

## MT-PT-41 SIMULATION AND MODELING

L/T - 4

Total Credits – 4

Internal - 30 Marks

External – 70 Marks

**Note:-** Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

### Course Learning Objectives:

1. Fundamentals of creating mathematical models of physical systems and implementation on computers to analyse the system.
2. The different mathematical approaches to modelling that are covered in the course can be characterized into differential and difference equation based models, probability based a model which includes stochastic differential equations, cellular automata and event based approaches, and matrix based models.
3. The course is interdisciplinary in nature and looks at many systems from physics, biology, finance, engineering etc. from a modelling perspective.
4. Each topic is followed by many examples from different disciplines.

### Course Learning Outcomes:

1. to create a relevant model for a multitude of problems from science and engineering, by extracting the necessary and relevant information regarding the problem.
2. They would also be able to define the different modelling terms by analysing the system or the data that is present.
3. They would be able to implement the model on the computer and from the results check for the validity of the model and correctness of the assumptions present in the model.

### Unit-1

Introduction: System Concepts, System boundaries and environment, continuous and discrete systems, system modeling, Type of Models, Modeling Methodology, Model validation, Principles & Nature of Computer modeling and simulation, Steps in Simulation Study, Pitfalls in Simulation, When to use Simulation?, Physical and Interactive Simulation, Real-Time Simulation, Simulation and Analytical Methods, Areas of Application.

### Unit-II

Continuous & Discrete: Analog vs. Digital Simulation, Continuous simulation vs. Numerical Integration; Time Flow Mechanism, Concepts of simulation of continuous and discrete system with the help of live examples- Pure Pursuit Problem, Inventory Problem, Chemical Reactor; Generation of random numbers, Monte Carlo Computation vs Stochastic Simulation, Generation of non-uniformly distributed random numbers, Discrete Probability Functions, Cumulative Distribution Function, Measures of Probability Function-Central Tendency & Dispersion, Generation of Poisson and Erlang variates.

### Unit III

Simulators for the live systems: Simulation of a water reservoir system, Simulation of a hypothetical Computer. Simulation of queuing Systems: Basic concepts of queuing theory, Simulation of single-server, two server and general queuing systems, Simulation in Inventory Control systems : Elements of inventory theory, inventory models, simulators for complex Inventory systems.

### Unit IV

Design and Evaluation of Simulation Experiments: Length of simulation run, variance reduction techniques. Experiment layout and Validation. Simulation Languages: Continuous

staff council  
27/09/2021  
27-9-21

PG BSA R  
27-9-21  
Kumar  
27/9/21

and discrete simulation languages, Block-Structured continuous simulation languages, Expression based languages, discrete system simulation languages: GPSS, SIMSCRIPT, SIMULA, Factors in selection of discrete system simulation languages.

**Text/Reference Books:**

1. Gordon G.: "System Simulation" , Prentice-Hall of India Pvt. Ltd. New Delhi 1993.
2. Narsingh Deo: "System Simulation with Digital Computer:", PHI New Delhi, 1993
3. Neelamkavil Frances: "Computer Simulation and modelling, John Wiley & Sons, New York 1987,
4. Payne, James A.: " Introduction to Simulation: Programming Techniques and Methods of Analysis, McGraw-Hill International Editions, Computer Science Services, New York(1998).
5. Reitman Julian: "Computer Simulation Experiments", Wiley- Interscience, 1971.

staff council  
[Signature]  
27/09/2021  
[Signature]  
27-9-21

PGBS&R  
[Signature]  
[Signature]  
27-9-21  
Kumar  
27/9/21

## MT-PT-42 ADVANCED OPERATING SYSTEMS

L/T - 4

Total Credits – 4

Internal - 30 Marks

External – 70 Marks

**Note:-**Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

### Course Learning Objectives:

Some advanced concepts of operating systems will be covered in this course. The objective of this course is to study, learn, and understand the major concepts of advanced operating systems, namely, multimedia operating systems, distributed and real time operating systems, threads, security and design issues in operating systems.

### Course Learning Outcomes:

From viewpoints of knowledge and understanding, a learner shall be able to appreciate the potential benefits of distributed systems and to summarize the major security issues associated with modern operating systems as also the array of techniques that might be used to enhance the system security. Cognitively, the learners shall be able to apply standard design principles in the construction of these systems and select appropriate approaches for building a range of advanced operating systems.

### Unit – I

Multimedia operating systems: Introduction to multimedia; multimedia files and video compression standards; process scheduling, file system, file placement, caching and disk scheduling for multimedia.

### Unit – II

Distributed operating systems: Multiprocessor hardware and scheduling; multicomputer hardware and scheduling; distributed computing architecture; distributed system models; distributed shared memory and distributed file system; mutual exclusion and deadlocks in distributed systems; network operating system vs. distributed operating system.

### Unit – III

Real-time operating systems: Characteristics and classification of real-time systems; scheduling in real-time operating systems; trends in kernel design, exo-kernel and micro-kernel; virtualization; threads – concept, advantages, implementation.

### Unit – IV

Design issues in operating systems: Goals and nature of design problem; guiding principles and paradigms of interface design; issues in implementation of operating system; performance of operating system; security – cryptography, user authentication, inside and outside attacks, protection mechanism.

### Text/Reference Books:

1. Andrew S. Tanenbaum, Modern operating systems, 2e, Pearson – Prentice Hall.
2. Pramod Chandra P. Bhatt, An introduction to operating systems – concepts and practice, 3e, Prentice Hall, India.
3. Charles Crowley, Operating systems – A design oriented approach, Tata McGraw Hill.

staff council  
27/09/2021  
27-9-21

PG BSA R  
27/09/21  
27-9-21  
Kumar  
27/9/21

## MT-PT-43(i) DATA WAREHOUSING AND DATA MINING

L/T - 4

Total Credits – 4

Internal - 30 Marks

External – 70 Marks

**Note:-** Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

### Course Learning Objectives

1. To identify the scope and essentiality of Data Warehousing and Mining.
2. To analyze data, choose relevant models and algorithms for respective applications.
3. To study spatial and web data mining.
4. To develop research interest towards advances in data mining.

### Course Learning Outcomes:

1. Understand Data Warehouse fundamentals, Data Mining Principles
2. Design data warehouse with dimensional modeling and apply OLAP operations.
3. Identify appropriate data mining algorithms to solve real world problems
4. Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
5. Describe complex data types with respect to spatial and web mining.
6. Benefit the user experiences towards research and innovation. Integration

### Unit-I

Data Mining: Introduction: Motivation, Importance, data mining, kind of data, Functionalities, interesting patterns, classification of data mining system, Major issues, Data Mining Primitives.

Data Preparation: Preprocess, Data cleaning, Data Integration and transformation, Data reduction, Discretization and concept hierarchy generation.

### Unit-II

Data warehouse and OLAP Technology for data mining: data warehouse, difference between operational data base systems and data warehouse, A Multidimensional Data Model, Architecture, Implementation, data warehousing to data mining, Data warehouse usage.

### Unit-III

Association Rule Mining: Mining single-dimensional Boolean association rules from transactional databases, mining multilevel association rules from transaction databases, Mining multidimensional association rules from relational databases and data warehouses, From association mining to correlation analysis, constraint-based association Mining.

### Unit-IV

Classification and prediction, issues, classification by decision induction, Bayesian classification, classification by back propagation, classification based on concepts from association rule mining other classification methods .Cluster Analysis: What is Cluster Analysis, Types of Data in Cluster Analysis, Applications and Trends in Data Mining.


### Text/Reference Books:

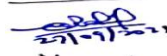
1. Ale Berson, Stephen Smith, Korth Theorling, *Data Mining*, TMH.
2. Adruaans, Longman, Addison-wesley *Data Mining*,

staff council  
27/09/2021  
27-9-21

PG Bosa R  
27/09/21  
27-9-21  
Kumar  
27/9/21

3. Addison-wesley Longman, *Data Warehousing in the Real World*.
4. Chanchal Singh, *Data Mining and Warehousing*, Wiley.
5. John E, Herbert P, *Data Mining*.

staff council  
  
27/09/2021  
H L  
27-9-21

PGBS&R  
  
H L  
27-9-21  
Kumar  
27/9/21

## MT-PT-43(ii) BIG DATA ANALYTICS

L/T - 4

Total Credits – 4

Internal - 30 Marks

External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

### Course Learning Objectives:

1. To provide an overview of an exciting growing field of big data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
3. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
4. To enable students to have skills that will help them to solve complex real-world problems in for decision support.

### Course Learning Outcomes:

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
3. Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
4. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

### UNIT I

Introduction, Wholeness of Big Data, Big Data Sources and Applications, Big Data Architecture.

### UNIT II

Distributed Computing Using Hadoop, Parallel Processing with Map Reduce, Application and Programming. NoSQL Databases, Big Data Programming Languages – Apache Hive, Apache Pig.

### UNIT III

BIG DATA PRIVACY, ETHICS AND SECURITY - Privacy – Reidentification of Anonymous People – Why Big Data Privacy is self regulating? , Ethics – Ownership – Ethical Guidelines – Big Data Security – Organizational Security

### UNIT IV

SECURITY, COMPLIANCE, AUDITING, AND PROTECTION- Steps to secure big data – Classifying Data – Protecting – Big Data Compliance – Intellectual Property Challenge – Research Questions in Cloud Security – Open Problems, HADOOP SECURITY DESIGN Kerberos – Default Hadoop Model without security - Hadoop Kerberos Security Implementation & Configuration, DATA SECURITY & EVENT LOGGING Integrating Hadoop with Enterprise Security Systems - Securing Sensitive Data in Hadoop – SIEM system – Setting up audit logging in hadoop cluster.



### Text/Reference Books:

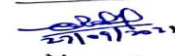

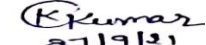
1. Mark Van Rijmenam, “Think Bigger: Developing a Successful Big Data Strategy for Your

staff council  
27/09/2021  
27-9-21

PG Bosa R  
27/09/21  
27-9-21  
Kumar  
27/9/21

2. Business”, Amazon, 1 edition, 2014.
3. Frank Ohlhorst John Wiley & Sons, “Big Data Analytics: Turning Big Data into Big Money”, John Wiley & Sons, 2013.
4. Sherif Sakr, “Large Scale and Big Data: Processing and Management”, CRC Press, 2014.
5. Sudeesh Narayanan, “Securing Hadoop”, Packt Publishing, 2013.
6. Ben Spivey, Joey Echeverria, “Hadoop Security Protecting Your Big Data Problem”, O’Reilly Media, 2015.
7. Boris Lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
8. Chris Eaton, Dirk Deroos et al., “Understanding Big Data”, McGraw Hill, 2012. 3. Tom White, “HADOOP: The definitive Guide” , O Reilly 2012

staff council  
  
27/09/2021  
  
27-9-21

PGBS&R  
  
  
27-9-21  
  
27/9/21

## MT-PT-43(iii) DATA SCIENCE

L/T - 4

Total Credits – 4

Internal - 30 Marks

External – 70 Marks

Note:-Total 09 Questions are to be set by the examiner. First question will be compulsory consisting of 5 short (each 2 marks) questions covering entire syllabus uniformly. In addition 8 more questions will be set unit wise comprising 2 questions from each unit of the given syllabus. A candidate is required to attempt five questions in all selecting one question from each unit including the compulsory question.

### Course Learning Objectives:

1. To know the fundamental concepts of data science and analytics
2. To learn various techniques for mining data streams
3. To learn event modeling for different applications.
4. To know about Hadoop and Map Reduce procedure

**Course Learning Outcomes:** Upon the completion of the course the student should be able to:

1. Work with big data platform and its analysis techniques.
2. Design efficient algorithms for mining the data from large volumes.
3. Model a framework for Human Activity Recognition
4. Development with cloud databases

### UNIT I

INTRODUCTION TO DATA SCIENCE – Applications - Data Science Process – Exploratory Data analysis – Collection of data – Graphical presentation of data – Classification of data – Storage and retrieval of data – Big data – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

### UNIT II

DATA ANALYSIS: Correlation – Regression – Probability – Conditional Probability – Random Variables – Analysis using Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis- Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics –

### UNIT III

DATA MINING TECHNIQUES: Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods- Neuro-Fuzzy Modeling – Association rule mining – Clustering – Outlier Analysis – Sequential Pattern Mining – Temporal mining – Spatial mining – Web mining.

### UNIT IV

FRAMEWORKS AND VISUALIZATION: Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – Cloud databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques – Social Network Analysis – Collective Inferencing – Egonets - Systems and Applications.

### Text/Reference Books:



1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.

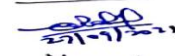

staff council  
27/09/2021  
27-9-21

PG Bosa R  
27/09/21  
27-9-21  
Kumar  
27/9/21



2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
4. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
5. Rachel Schutt, Cathy O'Neil, "Doing Data Science", O'Reilly Publishers, 2013.
6. Foster Provost, Tom Fawcet, "Data Science for Business", O'Reilly Publishers, 2013.
7. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2014.
8. S. N. Sivanandam, S. N Deepa, "Introduction to Neural Networks Using Matlab 6.0", Tata McGraw- Hill Education, 2006.

staff council  
  
27/09/2021  
  
27-9-21

PGBS&R  
  
  
27-9-21  
Kumar  
27/9/21