AC 27-2-13
Item no. 4.133

UNIVERSITY OF MUMBAI

Syllabus for Semester I and II
Program: M.Sc.
Course: Information Technology

(Credit Based Semester and Grading System with effect from the academic year 2013–2014)

Revised syllabus of M.Sc. Information Technology
(Based on Credit and grading system)

Semester I

Course code	Course Nomenclature	Lectures	Credit	Practical Course	Hrs	Credit	Total Credit
PSIT101	Data Mining	60	04	PSIT1P1	60	02	06
PSIT102	Distributed System	60	04	PSIT1P2	60	02	06
PSIT103	Data Analysis Tools	60	04	PSIT1P3	60	02	06
PSIT104	Software Testing	60	04	PSIT1P4	60	02	06
	Total						24

Semester II

Course code	Course Nomenclature	Lectures	Credit	Practical Course	Hrs	Credit	Total Credit
PSIT201	Mobile Computing	60	04	PSIT2P1	60	02	06
PSIT202	Advanced Computer Networks	60	04	PSIT2P2	60	02	06
PSIT203	Cloud Computing and Ubiquitous System	60	04	PSIT2P3	60	02	06
PSIT204	Advanced Database Systems	60	04	PSIT2P4	60	02	06
	Total						24

Total credits for M.Sc. Sem I and II Sem I- 24 and sem II-24 = 48

Evaluation: The students will be evaluated externally. The external evaluation will be done by the committee appointed by the University norms. Standard of passing and scale as per the university norms.

Information Technology Syllabus
Restructured for Credit Based and Grading System

SEM: I

Course I:	Data Mining	**PSIT101**
Course II:	Distributed System	**PSIT102**
Course III:	Data Analysis Tools	**PSIT103**
Course IV:	Software Testing	**PSIT104**

SEM: IV

Course IV:	Mobile Computing	**PSIT201**
Course V:	Advanced Computer Networks	**PSIT202**
Course VI:	Cloud Computing and Ubiquitous System	**PSIT203**
Course VIII:	Advanced Database Systems	**PSIT204**

SEMESTER I

Course 1:Data Mining **PSIT101**

Course Code	Unit	Description	Credits
PSIT101	I	**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.	4
	II	**Data Preprocessing:** Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation. **Mining Frequent Patterns, Associations, and Correlations:** Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining	
	III	**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 MethodsIncreasing the Accuracy, Model Selection.	
	IV	**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	
	V	**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.	

References:

1. M. H. Dunham. Data Mining: Introductory and Advanced Topics. Pearson Education. 2010. (Unit I)
2. Krzysztof J. Cios,W. Pedrycz,R. W.Swiniarski,L.A. Kurgan," **Data Mining"** A Knowledge Discovery Approach", Springer (Unit I).
3. J. Han and M. Kamber, " Data Mining: Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008(Unit II-Unit VI)
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

Course Code: PSIT1P1

1. Show the design and implementation of data mining model using Java API
2. Design the data mining model using SQL server / Oracle.
3. Show the implementation of Naïve Bayes algorithm.
4. Show the implementation of Decision Tree.
5. Show the implementation of Time Series Algorithm.
6. Show the implementation of Clustering Algorithm.
7. Show the implementation of k-nearest neighbor.
8. Show the implementation of Apriori Algorithm
9. Show the implementation of Association Algorithm.
10. Show the implementation of Text Mining.
11. Show the implementation of Multimedia Mining.
12. Show the implementation of Spatial Mining.

Course 2 :Distributed System **PSIT102**

Course Code	Unit	Description	Credits
PSIT102	I	**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	4
	II	**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	
	III	**Remote Invocation:** Request-Reply Protocols, Remote Procedure Call, Remote Method Invocation,Case Study: Java RMI **Indirect Communication:** Group communication, Publish-subscribe systems, Message queues, Shared memory approaches **Web Services:** Web services,Service descriptions and IDL for web services, A directory service for use with web services, XML security, Coordination of web services, applications of web services.	
	IV	**Coordination And Agreement:** Distributed mutual exclusion Elections Coordination and agreement in group communication, Consensus and related problems **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	
	V	**Distributed Transactions:** Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks. Replication: System model and the role of group communication, Fault-tolerant services, Case studies of highly available services: The gossip architecture, Bayou and Coda, Transactions with replicated data **Mobile And Ubiquitous Computing:** Association, Interoperation, Sensing and context awareness,Security and privacy, Adaptation,Case	

		study: Cooltown	

References:

1. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair , Distributed Systems - Concepts and Design (Unit I-Unit VI)
2. A. Taunenbaum, "Distributed Systems: Principles and Paradigms"
3. G. Coulouris, J. Dollimore, and T. Kindberg, "Distributed Systems: Concepts and Design", Pearson Education

Course Code: PSIT1P2

1. Implement the concept for sharing the resources using distributed system.
2. Write a program for implementing Client Server communication model.
3. Write a program to show the object communication using RMI.
4. Show the implementation of Remote Procedure Call.
5. Show the implementation of web services.
6. Write a program to execute any one mutual exclusion algorithm.
7. Write a program to implement any one election algorithm.
8. Show the implementation of any one clock synchronization algorithm.
9. Write a program to implement two phase commit protocol.
10. Implement the concept of distributed file system architecture.

Course 3: Data Analysis Tools **PSIT103**

Course Code	Unit	Description	Credits
PSIT103	I	***PART I : COMPUTING*** **Statistics in Modern day**, **C :** Lines, Variables and their declarations, Functions, The debugger , Compiling and running, Pointers , Arrays and other pointer tricks, Strings **Databases** :Basic queries , Doing more with queries, Joins and subqueries, On database design , Folding queries into C code	4
	II	**Matrices and models** :The GSL's matrices and vectors apo_da t, Shunting data, Linear algebra, Numbers, gsl_matrix and gsl_ve ctor internals, Models, **Graphics:** plot , Some common settings, From arrays to plots, A sampling of special plots, Animation, On producing good plots, Graphs--nodes and flowcharts, Printing and LATEX	
	III	**More coding tools :** Function pointers , Data structures, Parameters, Syntactic sugar, More tools ***PART II : STATISTICS*** **Distributions for description** : Moments ,Sample distributions, Using the sample distributions , Non-parametric description	
	IV	**Linear projections**: Principal component analysis, OLS and friends, Discrete variables, Multilevel modeling **Hypothesis testing with the CLT**: The Central Limit Theorem, Meet the Gaussian family, Testing a hypothesis, ANOVA, Regression , Goodness of fit.	
	V	**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	

References:

1. Modeling with Data: Tools and Techniques for Scientific Computing Ben Klemens, Princeton University Press.
2. Computational Statistics, James E. Gentle, Springer
3. Computational Statistics, Second Edition, Geof H. Givens and Jennifer A. Hoeting, Wiley Publications

Course Code: PSIT1P3

1. Some SQL queries based on the 1st Unit.
2. Implementing GSL matrix and vectors
3. Graph Plotting
4. Implement the statistical distributions
5. Implement regression and goodness of fit
6. Implement testing with likelyhood
7. Generate random numbers using Monte Carlo method
8. Implementing Non-Parametric testing
9. Drawing an Inference
10. Implement Non-parametric Testing

Course 4: Software Testing PSIT104

Course Code	Unit	Description	Credits
PSIT104	I	**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	4
	II	**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, Risk-Based 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	
	III	**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, Requirements-Based 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.	
	IV	**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.	
	V	**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

Advanced SoftwareTesting—Vol. 3 by Rex Black and· Jamie L. Mitchell, Rocky Nook Publication,
Advanced Software Testing Vol. 2 by Rex Black, Rocky Nook Publication, 2008
W.E. Perry, "Effective Methods for Software Testing", John Wiley.
Kaner C., Nguyen H., Falk J., "Testing Computer Software", John Wiley.
Boris Beizer, "Software Testing Techniques", Dreamtech
Louise Tamres, "Introducing Software Testing", Pearson Education.

Course Code: PSIT1P4

1. Evaluating Test Exit Criteria and Reporting
2. Static and Dynamic Analysis
3. Rate Quality Attributes for Domain and Technical Testing
4. Perform Review
5. Incident Management

6. Path Testing and Equivalence Partitioning
7. Performance Testing
8. Using Testing Tool Selenium
9. Using Testing Tool QTP
10. Using Testing Tool WAPT
11. Using Testing Tool VTEST
12. Using Testing Tool AutoIT

SEMESTER II

Course 5: Mobile Computing PSIT201

Course Code	Unit	Description	Credits
PSIT201	I	**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.	4
	II	**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	
	III	**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.	
	IV	**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 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	
	V	**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	

References :

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

Course Code: PSIT2P1

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

Course 6: Advanced Computer Networks PSIT202

Course Code	Unit	Description	Credits
PSIT202	I	TCP/IP Review, Static Routing, Dynamic Routing Protocols- Interior Gateway Protocol & Exterior Gateway Protocol	4
	II	OSPF Overview and Neighbour Relationships, OSPF Topology, Routes and Convergence, OSPF Route Summarization, Filtering and Default Routing OSPF Virtual Links and Frame Relay Operations	
	III	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,	
	IV	Enterprise Campus Network Design Developing an Optimum Design for Layer 3 Advanced WAN Services Design Considerations	
	V	IPsec and SSL VPN Design Enterprise Data Center Design SAN Design Considerations	

References:

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

Course Code: PSIT2P2

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

Course 7: Cloud Computing and Ubiquitous System **PSIT203**

Course Code	Unit	Description	Credits
PSIT203	I	**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.	4
	II	**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.	
	III	**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.	
	IV	**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 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.	
	V	**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.	

BOOKS

References:

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

Course Code: PSIT2P3

1. Implement Distributed System on Windows and Linux
2. Implement application on Azure
3. Implement private cloud
4. Implement Search engine
5. Implement Server Cluster
6. Implement MapReduce and Hadoop
7. Implement Social Networking Site
8. Implement Blogging site
9. Implement Grid Computing
10. Implement IaaS (Eucalyptus, Nimbus)
11. Implement PaaS
12. Implement SaaS
13. Implement OpenNebula

Course 8: Advanced Database Systems PSIT204

Course Code	Unit	Description	Credits
PSIT204	I	**The Extended Entity Relationship Model and Object Model:** The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.	4
	II	**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	
	III	**Object Relational and Extended Relational Databases:** 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	
	IV	**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	
	V	**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.	

References:

1. Elmasri and Navathe, "*Fundamentals of Database Systems*", Pearson Education
2. Raghu Ramakrishnan, Johannes Gehrke, "*Database Management Systems*", McGraw-Hill
1. Korth, Silberchatz, Sudarshan , "*Database System Concepts*", McGraw-Hill.
2. Peter Rob and Coronel, "*Database Systems, Design, Implementation and Management*", Thomson Learning.

   C.J.Date, Longman, "*Introduction To Database Systems*", Pearson Education

Course Code: PSIT2P4

1. Horizontal fragmentation of database.
2. Vertical fragmentation of database
3. Creating Replica of database.
4. Create Temporal Database.
5. Inserting and retrieving multimedia objects in database (Image / Audio /Video).
6. Implement Active database using Triggers
7. Create ORDBMS Application
8. Implement and retrieve records from a Spatial Database
9. Create XML Parser
10. Using XML DOM Traverse XML Document.
11. Create an XML Application using database and any programming language (Java / VB.NET – ASP.NET, C#-ASP.NET).
12. Prolog programming.