and Virtualization Technologies,Blade Architecture,Assessing Needs — Blade System Hardware Considerations

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books
ELECTIVE 1:- Virtualization

Reference books:

1. Mastering_VMware_vSphere_5.5 Sybex Publication
2. Configuring Windows Server Virtualization Microsoft Press
3. Citrix.XenServer.6.0.Administration.Essential.Guide Feb.2007 Packtpub.
4. Blade.Servers.and.Virtualization. Wiley.
5. Virtualization:A Beginner's Guide
6. Professional Xen Virtualization William von Hagen January, 2008. Wrox Publications
7. Virtualization: From the Desktop to the Enterprise Chris Wolf , Erick M. Halter 2005. APress
8. VMware and Microsoft Platform in the Virtual Data Center 2006 Auerbach
9. Network virtualization . Kumar Reddy, Victor Moreno July, 2006 Cisco Press

Practical (1737PITVR) (Skill development & Employability)

1. Implement vmware ESXi for server virtualization
2. Implement XEN for server virtualization
3. Implement Hyper-V server virtualization
4. Manage vmware ESXi with vCentre server
5. Manage xen server Xen center
6. Understanding blade server with cisco UCS/HP eva simulator
7. Implement vlan concept with L2/L3 switches/nexus virtual switching
8. Simulating SAN with navisphere/netapps

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1744PITIP	**Elective 2: Advanced Image Processing**	3	2 ½ hrs	25	75	100	4

Course Objectives:

1. To study the image fundamentals and mathematical transforms necessary for image processing based on frequencies.
2. To study the image enhancement techniques
3. To study medical images.
4. To study the feature extraction procedures.

Course Outcome:

After successful completion of course, learners will be able to:
CO1: Explain the fundamental concepts of a digital image processing system in the frequency domain. (Level: Understand)
CO2: Analyze images in the frequency domain using various transforms. (Level: Analyse)
CO3: Implement image enhancement techniques on medical images. (Level: Analyse and Apply)
CO4: Implement feature extractions from an image. (Level: Analyse and Apply)

Sr. No.	Modules / Units
1	**UNIT 1**
	Enhancement in Frequency domain Introduction, 2-D Discrete Fourier Transform, Properties of Fourier transform, Basic filtering in the frequency domain, Smoothing and Sharpening filters, FFT algorithm. Discrete cosine transform (DCT), KL (PCT) transform, HAAR, Basics of wavelets. **Remote Sensing** Introduction (Passive and Active sensing), Electromagnetic remote sensing process, Physics of radiant energy, Energy source and its characteristics, Atmospheric interactions with electromagnetic radiation, Energy interaction with Earth's surface materials.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

2	**UNIT 2**
	Microwave Remote Sensing Introduction, The Radar principle, Factors affecting microwave measurements, Radar wavebands, Side looking airborne (SLAR) systems, Synthetic Aperture Radar (SAR), Polarimetric SAR (PolSAR), Interaction between microwaves and Earth's surface, Interpreting SAR images, Geometric characteristics. **Remotes Sensing Platforms and Sensors** Introduction, Satellite system parameters, Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal resolution, Imaging sensor systems (thermal, multispectral and microwave imaging), Earth resources satellites, Meteorological satellites, Satellites carrying microwave sensors, OCEASAT-1, IKONOS, Latest trends in remote sensing platforms and sensors (weather, land observation and marine satellites).
3	**UNIT 3**
	Image Analysis Introduction, Visual interpretation, Elements of visual interpretation, Digital processing, Pre-processing, Enhancement, Transformations, Classification, Integration, Classification accuracy assessment. **Applications** Introduction, Agriculture, Forestry, Geology, Hydrology, Sea Ice, Land cover, Mapping, Oceans and Costal.
4	**UNIT 4**
	Medical Image Processing Various modalities of medical imaging, Breast cancer imaging, Mammographic imaging, Ultrasound imaging, Magnetic resonance imaging (MRI), Breast thermograph imaging, Problems with medical images. Image enhancement, Spatial domain methods, Frequency domain methods, Other modalities of medical imaging, Radiography, Positron emission tomography (PET), Computed tomography angiography (CTA), Echocardiogram.
5	**UNIT 5**
	Feature Extraction and Statistical Measurement Selection of features, Shape related features, Shape representation, Bounding box, Shape matrix, Moments of region and shape, Co-occurrence matrix, Principle feature analysis (PFA), Fourier descriptors, Snake boundary detection, Snake algorithm, Texture analysis, Texture features, Feature extraction using discrete Fourier transform, wavelet transform, Gabor filters for texture analysis, Breast tissue detection, Analysis of tissue structure.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books

Elective 2: Advanced Image Processing

Reference books:

1. Text Book of Remote Sensing and Geographical Information Systems M. Anji Reddy **4th Edition** BS publication.
2. Remote Sensing and Image Interpretation Lillesand, T.M. and Kiefer, R.W. 6th edition. John Wiley and Sons Inc.
3. Medical Image Processing Concepts and Applications Sinha, G.R., Patel, Bhagwati Charan PHI
4. Digital Image Processing Gonzalez and Woods 3rd Edition Pearson
5. Digital Image Processing and Analysis Bhabatosh Chanda, Dwijesh Dutta Majumder 2nd Edition PHI

Practical (1746PITIP) (Skill development & Employability)

Comment [1]: Focusses on employability

Practicals (PSIT4P4b): Note:

1. All the practical can be done in C, C++, Java or Matlab, PolSARPro, Nest, ImageJ, R and ENVI
2. Satellite images can be downloaded from
3. http://bhuvan3.nrsc.gov.in/bhuvan/bhuvannew/bhuvan2d.php
4. http://landsat.usgs.gov/Landsat_Search_and_Download.php
5. http://uavsar.jpl.nasa.gov/
6. http://airsar.jpl.nasa.gov/
7. Medical images can be downloaded from
8. http://www.barre.nom.fr/medical/samples/
9. Apply DFT on Image
10. WAP for implementing LPF
    a. Ideal LPF on square image
    b. Butterworth filter
    c. Gaussian filter
11. WAP for implementing HPF
    a. Ideal HPF on square image
    b. Butterworth filter
    c. Gaussian filter
12. a. WAP for high boost filtering on square image
    b. WAP for homomorphic filtering on square image
13. Acquire satellite/medical image and apply pre-processing techniques to improve the quality of image (use different low pass filters and compare the results).

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

14. Apply different image enhancement techniques (to improve contrast, brightness, sharpness) on satellite image
15. Apply different supervised classification techniques to classify the satellite image (minimum distance, maximum likelihood, decision tree, ANN)
16. Apply different clustering algorithms (K-means, ISODATA)
17. Apply compression and decompression algorithm on image (Huffman coding, Arithmetic encoding, LZW encoding)
18. Apply DCT and PCA on image

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1744PITCM	**Elective 2: Cloud Management**	3	2 ½ hrs	25	75	100	4

Course Objectives:

1. To understand the functioning of Virtualized Data Center Architecture.
2. To gain knowledge of Storage Network Design
3. To work with Cloud OS and System Centre 2012
4. To monitor the performance of Cloud
5. To manage and maintain the cloud

Course Outcome:

After completion of this course, learners will be able to:

CO1: Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures. (Level: Analyse)

CO2: Design different workflows according to requirements and apply map-reduce programming models. (Level: Create)

CO3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms. (Level: Apply)

CO4: Monitor the performance of the cloud using different tools. (Level: Analyse and Apply)

Sr. No.	Modules / Units
1	**UNIT 1**
	Virtualized Data Center Architecture: Cloud infrastructures; public, private, hybrid. Service provider interfaces; Saas, Paas, Iaas. VDC environments; concept, planning and design, business continuity and disaster recovery principles. Managing VDC and cloud environments and infrastructures.
2	**UNIT 2**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Storage Network Design: Architecture of storage, analysis and planning. Storage network design considerations; NAS and FC SANs, hybrid storage networking technologies (iSCSI, FCIP, FCoE), design for storage virtualization in cloud computing, host system design considerations IP- SAN:Introduction, iSCSI—components of iSCSI, iSCSI host connectivity, topologies for iSCSI connectivity, iSCSI discovery, iSCSI names, iSCSI session, iSCSI PDU, ordering and numbering, iSCSI security and error handling, FCIP—FCIP topology, FCIP performance and security, iFCP—iFCP topology, iFCP addressing and routing, iFCP gateway architecture,FCOE architecture.
3	**UNIT 3**
	Cloud Management: System Center 2012 and Cloud OS, Provisioning Infrastructure: Provisioning Infrastructure with Virtual Machine Designing, Planning and Implementing. Managing Hyper-V Environment with VMM 2012. Provisioning self-service with AppController, AppController essentials, Managing Private, Public, Hybrid clouds. AppController cmdlets.
4	**UNIT 4**
	Managing and maintaining with Configuration Manager 2012, Design, Planning, Implementation, Administration, Distributing Applications, Updates, Deploying Operating Systems, Asset Management and reporting. Backup and recovery with Data Protection Manager. Design, Planning,

	Implementation and Administration.
5	**UNIT 5**
	Implementing Monitoring: Real-time monitoring with Operations Manager, Proactive monitoring with Advisor, Operations Design, Planning, Implementation, Administration, Monitoring, Alerting, Operations and Security reporting. Building private clouds: Standardisation with service manager, Service Manager 2012: Design, Planning, Implementing, Incident Tracking, Automation with orchestrator, System Orchestrator 2012: Design, Planning, Implementing. Windows Azure Pack.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books

Elective 2: Cloud Management

Reference books:

1. Introducing Microsoft System Center 2012, Technical Overview Mitch Tulloch, Symon Perriman and Symon Perriman **Microsoft**
2. Microsft System Center 2012 Unleashed Chris Amaris, Rand Morimoto, Pete Handley,David E. Ross, Technical Edit by Yardeni Pearson Education
3. The.Official.VCP5.Certification.Guide Aug.2012, VMware.Press
4. VCAP5-DCD Official Cert Guide, VMware press
5. Automating vSphere with VMware vCenter Orchestrator
6. VMware Private Cloud Computing with vCloud Director
7. Managing and optimizing VMWare VSphere deployment
8. Storage Networks: The Complete Reference, Robert Spalding
9. Storage Networking Protocol Fundamentals, James Long
10. Storage Networking Fundamentals: An Introduction to Storage Devices, Subsystems, Applications, Management, and Filing Systems, Marc Farley

Practical (1744PITCM) (Skill development & Employability)

Managing Hyper –V environment with SCVVM 2012
Provisioning Self-service with AppController
Managing Private Cloud with AppController
Using Data Protection Manager for Backup and Recovery
Using Operations Manager for real-time monitoring
Using Advisor for proactive monitoring
Using Service Manager to standardize
Using Orchestrator for automation
Implementing Windows Azure Pack
Using Configuration Manager 2012 for managing and maintaining

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1743PITCF	**Elective 1: Computer Forensics**	3	2 ½ hrs	25	75	100	4

Course Objectives:

1. To provide an understanding Computer forensics fundamental
2. To analyze various computer forensics technologies
3. To provide computer forensics systems
4. To identify methods for data recovery.
5. To apply the methods for preservation of digital evidence.

Course Outcome:

After the successful completion of this course, learners will be able to:
CO1: Explain the definition of computer forensics fundamentals. (Level: Understand)
CO2: Describe the types of computer forensics technology. (Level: Understand)
CO3: Analyze various computer forensics systems. (Level: Analyse)
CO4: Illustrate the methods for data recovery, evidence collection and data seizure. (Level: Analyse and Apply)

Sr. No.	Modules / Units
1	**UNIT 1**
	Computer Forensics and Investigation Processes, Understanding Computing Investigations, The Investigator's Office and Laboratory, Data Acquisitions
2	**UNIT 2**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Processing Crime and Incident Scenes, Working with Windows and DOS Systems, Current Computer Forensics Tools.
3	**UNIT 3**
	Macintosh and Linux Boot Processes and File Systems, Computer Forensics Analysis, Recovering Graphics Files
4	**UNIT 4**
	Virtual Machines, Network Forensics, and Live Acquisitions, E-mail Investigations, Cell Phone and Mobile Device Forensics
5	**UNIT 5**
	Report Writing for High-Tech Investigations, Expert Testimony in High-Tech Investigations, Ethics and High-Tech Investigations

Reference Books

ELECTIVE 1:- Computer Forensics

Reference books:

1. Guide to Computer Forensics and Investigations Bell Nelson, Amelia Phillips,Christopher Steuart 4th Edition Cengage Learning
2. Computer Forensics A Pocket Guide Nathan Clarke I.T G.vernance Publishing
3. Computer Forensics: Computer Crime Scene Investigation John R. Vacca 2nd Edition, Charles River Media

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Practical (1745PITCF) (Skill development & Employability)

File System Analysis using The Sleuth Kit
Using Windows forensics tools
Using Data acquisition tools
Using file recovery tools
Using Forensic Toolkit (FTK)
Forensic Investigation using EnCase
Using Steganography tools
Using Password Cracking tools
Using Log Capturing and Analysis tools
Using Traffic capturing and Analysis tools
Using Wireless forensics tools
Using Web attack detection tools
Using Email forensics tools
Using Mobile Forensics software tools
Writing report using FTK

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code:	Course	Hrs. of Instruction/ week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1744PITES	**Elective 2: Design of Embedded Control System**	3	2 ½ hrs	25	75	100	4

Course Objectives:

1. To have knowledge about the basic working of a microcontroller system and its programming in assembly language and C language
2. To provide experience to integrate hardware and software for microcontroller applications systems.
3. To work with ATMEL Microcontrollers
4. To understand different instruction sets

Course Outcome:

After successful completion of course, Learners will be able to:

CO1: Explain the knowledge about microcontrollers embedded processors and their applications. (Level: Understand)

CO2: Explain the internal architecture and interfacing of different peripheral devices with Microcontrollers. (Level: Understand)

CO3: Write the programs for microcontrollers. (Level: Create)

CO4: Analyse the role of embedded systems in the security, monitoring and control industry. (Level: Analyse)

CO5: Program ARM Controller as per user need. (Level: Create)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Sr. No.	Modules / Units
1	**UNIT 1**
	Introduction to microcontrollers Microprocessors and microcontrollers, History, Embedded vs external memory devices, 8-bit and 16-bit microcontrollers, RISC and CISC processors, Harvard and Von Neumann architectures, Commercial microcontroller devices. Industrial applications. **Design with Atmel microcontrollers** Architecture overview of Atmel 89C51, Pin description of 89C51, Using flash memory devices Atmel 89CXX, Power saving options.
2	**UNIT 2**
	PIC Microcontrollers Overview, PIC16C6X/7X, Reset actions, Oscillators, Memory organization, PIC16C6X/7X instructions, Addressing modes, I/O ports, Interrupts PIC16C61/71, PIC16C61/71 timers, PIC16C 71 ADC, **PIC16F8XX Flash microcontrollers** Introduction, pin diagram, status registers, options_reg registers, power control registers, PIC16F8 program memory, PIC16F8 data memory, Data EEPROM, Flash program EEPROM, Interrupts PIC16F877, I/O ports, Timers **More about PIC microcontrollers** Introduction, Capture/compare/PWM modules in PIC16F877, Master synchronous serial port (MSSP) module, USART, ADC
3	**UNIT 3**
	ARM Embedded Systems The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software, **ARM Processor Fundamentals** Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions, Architecture Revisions, ARM Processor Families
4	**UNIT 4**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE, ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Introduction to the ARM Instruction Set Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program Status Register Instructions, Loading Constants, ARMv5E Extensions, Conditional Execution **Introduction to the Thumb Instruction Set** Thumb Register Usage, ARM-Thumb Interworking, Other Branch Instructions, Data Processing Instructions, Single-Register Load-Store Instructions, Multiple-Register Load-Store Instructions, Stack Instructions, Software Interrupt Instruction
5	**UNIT 5**
	Writing and Optimizing ARM Assembly Code Writing Assembly Code, Profiling and Cycle Counting, Instruction Scheduling, Register Allocation, Conditional Execution, Looping Constructs, Bit Manipulation, Efficient Switches, Handling Unaligned Data

Reference Books
Design of Embedded Control System
Reference books: 1. Microcontrollers theory and applications (UnitI and II) Ajay Deshmukh First Tata McGraw- Hill 2. ARM system developer's guide: designing and optimizing system. (Unit III to V) Andrew N. Sloss, Dominic Symes, Chris Wright. First Elsevier Publication

Practical (1746PITES) (Skill development & Employability)
Interfacing of LED, relay, Push Button Sending and Receive Data Serially to/from PC. Interfacing Wireless Module using ASK and FSK Interfacing PC Keyboard. Interfacing with EEPROM using I2C BUS. Using a Watchdog Timer. Using an External RTC. Design a 4 bit binary counter. DC Motor Control using PWM module. Interfacing of temperature sensor. Interfacing a 7 segment display. Scrolling text message on LED dot matrix display

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1743PITIS	Intelligent Systems	3	2 1/2 Hours	25	75	100	4

Course Objectives

1. To introduce the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems
2. To create an understanding of the basic issues of knowledge representation and Logic and blind and heuristic search.
3. To provide an understanding of topics such as minimal, resolution, etc. that play an important role in AI programs.
4. To understand the role of agents in decision making.

Course Outcomes:

CO1: Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents. (Level: Apply)
CO2: Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game-based techniques to solve them. (Level: Analyse)
CO3: Develop intelligent algorithms for constraint satisfaction problems. (Level: Create)
CO4: Design intelligent systems for Game Playing (Level: Create)
CO5: Analyze the role of agents for decision making. (Level: Analyse)

Sr. No.	Modules / Units
1	**UNIT 1**
	Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, Structure of Agents Problem Solving by searching: Problem-Solving Agents Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed Search and exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Nondeterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environments
2	**UNIT 2**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Games: Optimal Decisions in Games, Alpha—Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-of-the-Art Game Programs Constraint Satisfaction, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems Logical Agents: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving, Effective Propositional Model Checking, Agents Based on Propositional Logic First-Order Logic: Representation Revisited, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic, Inference in First-Order Logic, Propositional vs. First- Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution,
3	**UNIT 3**
	Planning: Classical Planning, Algorithms for Planning as State-Space Search, Planning Graphs, Other Classical Planning Approaches, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multiagent Planning Uncertain Knowledge and Reasoning: Acting under Uncertainty, Basic

	Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, The Wumpus World Revisited, Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Networks, Approximate Inference in Bayesian Networks, Relational and First-Order Probability Models, Approaches to Uncertain Reasoning, Probabilistic reasoning over time: Inference in Temporal Models, Hidden Markov Models, Kalman Filters, Dynamic Bayesian Networks, Keeping Track of Many Objects
4	**UNIT 4**
	Simple Decision Making: Combining Beliefs and Desires under Uncertainty, The Basis of Utility Theory, Utility functions, Multiattribute Utility Functions, Decision Networks, Complex Decision Making: Sequential Decision Problems, Value Iteration, Policy Iteration, Partially Observable MDPs, Decisions with Multiple Agents: Game Theory Knowledge in Learning: Review of Forms and types of Learning, Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming,
5	**UNIT 5**

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

	Statistical and Reinforced Learning: Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm, Reinforcement Learning, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Applications of Reinforcement Learning Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction. Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to Move, Planning Uncertain Movements, Moving, Robotic Software Architectures, Applications.

Reference Books

Intelligent Systems

Reference books:

1. Artificial Intelligence: A Modern Approach Staurt Russell, Peter Norvig **3rd Edition Pearson Education**
2. Artificial Intelligence: Structures and Strategies for Complex Problem Solving George F.Luger **Pearson Education**
3. Artificial Intelligence Patrick Winston **Pearson Education**

Practical (1745PITIS) (Skill development & Employability)

Comment [1]: Focusses on employability

At least Eight practicals covering the entire syllabus must the taken.

1. Write a program for implementing the Depth First Search (DFS) Algorithm. And also write the algorithm for the same.
2. Write a program for implementing BFS algorithm.
3. Apply domain specific heuristic to generate possible solution for the AI problems using Greedy Best First Search.
4. Implement the mechanism of A* algorithm.
5. Implement recursive BFS.
6. Generate succession nodes and check possibility of finding solutions of the specified problems using:
   a) Steepest Ascent Hill Climbing
   b) Simulated Annealing
7. Optimize the search strategy for the suggested problems using:
   a) Mini-Max algorithm
   b) Alpha Beta Pruning
8. Find a solution to map-coloring as a constraint satisfaction problem using: Forward Checking
9. Show the implementation of Bayesian Network Classification.
10. Show the application of Hidden Markov Model.

All practicals can be done using C++ / R / MATLAB

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE ARTS & MANAGEMENT STUDIES AND SHANTABEN NAGINDAS KHANDWALA COLLEGE OF SCIENCE (AUTONOMOUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Project: 1747PITPR

(Skill development & Employability)

- The project topic may be undertaken in any area of Core Courses.
- Each of the students has to undertake a Project individually under the supervision of a teacher-guide.
- The student shall decide the topic in consultation with the teacher-guide concerned.
- College will allot P G Teacher for guidance to the students based on her / his specialization.
- There shall be double valuation of project by the teacher- guide concerned and an external examiner appointed by the College with equal weightage.
- The teacher-guide along with the external examiner appointed by the College for the valuation of project shall conduct viva voce examination with equal weightage.
- The project report shall be prepared as per the broad guidelines given below:
    - Project Report shall be typed in Times New Roman with one and half line spacing in 12 Font Size and 1.5 spacing.
    - The size of the Project Report shall be with a minimum of 50 pages.
    - Project Report shall be printed on both sides of the paper.
    - The Project Report shall be bounded.
- Minimum of Grade E in the project component is needed for passing
- In case of failing in the project work, the same project can be revised for ATKT examination
- Absence of student for viva voce: If any student fails to appear for the viva voce on the date and time fixed by the department, such student shall appear for the viva voce only along with students of the next batch.

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Nagindas Khandwala College
(Autonomous)

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

Part II

Semester IV

Under Academic Autonomy and Credit, Grading and Semester System

(To be implemented during Academic Year- 2017-2018)

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Course Code	Course	Hrs. of Instruction/Week	Exam Duration (Hours)	Maximum Marks			Credits
				CIE	SEE	Total	
1743PITES	Elective 1 Real time Embedded System	3	2 1/2 Hours	25	75	100	4

Course Objectives:

1. To have knowledge about the basic working of a microcontroller system and its programming in assembly language and C language.
2. To provide experience to integrate hardware and software for microcontroller applications systems.
3. To understand the memory system of embedded systems
4. To understand the process behind task scheduling, communication and real time databases.

Course Outcomes:

After completion of this course, learners will be able to:

CO1: Explain knowledge about microcontrollers embedded processors and their applications. (Level: Understand)

CO2: Explain the internal architecture and interfacing of different peripheral devices with Microcontrollers. (Level: Understand)

CO3: Perform scheduling, communication and create real time databases with an embedded system. (Level: Analyse and Apply)

CO4: Identify the role of embedded systems in industry. (Level: Analyse and Apply)

CO5: Create Embedded Products which are real time in nature. (Level: Create)

Sr. No.	Modules / Units
1	**UNIT 1**
	Introduction- What is Real Time System, Application of real time system, A Basic Model of Real time system, Characteristics of Real Time System,Safety and Realibility, Types of Real Time Task, Timing Constraints,Modeling Timing Constraints. **Embedded Operating Systems** Fundamental Components, Example: Simple Little Operating System
	Caches The Memory Hierarchy and Cache Memory, Cache Architecture, Cache Policy
2	**UNIT 2**

	Exception and Interrupt Handling Exception Handling, Interrupts, Interrupt Handling Schemes **Firmware** Firmware and Bootloader, Example: Sandstone **Memory Management** Moving from an MPU to an MMU, How Virtual Memory Works, Details of the ARM MMU, Page Tables, The Translation Lookaside Buffer, Domains and Memory Access Permission, The Caches and Write Buffer.
3	**UNIT 3**
	Real Time Task Scheduling Types of real time task and their characteristics, Task Scheduling, Clock driven scheduling, Hybrid Schedulers, Event Driven Scheduling, Earliest Deadline first scheduling, Rate Monotic Algorithm. **Handling Resource Sharing and Dependencies** Resource sharing among real time task, Priority Inversion, Prioroty inheritence protpcol, Highest locker protocol,prioroty ceiling protocol,Different types of priority inversion Under PCP,Important features of PCP, Resource sharing Protocol, Handling Task Dependencies.
4	**UNIT 4**
	Real Time Communication Basic Concept, Real Time Communication in Lan, Soft/Hard Real Time communication in a Lan, Bounded Access Protocol for Lans, Performance comparison, Real time communication over Packet Switched networks, QoS framework, Routing,Resource reservation, Rate Control, QoS Model-Integrated services and Differentiated Services.
5	**UNIT 5**
	Real Time Databases Concept and Example of real time databases, Real time databases application design issues, Characteristics of temporal data, Concurrency control in real-time databases. Case study on commercial real time databases

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064

Reference Books
Real Time Embedded Systems

Reference books:

1. Real-Time Systems: Theory and Practice. Rajib Mall First Pearson Publication.
2. ARM system developer's guide: designing and optimizing system. (Ch-8,Ch-9,Ch-12, Ch-14) software/Andrew N. Sloss, Dominic Symes, Chris Wright. First Elsevier Publication
3. Embedded Systems Design S. Heath Second Edition Newnes Publication
4. Real-Time Systems: Theory and Practice. Rajib Mall First Pearson Publication

Practical (1745PITES) (Skill development & Employability)

Schedule a task periodically; after 5 min xyz task has to perform (Hint JITTER).
Schedule a task non periodically; no specific time stamp is set for any task.
Shared resources management using SEMAPHORE.
Shared resources management using MUTEX.
Implement scheduling algorithm FIFO.
Implement scheduling algorithm ROUND ROBIN.
Implement scheduling algorithm RATE MONOTONIC.
Implement Inter process communication (IPC) using NAMED PIPES.
IPC using simple PIPES.
IPC using MAIL BOXES.
Using Client Socket & Server Socket (UDP/TCP) maintain data received from client node.
Small demonstration of Kernel Level & User Level Communications

PRINCIPAL
NAGINDAS KHANDWALA COLLEGE OF COMMERCE
ARTS & MANAGEMENT STUDIES AND SHANTABEN
NAGINDAS KHANDWALA COLLEGE OF SCIENCE
(AUTONOMUS)
MALAD (W), MUMBAI - 400 064