DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

For

Third Year
(Master of Computer Applications)
On
Choice Based Credit System

(Effective from the Session: 2018-19)
# Master of Computer Applications 2018-19

## FIFTH SEMESTER

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
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### Practical

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## SIXTH SEMESTER

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MCA V Semester Electives

Elective : II

1. RCA-E21 : Cryptography and Network Security
2. RCA-E22 : Natural language Processing
3. RCA-E23 : Human Computer Interaction
4. RCA-E24 : Software Testing
5. RCA-E25 : Modern Application Development

Elective: III

1. RCA-E31 : Cloud Computing
2. RCA-E32 : Soft Computing
3. RCA-E33 : Information Storage Management
4. RCA-E34 : Digital Image Processing
5. RCA-E35 : Distributed Systems

Elective : IV

1. RCA-E41 : Distributed Database Systems
2. RCA-E42 : Simulation and Modeling
3. RCA-E43 : Real Time Systems
4. RCA-E44 : Pattern Recognition
5. RCA-E45 : Big Data
RCA-501 Computer Graphics and Animation

UNIT-I:  

UNIT-II:  

UNIT-III:  

UNIT-IV:  

UNIT-V:  
Animation: Fundamentals of computer animation, Animation Techniques. Animation and Flash Overview, Using Layer and Creating Animation

REFERENCES:
RCA-502 Software Engineering

UNIT-I: (8)

UNIT-II: (8)
**Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT-III: (8)

UNIT-IV: (8)

UNIT-V: (8)

REFERENCES:

4. Pankaj Jalote, Software Engineering, Wiley
7. N.S. Gill, Software Engineering, Khanna Publishing House
UNIT-I


UNIT-II

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat’s and Euler’s theorem, primality testing, Euclid’s Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

UNIT-III


UNIT-IV

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security - pretty good privacy (PGP), S/MIME.

UNIT-V


REFERENCES

5. V.K. Jain, Cryptography and Network Security, Khanna Publishing House
RCA-E22 : Natural language Processing

UNIT-I (8)

UNIT-II (8)
Introduction to semantics and knowledge representation, some applications like machine translation, database interface.

UNIT-III (8)

UNIT-IV (8)

UNIT-V (8)

REFERENCES:
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley
RCA-E23: Human Computer Interaction

UNIT-I
Introduction: Importance of user Interface – definition, importance of 8 good designs. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface

UNIT-II
Design process – Human interaction with computers, importance of 8 human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT-III

UNIT-IV

UNIT-V

REFERENCES;
UNIT-I


UNIT–II


UNIT-III

Regression Testing: What is Regression Testing? Regression Test cases selection, reducing the number of test cases, Code coverage prioritization technique. Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis.

UNIT-IV


UNIT-V


REFERENCES:

UNIT-I
Introduction: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT-II
Basic design: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT-III
Advanced design: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT-IV

UNIT-V

REFERENCES:
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps, Learn, explore, apply
RCAE-31 Cloud Computing

UNIT-I

UNIT-II
Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT-III

UNIT-IV

UNIT-V

REFERENCES:

2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
RCA-E32 Soft Computing

UNIT-I (8)

UNIT-II (8)
Fuzzy systems: Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition – Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

UNIT-III (8)

UNIT-IV (8)

UNIT-V (8)

REFERENCES:
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
6. Wang, "Fuzzy Logic", Springer
UNIT-I
Introduction to Storage Technology: Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

UNIT-II
Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

UNIT-III

UNIT-IV
Introduction to Information Availability: Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

UNIT-V
Managing & Monitoring: Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

REFERENCES:
2. Information storage and management: storing, managing, and protecting digital information by Wiley Pub G Somasundaram, Alok Shrivastava
**UNIT-I**


**Image Enhancement in Frequency Domain: Fourier** Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Low pass Filters; Sharpening Frequency Domain Filters – Gaussian High pass Filters; Homomorphic Filtering.

**UNIT-II**


**UNIT-III**

**Image Restoration:** A Model of Restoration Process, Noise Models, Restoration in the presence of Noise Only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Band pass Filters; Minimum Mean-square Error Restoration.

**UNIT-IV**


**UNIT-V**

**Registration:**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

**Segmentation:** **Introduction**, Region Extraction, Pixel-Based Approach, Multi-level thareholding, Local thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by thareholding, Edge Detector Performance, Line Detection, Corner Detection.

**REFERENCES:**

UNIT–I
Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks; Lamport’s & vectors logical clocks.

UNIT–II
Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non-token-based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

UNIT–III

UNIT–IV

UNIT–V
Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.
Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

REFERENCES:
2. Ramakrishna,Gehrke,” Database Management Systems”, Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design”, Pearson Education
4. Distributed System, Munesh C. Trivedi, Khanna Publishing House
5. Tenanuanbaum, Steen,” Distributed Systems”, PHI
RCA-E41 Distributed Database System

UNIT-I (8)
Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascade less schedules.

UNIT-II (8)
Lock based protocols, time stamp-based protocols, Multiple Granularity and Multi version Techniques, enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT-III (8)
Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT-IV (8)

UNIT-V (8)
Distributed Query Processing, Multiday Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

REFERENCES:

2. Ramakrishna and Gehrke,’ Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,’ Database System Implementation’ Pearson Education
4. Ceei and Pelagatti,’Distributed Database’, TMH
5. Distributed System, Munesh C. Trivedi, Khanna Publishing House
RCA-E42 Simulation and Modelling

UNIT-I
System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

UNIT-II
System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

UNIT-III
Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

UNIT-IV
System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams, Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

UNIT-V
Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression-based languages, object-oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

REFERENCES:

RCA-E43 Real Time Systems

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Real Time Communication: Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V
Real Time Operating Systems and Databases: Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

REFERENCES:
UNIT-1  
**Introduction:** Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

UNIT-II  
**Statistical Pattern Recognition:** Bayesian Decision Theory, Classifiers, Normal density and discriminant functions.

UNIT-III:  
**Parameter estimation methods:** Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

UNIT-IV:  

UNIT-V:  
**Unsupervised Learning & Clustering:** Criterion functions for clustering, Clustering Techniques: Iterative square - error partitioned clustering – K means, agglomerative hierarchical clustering, Cluster validation.

**REFERENCES:**

UNIT-I

Understanding big data: What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and Healthcare, big data in medicine, advertising and big data, big data technologies, Introduction to Hadoop, open source technologies, cloud and big data mobile business intelligence, Crowd sourcing Analytics, inter and trans firewall analytics

UNIT-II

NoSQL data management: Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharing, masters slave replication, peer-peer replication, sharing and replication, consistency, relaxing consistency, version stamps, map reduce, partitioning and combining, composing map-reduce calculations

UNIT-III

Basics of Hadoop; Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, oppression, serialization, Avro file-based data structures

UNIT-IV

Map reduce applications; Map Reduce workflows, UNIT tests with MR UNIT, test data and local tests – anatomy of Map Reduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

UNIT-V

Hadoop related tools; HBase, data model and implementations, Hbase clients, Hbase examples – praxis. Cassandra, cassandra data model, cassandra examples, cassandra clients, Hadoop integration. Pig, Grunt, pig data model, Pig Latin, developing and testing PigLatin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation – HiveQL queries

REFERENCES:

4. V.K. Jain, Big Data & Hadoop, Khanna Publishing House
RCA-511 Computer Graphics and Animation Lab

LIST OF EXPERIMENTS

(1) Digital differential Analyzer
(2) Line Drawing Algorithms
(3) Mid-point Circle Generation Algorithm
(4) Creating two-Dimensional Objects
(5) Two-dimensional Transformation
(6) Picture Coloring
(7) Three-Dimensional transformation
(8) Simple Animation using Transformation
(9) Key-Frame Animation
(10) Design Animation using FLASH

Note: Lab can be conducted in “C” language / Virtual Labs /Open GL.

RCA-512 Project Based on Software Engineering

Students are expected to analyze the problem Statement/ case study and design a solution applying software engineering principles.

Note: Lab can be conducted using Virtual Labs provided by IIT Khargpur/Bombay.