RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Departmental Elective IT 702(A) Data Science

Course Objective:
The objective of this course is to familiarize students with the roles of a data scientist and enable them to analyze data to derive meaningful information from it.

Unit I Data Science and Big Data Overview: Types of data, Sources of data, Data collection, Data storage and management, Big Data Overview, Characterization of Big data, Drivers of Big Data, Challenges, Big Data Use Cases, Defining Big Data Analytics and examples of its use cases, Data Analytics Lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize.

Unit II Advanced Analytical Theory and Methods: Clustering, K-means, Additional Clustering Algorithms, Association Rules, Apriori Algorithm, Applications of Association Rules, Regression, Linear Regression, Logistic Regression, Classification, Decision Trees, Naive Bayes, Additional Classification Methods, Text Analysis, Text Analysis Steps, Determining Sentiments.

Unit III Advanced Analytics-Technology and Tools: Analytics for Unstructured Data Use Cases, MapReduce, Apache Hadoop,Traditional database vs Hadoop, Hadoop Core Components, HDFS, Design of HDFS, HDFS Components, HDFS Architecture, Hadoop 2.0 Architecture, Hadoop-2.0 Resource Management, YARN.

Unit IV The Hadoop Ecosystem: Introduction to Hive, Hbase, HiveUse Cases: Facebook, Healthcare; Hive Architecture, Hive Components. Integrating Data Sources, Dealing with Real-Time Data Streams and Complex Event Processing, Overview of Pig, Difference between Hive and Pig, Use Cases of Pig, Pig program structure, Pig Components, Pig Execution, Pig data models, Overview of Mahout, Mahout working.

Unit V Introduction to R, Basic Data Analytics Methods Using R, Communicating and Operationalizing an Analytics Project, Creating the Final Deliverables, Data Visualization Basics.

References:

1. EMC Education Services, “Data Science and Big Data Analytics”, Wiley, 2015.
2. Judith Hurwitz, Alan Nugent, Fern Halper, and Marcia Kaufman, “Big Data for Dummies”,Wiley & Sons, 2013.
3. VigneshPrajapati, “Big Data Analytics with R and Hadoop” ,Packt Publishing, 2013.
4. David Dietrich, Barry Heller, and Beibei Yang“Data Science and Big Data Analytics:Discovering, Analyzing, Visualizing and Presenting Data”, John Wiley & Sons, Inc.

Course Outcomes:
After the completion of this course, the students will be able to:

1. Demonstrate proficiency with statistical analysis of data.

2. Build and assess data-based models.
3. Execute statistical analyses with professional statistical software.
4. Demonstrate skill in data management.
5. Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Departmental Elective IT 702(B) Cloud Computing

Course Objective:
The objective of this course is to provide students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications.

UNIT I
Introduction of Grid and Cloud computing, characteristics, components, business and IT perspective, cloud services requirements, cloud models, Security in public model, public verses private clouds, Cloud computing platforms: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing.

UNIT II
Cloud services- SAAS, PAAS, IAAS, cloud design and implementation using SOA, conceptual cloud model, cloud stack, computing on demand, Information life cycle management, cloud analytics, information security, virtual desktop infrastructure, storage cloud.

UNIT III
Virtualization technology: Definition, benefits, sensor virtualization, HVM, study of hypervisor, logical partitioning- LPAR, Storage virtualization, SAN, NAS, cloud server virtualization, virtualized data center.

UNIT IV
Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro- architectures; Identity Management and Access control-Identity management, Access control, Autonomic Security, Cloud computing security challenges: Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.

UNIT V
SOA and cloud, SOA and IAAS, cloud infrastructure benchmarks, OLAP, business intelligence, e-Business, ISV, Cloud performance monitoring commands, issues in cloud computing. QOS issues in cloud, mobile cloud computing, Inter cloud issues, Sky computing, Cloud Computing Platform, Xen Cloud Platform, Eucalyptus, OpenNebula, Nimbus, TPlatform, Apache Virtual Computing Lab (VCL), Anomaly Elastic Computing Platform.

References:
1. Dr.Kumar Saurabh, “Cloud Computing”, Wiley India.
2. Ronald Krutz and Russell Dean Vines, “Cloud Security”, Wiley-India.
3. Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, “Computing for Dummies”, Wiley India Edition.
4. Anthony T.Velte Toby J.Velte, “Cloud Computing – A Practical Approach”, TMH.
5. Barrie Sosinsky, ‘Cloud Computing Bible”, Wiley India.

Course Outcomes:
After the completion of this course, the students will be able to:

1. Explain the core concepts of the cloud computing paradigm
2. Demonstrate knowledge of virtualization
3. Explain the core issues of cloud computing such as security, privacy, and interoperability.
4. Choose the appropriate technologies, algorithms, and approaches for the related issues.
5. Identify problems, and explain, analyze, and evaluate various cloud computing solutions.

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New Scheme Based On AICTE Flexible Curricula

Information Technology, VII-Semester

Departmental Elective IT 702(C) SIMULATION & MODELING

Course Objective:
The objective of this course is to introduce students to basic simulation methods and tools for modeling and simulation of continuous, discrete and combined systems. The objective is to impart knowledge of simulation principles. The ability to create simulation models of various types.

Unit I
Modeling & Simulation Concepts Modeling & Simulation Concepts: System Concepts, What is a Model? Type of Models, Modeling & Simulation, Continuous vs. Discrete System Simulation, Numerical Integration vs. Continuous Simulation, Analog vs. Digital Simulation, Simulation vs. Monte- Carlo Simulation, Nature of Computer Modeling and Simulation, When to Use Simulation? Limitations of Simulation

Unit II
Probability Concepts in Simulation Stochastic variables, Random numbers: Pseudo-random generators, Testing of Pseudo-random number generators, Generation of non-uniformly distributed random numbers, discrete and continuous random variables, and density and distributive functions. Study of few distributions such as Poisson, Normal, Uniform

Unit III
Simulation of Continuous Systems Introduction, Differential equations, Pure Pursuit Problem, Simulation of Chemical Reaction, Autopilot Simulation and Simulation of other Continuous systems

Unit IV
Simulation of Discrete Systems Arrival patterns and service times, Simulation of Queuing System - Elementary idea about networks of Queuing with particular emphasis to computer system environment

Unit V
Verification & Validation Design of simulation experiments and validation of simulation experiments comparing model data units and real system data
Simulation Language A brief introduction to important discrete and continuous languages such as GPSS (Study & use of the language). Use of data base & AI techniques in the area of modeling and simulation

References:

1. Deo, Narsing "System Simulation with Digital Computers"
2. Gorden G, "System Simulation", Prentice Hall
3. Shridhar Bhai Trivedi, Kishore "Probability & Statistics with reliability Queuing, Computer Science Applications"
4. Payer, T.A., "Introduction to System Simulation", McGraw Hill
5. Reitman, J, "Computer Simulation Application", Wiley
6. Barnes B, "Modeling and Performance Measurement of Computer System
7. Spriet, WIA. "Computer Aided Modeling and Simulation (Academic Press).

Course Outcomes:
After the completion of this course, the students will be able to:

1. Define, describe and apply basic concepts related to modeling, identification and simulation
2. Classify various simulation models and give practical examples for each category.
3. Demonstrate the ability to apply knowledge of probability and statistics for *simulation & modeling*,
4. Generate and test random numbers and apply them to develop simulation models.
5. Construct a model for a given set of data and motivate its validity.

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Information Technology, VII-Semester

Departmental Elective IT 702(D) Augmented and Virtual Reality

Course Objective:
The objective of this course is to provide students a general introduction of Virtual and Augmented Environments followed by an analysis of features, requirement and issues in real-life applications.

Unit I Introduction to Virtual Reality- Virtual Reality and Virtual Environment: Introduction, Applications of Virtual Reality, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modeling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

Unit II Geometric Modeling- Geometric Modeling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

Unit III Virtual Environment -Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in betweening, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

Unit IV VR Hardware and Software- Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML

Unit V Augmented and Mixed Reality- Taxonomy, Technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

References:

1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
3. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley Inter Science, 2 nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann, 2008.
6. Alan B Craig, William R Sherman and Jeffrey D Will, Developing Virtual Reality Applications: Foundations of Effective Design, Morgan Kaufmann, 2009.

7. Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, 2005.
8. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

Course Outcomes:

After the completion of this course, the students will be able to:

1. Demonstrate knowledge of virtual reality and its applications
2. To describe the importance of viewing and projections.
3. Understand geometric modeling and Virtual environment.
4. Explain about virtual reality hardware and software
5. Develop Virtual Reality applications.