Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

<table>
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<th>Group 1</th>
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<td>Advances in Data Base Management System</td>
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<td>16SCE22</td>
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Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

**Group-4**

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<td>16SCN424</td>
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<td>16MCA441</td>
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**Group-5**

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<td>Big Data Analytics</td>
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<td>3</td>
<td>16MCA353</td>
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**Group-6**

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<td>Software Defined Networks</td>
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<td>16SCE14</td>
<td>Probability Statistics and Queuing Theory</td>
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<td>4</td>
<td>16MCA444</td>
<td>Cryptography and Network security</td>
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</table>
Module 1.

Module 2.
Workloads, Workload Selection and Characterization: Types of Workloads, addition instructions, Instruction mixes, Kernels; Synthetic programs, Application benchmarks, popular benchmarks. Workload Selection: Services exercised, level of detail; Representativeness; Timeliness, Other considerations Workloads, Workload Selection and Characterization: Types of Workloads, addition instructions, Instruction mixes, Kernels; Synthetic programs, Application benchmarks, popular benchmarks. Workload Selection: Services exercised, level of detail; Representativeness; Timeliness, Other considerations in workload selection. Workload characterization Techniques: Terminology; Averaging, Specifying dispersion, Single Parameter Histograms, Multi Parameter Histograms, Principle Component Analysis, Markov Models, Clustering.

Module 3.
Monitors, Program Execution Monitors and Accounting Logs: Monitors: Terminology and classification; Software and hardware monitors, Software versus hardware monitors, Firmware and hybrid monitors, Distributed System Monitors, Program Execution Monitors and Accounting Logs, Program Execution Monitors, Techniques for Improving Program Performance, Accounting Logs, Analysis and Interpretation of Accounting log data, Using accounting logs to answer commonly asked questions.

Module 4.
Capacity Planning and Benchmarking: Steps in capacity planning and management; Problems in Capacity Planning; Common Mistakes in Benchmarking; Benchmarking Games; Load Drivers; Remote Terminal Emulation; Components of an RTE; Limitations of RTEs. Experimental Design and Analysis: Introduction: Terminology, Common mistakes in experiments, Types of experimental designs, 2k Factorial Designs, Concepts, Computation of effects, Sign table method for computing effects; Allocation of variance; General 2k Factorial Designs, General full factorial designs with k factors: Model, Analysis of a General Design, Informal Methods.

Module 5.
Queuing Models: Introduction: Queuing Notation; Rules for all Queues; Little’s Law, Types of Stochastic Process. Analysis of Single Queue: Birth-Death Processes; M/M/1 Queue; M/M/m Queue; M/M/m/B Queue with finite buffers; Results for other M/M/1 Queuing Systems. Queuing Networks: Open and Closed Queuing Networks; Product form networks, queuing Network models of Computer Systems. Operational Laws:

Utilization Law; Forced Flow Law; Little’s Law; General Response Time Law; Interactive Response Time Law; Bottleneck Analysis; Mean Value Analysis and Related Techniques; Analysis of Open Queuing Networks; Mean Value Analysis; Approximate MVA; Balanced Job Bounds; Convolution Algorithm, Distribution of Jobs in a System, Convolution Algorithm for Computing G(N), Computing Performance using G(N), Timesharing Systems, Hierarchical Decomposition of Large Queuing Networks: Load Dependent Service Centers, Hierarchical Decomposition, Limitations of Queuing Theory.

Question paper pattern:
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books:
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

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<th>02</th>
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<th>DATA WAREHOUSING AND DATA MINING</th>
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<tr>
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<td>Exam Hours:03 Exam Marks:100</td>
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**Module 1.**
Data warehousing and OLAP
Data Warehouse basic concepts, Data Warehouse Modeling, Data Cube and OLAP: Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Software.

**Module 2.**
Data Mining and its Applications
Introduction, What is Data Mining, Motivating Challenges, Data Mining Tasks, Which technologies are used for data mining, Kinds of pattern that can be mined, Data Mining Applications, Data Preprocessing, Data cleaning, data integration, data reduction and data transformation.

**Module 3.**
Association Analysis: Basic Concepts and Algorithms
Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns.

**Module 4.**
Classification : Methods, Improving accuracy of classification

**Module 5.**
Clustering Techniques
Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis.

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**
1. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.

**Reference Books:**
# DISTRIBUTED OPERATING SYSTEM

**Module 1.**

**Module 2.**
Remote Procedure Calls: Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC.

**Module 3.**

**Module 4.**

**Module 5.**

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
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The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
04 | 16MCA453 | Group-1 | SOFTWARE QUALITY MANAGEMENT
--- | --- | --- | ---
Exam Hours:03 | Exam Marks:100

**Module 1.**
INTRODUCTION TO SOFTWARE QUALITY
Software Quality - Hierarchical models of Boehm and McCall – Quality measurement – Metrics measurement – Metrics measurement and analysis – Gilb’s approach – GQM Model

**Module 2.**
SOFTWARE QUALITY ASSURANCE

**Module 3.**
QUALITY CONTROL AND RELIABILITY

**Module 4.**
QUALITY MANAGEMENT SYSTEM
Elements of QMS – Rayleigh model framework Reliability Growth models for QMS – Complexity metrics and models Customer satisfaction analysis.

**Module 5.**
QUALITY STANDARDS

**Question paper pattern:**
- The question paper will have ten questions.
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The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

<table>
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<tr>
<th>01</th>
<th>16MCA544</th>
<th>Group-2</th>
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**Module 1.**
**Concepts of Storage Networking**  
The Data Storage and Data Access Problem, The Battle for Size and Access  
Decoupling the Storage Component: Putting Storage on the Network,  
Decoupling the Storage Component: Creating a Network for Storage

**Module 2.**
**Storage Fundamentals**  
Storage Architectures, Device Overviews, Connectivity Options, Data Organizational Methods

**Module 3.**
**Network Attached Storage**  
Putting Storage on the Network, NAS Hardware Devices, NAS Software Components, NAS Connectivity Options

**Module 4.**
**Storage Area Networks**  
Architecture Overview, Hardware Devices, Software Components, Configuration Options for SANs.

**Module 5.**
**Application**  
Defining the I/O Workload, Applying the SAN Solution, Applying the NAS Solution  
Considerations When Integrating SAN and NAS Management, Planning Business Continuity,  
Managing Availability, Maintaining Serviceability, Capacity Planning and Security Considerations

**Case Studies**  
NAS Case Study, SAN Case Study, SAN/NAS Management Case Study

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**
3. Storage Area Networks Essentials : A complete guide to understanding and Implementing SANs, Richard Barker, Paul Massiglia, Wiley
### Module 1.
Review of Analysis Techniques:
- Growth of Functions: Asymptotic notations;
- Standard notations and common functions;
- Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method;

### Module 2.
Graph Algorithms:
- Bellman-Ford Algorithm; Single source shortest paths in a DAG;
- Johnson’s Algorithm for sparse graphs;
- Flow networks and Ford-Fulkerson method;
- Maximum bipartite matching.

Polynomials and the FFT:
- Representation of polynomials;
- The DFT and FFT; Efficient implementation of FFT.

### Module 3.
Number-Theoretic Algorithms:
- Elementary notions;
- GCD; Modular Arithmetic;
- Solving modular linear equations;
- The Chinese remainder theorem;
- Powers of an element;
- RSA cryptosystem;
- Primality testing;
- Integer factorization.

### Module 4.
String-Matching Algorithms:
- Naïve string Matching;
- Rabin-Karp algorithm;
- String matching with finite automata;
- Knuth-Morris-Pratt algorithm;
- Boyer-Moore algorithms.

### Module 5.
Probabilistic and Randomized Algorithms:
- Probabilistic algorithms;
- Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms;
- Probabilistic numeric algorithms.

### Question paper pattern:
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### Text Books:

### Reference Books:
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

<table>
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<tr>
<th>03</th>
<th>16SCE252</th>
<th>Group-2</th>
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<td>Exam Marks:100</td>
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**Module 1.**
Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.

**Module 2.**
Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation

**Module 3.**
Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Bayesian belief network

**Module 4.**
Naive Bayes classifier, Bayesian belief network, Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over fitting & Pruning, Examples, Hidden Markov models: Markov models for classification, Hidden Markov models and classification using HMM

**Module 5.**
Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy’s, k-means, Isodata), clustering large data sets, examples, An application: Handwritten Digit recognition

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
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**Text Books:**

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Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

<table>
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<tr>
<th>04</th>
<th>16SSE24</th>
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<th>SOFTWARE METRICS AND QUALITY ASSURANCE</th>
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**Module1.**

**Module2.**
Applying The Seven Basic Quality Tools In Software Development: Ishikawa’s Seven Basic Tools, Checklist, Pareo Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause And Effect Diagram. The Rayleigh Model: Reliability Models, The Rayleigh Model Basic Assumptions, Implementation, Reliability And Predictive Validity.

**Module3.**

**Module4.**

**Module5.**

**Question paper pattern:**
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**Text Books:**
**Visvesvaraya Technological University, Belagavi.**

**PhD Coursework Courses – 2018 (Master of Computer Applications)**

**As per 2017 Regulation**

<table>
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<th>01</th>
<th>16SCS13</th>
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<td></td>
<td>Exam Hours:03</td>
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**Module1.**
Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations. Overview of Object-Oriented Concepts – Objects, Basic properties. Advantages, examples, Abstract data types, Encapsulation, class hierarchies, polymorphism, examples.

**Module2.**
Object and Object-Relational Databases: Overview of OOP; Complex objects; Identity, structure etc. Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Conceptual design of Object database. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for extended type systems; syntax and demo examples, The nested relational model. Overview of C++ language binding

**Module3.**
Parallel and Distributed Databases: Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations; Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery.

**Module4.**
Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support, View materialization, Maintaining materialized views. Introduction to Data Mining; Counting co-occurrences; Mining for rules; Tree-structured rules; ROC and CMC Curves; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks.

**Module5.**
Enhanced Data Models for Some Advanced Applications: Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts. More Recent Applications: Mobile databases; Multimedia databases; Geographic Information Systems; Genome data management

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
### ADVANCES IN OPERATING SYSTEMS

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**Module 1.**

**Module 2.**

**Module 3.**
Multiprocessor and Real-Time Scheduling: Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclSSl) Scheduling, Windows Vista Hours Scheduling, Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock

**Module 4.**

**Module 5.**

**Question paper pattern:**
- The question paper will have ten questions.
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**Text Books:**

**Reference Books:**
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

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<tr>
<td>Module5.</td>
<td>J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.</td>
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- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books:
Advances in Digital Image Processing

Exam Hours: 03 Exam Marks: 100

Module 1.

Module 2.

Module 3.

Module 4.

Module 5.

Question paper pattern:
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Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

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<th>Group-4</th>
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**Question paper pattern:**
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**Text Books:**
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<th>Module</th>
<th>Topics</th>
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<tbody>
<tr>
<td>Module 1</td>
<td>Distributed System Models and Enabling Technologies Scalable Computing Service over the Internet, System Models for Distributed and Cloud Computing</td>
</tr>
<tr>
<td>Module 2</td>
<td>Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency</td>
</tr>
<tr>
<td>Module 3</td>
<td>Virtual Machines and Virtualization of Clusters and Data Centers Implementation Levels of Virtualization, Virtualization Structures /Tools and Mechanisms, Virtual Cluster and Resource Management, Virtualization for Data-Center Automation</td>
</tr>
<tr>
<td>Module 5</td>
<td>Cloud Programming and Software Environments Features of Cloud and Grid Platforms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments</td>
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</table>

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**Text Books:**
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

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</table>

Module 1.

Module 2.

Module 3.
LEARNING I: Similarity and Clustering – Formulations and approaches- Bottom up and Top down Partitioning Paradigms – Clustering and Visualization via Embedding’s – Probabilistic Approaches to clustering – Collaborative Filtering, SUPERVISED LEARNING: The Supervised Learning Scenario, Overview of Classification Strategies, Evaluating Text Classifiers, Nearest Neighbor Learners, Feature Selection.

Module 4.
LEARNING II: SUPERVISED LEARNING – Bayesian Learners, Exploiting Hierarchy among Topics, Maximum Entropy Learners, Discriminative Classification, Hypertext Classification, SEMI SUPERVISED LEARNING- - Expectation Maximization, Labeling Hypertext Graphs and Co-training.

Module 5.

Question paper pattern:
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- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books:
### Module 1: Introduction to Computer Networks

- History of TCP/IP, TCP Applications and Services, Performance Study of TCP/IP.
- Learning of TCP Performance? TCP, TCP Services, Header Format, Encapsulation in IP, Acknowledgment Mechanism, Retransmission Mechanism, Connection Establishment and Termination, Control and Sliding Window, Congestion Control.
- UDP, UDP Services, Header Format, Encapsulation in IP, IP Services, Fragmentation and Reassembly.

### Module 2: TCP/IP Network Simulation and TCP Modeling

- The Role of Simulation, Steps of a Systematic Simulation Study, Types of Simulations.
- Continuous versus Discrete Event, Terminating versus Steady State, Synthetic versus Trace Driven Simulation.
- Simulation Validation and Verification, Confidence Level of Simulation Results, Confidence Level Formula.

### Module 3: TCP/IP Performance over Wireless Networks & TCP/IP Performance over Mobile Networks & Optical Networks

- Layer Wireless Networks: Generic Characteristics, Wireless Local Area Networks and Cellular Communications Networks.

### Module 4: TCP/IP Performance over Satellite Networks & TCP/IP Performance over Asymmetric Networks

- A Brief History of Data Satellites, Motivations for Using Satellites, Types of Satellites Satellite Internet Architectures, Satellite Characteristics Affecting TCP.

### Exam Details

- **Exam Hours:** 03
- **Exam Marks:** 100

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**ADVANCES IN COMPUTER NETWORKS**

<table>
<thead>
<tr>
<th>Group-4</th>
<th>ADVANCES IN COMPUTER NETWORKS</th>
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</thead>
<tbody>
<tr>
<td>04</td>
<td>16MCA441</td>
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**Module 1:**
- Introduction to Computer Networks

**Module 2:**
- TCP/IP Network Simulation and TCP Modeling

**Module 3:**
- TCP/IP Performance over Wireless Networks & TCP/IP Performance over Mobile Networks & Optical Networks

**Module 4:**
- TCP/IP Performance over Satellite Networks & TCP/IP Performance over Asymmetric Networks
Module 5.
TCP/IP Performance over Asymmetric Networks & New TCP Standards and Flavors

Question paper pattern:
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:
1. High Performance TCP/IP: Networking Concepts, Issues, and Solutions, Mahhub Hassan and Raj Jain, IST Edition, 2009 PHI Learning Chapters 1,2,3,4,5,6,7,8,9,10,11,12,13 (excluding those topics which are not in the syllabus )

Reference Books:
1. TCP/IP Illustrated (Volume I, Volume II and Volume III), W. Richard Stevens, Addison-Wesley
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

<table>
<thead>
<tr>
<th>01</th>
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<th>Group-5</th>
<th>ARTIFICIAL INTELLIGENCE</th>
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<tbody>
<tr>
<td>Exam Hours:03</td>
<td>Exam Marks:100</td>
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</table>

**Module 1.**
What is Artificial Intelligence: The AI Problems, The Underlying assumption, What is an AI Technique?, The Level of the model, Criteria for success, some general references, One final word and beyond. Problems, problem spaces, and search: Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics.

**Module 2.**

**Module 3.**

**Module 4.**

**Module 5.**

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation

02 16MCA452 Group-5 BIG DATA ANALYTICS

Exam Hours:03  Exam Marks:100

Module1.
Big Data and Analytics
Example Applications, Basic Nomenclature, Analysis Process Model, Analytical Model Requirements, types of Data Sources, Sampling, Types of data elements, data explorations, exploratory statistical analysis, missing values, outlier detection and Treatment, standardizing data labels, categorization.

Module2.
Big Data Technology
Hadoop’s Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data – Predictive Analytics – Mobile Business Intelligence and Big Data – Crowd Sourcing Analytics – Inter- and Trans-Firewall Analytics.

Module 3.
Meet Hadoop
Data, Data Storage and Analysis, Comparison with Other Systems, RDBMS, Grid Computing Volunteer Computing, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem Hadoop Releases Response

Module4.
The Hadoop Distributed File system
The Design of HDFS, HDFS Concepts, Blocks, Name nodes and Data nodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic File system Operations, Hadoop File systems Interfaces ,The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the File System API, Writing Data, Directories, Querying the File system, Deleting Data, Data Flow Anatomy of a File Read ,Anatomy of a File Write, Coherency Model, Parallel Copying with distcp Keeping an HDFS Cluster Balanced, Hadoop Archives

Module5.
Map Reduce
A Weather Dataset ,Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Map and Reduce, Java MapReduce, Scaling Out, Data Flow, Combiner functions, Running a Distributed MapReduce Job, Hadoop Streaming, Hadoop Pipes, Compiling and Running, Developing a MapReduce Application, The Configuration API, Combining Resources, Variable Expansion, Configuring the Development Environment, Managing Configuration, GenericOptionsParser, Tool and ToolRunner, Writing a Unit Test, Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging, Launching a Job, The MapReduce Web UI, Retrieving the Results, Debugging a Job, Hadoop Logs, Remote Debugging.

Question paper pattern:
• The question paper will have ten questions.
• Each full question consists of 20 marks.
• There will be 2 full questions (with a maximum of four sub questions) from each module.
• Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books:
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<th>Group-5</th>
<th>CYBER SECURITY</th>
</tr>
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<tbody>
<tr>
<td>04</td>
<td>16MCA354</td>
</tr>
</tbody>
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**Exam Hours:** 03  | **Exam Marks:** 100

**Module 1.**
Introduction to Cybercrime and Laws

**Module 2.**
Tools and Methods used in Cybercrime
Introduction, Proxy Server and Anonymizers, Password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow.

**Module 3.**
Phishing and Identity Theft

**Module 4.**
Unix Command Lines, Backtrack Linux, Mac Ports, Cygwin, Windows Power Shell, Net Cat Commands, NetCat Uses, SSH, Data Pipe, Fpipe

**Module 5.**
Network Defense tools
Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System.

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**
1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill. (Chapters: 2, 7, 8, 11)
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by NinaGodbole and SunitBelpure, Publication Wiley. (Chapters: 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.5, 2.6, 2.7, 6.4,5.2.1, 5.2.2, 5.2.5, 5.3.1, 5.3.2, 5.3.3, 4.2,4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11)

**Reference Books:**
### Module 1.
What is Web 2.0? Folksonomies and Web 2.0, Software As a Service (SaaS), Data and Web 2.0, Convergence, Iterative development, Rich User experience, Multiple Delivery Channels, Social Networking. Web Services: SOAP, RPC Style SOAP, Document style SOAP, WSDL, REST services, JSON format, What is JSON? Array literals, Object literals, Mixing literals, JSON Syntax, JSON Encoding and Decoding, JSON versus XML.

### Module 2.
Rich Internet Applications With Ajax: Limitations of Classic Web application model, AJAX principles, Technologies behind AJAX, Examples of usage of AJAX; Asynchronous communication and AJAX application model. Ajax with XMLHttpRequest object: Part 1
Creating Ajax Applications: An example, Analysis of example ajax.html, Creating the JavaScript, Creating and opening the XMLHttpRequest object, Data download, Displaying the fetched data, Connecting to the server, Adding Server-side programming, Sending data to the server using GET and POST.

### Module 3.
Ajax with XMLHttpRequest object: Part 2
Handling multiple XMLHttpRequest objects in the same page, Using two XMLHttpRequest objects, Using an array of XMLHttpRequest objects, Using inner functions, Downloading JavaScript, connecting to Google Suggest, Creating google.php, Downloading from other domains with Ajax, HTML header request and Ajax, Defeating caching, Examples.

### Module 4.
Working with PHP and Ajax
Working with PHP server variables, Getting the data in to array format, Wrapping applications in to a single PHP page, Validating input from the user, Validating integers and text, DOM, Appending new elements to a web page using the DOM and Ajax, Replacing elements using the DOM, Handling timeouts in Ajax, Downloading images with Ajax, Example programs.

### Module 5.

### Question paper pattern:
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

### Text Books:

### Reference Books:
Visvesvaraya Technological University, Belagavi.
PhD Coursework Courses – 2018 (Master of Computer Applications)
As per 2017 Regulation


<table>
<thead>
<tr>
<th>02</th>
<th>16MCA551</th>
<th>Group-6</th>
<th>SOFTWARE DEFINED NETWORKS</th>
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<tbody>
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<td>Exam Marks:100</td>
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</table>

**Module 1.**
Introduction to SDN
Understanding the SDN, Understanding the SDN technology, Control Plane, Data Plane, Moving information between planes, separation of the control and data planes, Distributed control planes, Load Balancing, Creating the MPLS Overlay, Centralized control planes.

**Module 2.**
Working of SDN
Evaluation of Switches and Control planes, SDN Implications, Data centre Needs, Forerunner of SDN, Software Defines Networks is Born, Sustain SDN interoperability, Open source contribution, Fundamental Characteristics of SDN, SDN Operations, SDN Devices, SDN Controllers, SDN Applications, Alternate SDN methods.

**Module 3.**
The Open Flow Specifications

**Module 4.**
SDN via APIs, SDN via Hypervisor-Based Overlays, SDN via Opening up the device, Network function virtualization, Alternative Overlap and Ranking.

**Module 5.**
Data centres definition, Data centres demand, tunnelling technologies for Data centres Path technologies in data centres, Ethernet fabrics in Data centres, SDN use case in Data centres

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
1. Software Defined Networking for Dummies brought you by cisco, Brian Underdahl and Gary Kinghorn.
**Visvesvaraya Technological University, Belagavi.**

**PhD Coursework Courses – 2018 (Master of Computer Applications)**

**As per 2017 Regulation**

<table>
<thead>
<tr>
<th>03</th>
<th>16SCE14</th>
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<th>PROBABILITY STATISTICS AND QUEUING THEORY</th>
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<tbody>
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<td><strong>Exam Hours:</strong> 03</td>
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</tbody>
</table>

**Module 1.**
Axioms of probability, Conditional probability, Total probability, Baye’s theorem, Discrete Random variable, Probability mass function, Continuous Random variable. Probability density function, Cumulative Distribution Function, and its properties, Two-dimensional Random variables, Joint pdf / cdf and their properties.

**Module 2.**

**Module 3.**

**Module 4.**
Testing Hypothesis: Testing of Hypothesis: Formulation of Null hypothesis, critical region, level of significance, errors in testing, Tests of significance for Large and Small Samples, t-distribution, its properties and uses, F-distribution, its properties and uses, Chi-square distribution, its properties and uses, $\chi^2$ – test for goodness of fit, $\chi^2$ test for Independence

**Module 5.**

**Question paper pattern:**
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
Module 1.
Introduction to Cryptography

Module 2.
Data Encryption and advanced encryption techniques

Module 3.

Module 4.

Module 5.
WEB AND SYSTEM SECURITY

Question paper pattern:
- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books: