

**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL**

**New Scheme Based On AICTE Flexible Curricula**

**CSE- Data Science/Data Science, VII-Semester**

**CD702 (A) Data Analytics & Visualization**

**Unit 1:** Data Definitions and Analysis Techniques: Elements, Variables, and Data categorization Levels of Measurement Data management and indexing Introduction to Statistical Concepts: Sampling Distributions, Resampling, Statistical Inference and Descriptive Statistics, Measures of central tendency, Measures of location of dispersions

**Unit 2:** Advance Data analysis techniques: Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Regression Modelling, Multivariate Analysis, Bayesian Modelling, Inference and Bayesian Network, Regression analysis

**Unit 3:** Data Wrangling: Intro to Data Wrangling, Gathering Data, Assessing Data, Cleaning Data. Data Visualization in Data Analysis: Design of Visualizations, Univariate Exploration of Data, Bivariate Exploration of Data, Multivariate Exploration of Data, Explanatory Visualizations.

**Unit 4:** Data Ecosystem: Overview of the Data Analyst Ecosystem, Types of Data, Understanding Different Types of File Formats, Sources of Data, Overview of Data Repositories, NoSQL, Data Marts, Data Lakes, ETL, and Data Pipelines, Foundations of Big Data, Big Data processing tools such as Hadoop, Hadoop Distributed File System (HDFS), Hive, and Spark

**Unit 5:** Data Visualization tools: Python visualization libraries (matplotlib, pandas, seaborn, ggplot, plotly), Introduction to PowerBI tools, Examples of inspiring (industry) projects- Exercise: create your own visualization of a complex dataset.

**Text Books/References:**

1. Joel Grus, Data Science from Scratch, Shroff Publisher Publisher /O'Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Numsense! Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly Publisher Media.
4. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.
5. Jake VanderPlas, Python Data Science Handbook, Shroff Publisher Publisher /O'Reilly Publisher Media
6. Philipp Janert, Data Analysis with Open Source Tools, Shroff Publisher Publisher /O'Reilly Publisher Media.

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**CD702 (B) Wireless and Mobile Computing**

**Unit-1**

Review of traditional networks: Review of LAN, MAN, WAN, Intranet, Internet, and interconnectivity devices: bridges, Routers, etc. Review of TCP/IP Protocol Architecture: ARP/RARP, IP addressing, IP Datagram format and its Delivery, Routing table format, ICMP Messages, Subnetting, Super netting, and CIDR, DNS. NAT: Private addressing and NAT, SNAT, DNAT, NAT and firewalls, VLANS: Concepts, Comparison with Real LANS, Type of VLAN, Tagging, IPV6: address structure, address space and header.

**Unit 2**

Study of traditional routing and transport: Routing Protocols: BGP- Concept of hidden network and autonomous system, An Exterior gateway protocol, Different messages of BGP. Interior Gateway protocol: RIP, OSPF. Multiplexing and ports, TCP: Segment format, Sockets, Synchronization, Three Way Hand Shaking, Variable window size and Flow control, Timeout and Retransmission algorithms, Connection Control, Silly window Syndrome. Example of TCP: Tahoe, Reno, Sack etc. UDP: Message Encapsulation, Format and Pseudo header.

**Unit 3**

Wireless LAN: Transmission Medium For WLANs, MAC problems, Hidden and Exposed terminals, Near and Far terminals, Infrastructure and Ad hoc Networks, IEEE 802.11- System arch, Protocol arch, Physical layer, Concept of spread spectrum, MAC and its management, Power management, Security. Mobile IP: unsuitability of Traditional IP; Goals, Terminology, Agent advertisement and discovery, Registration, Tunneling techniques. Ad hoc network routing: Ad hoc Network routing v/s Traditional IP routing, types of routing protocols, Examples: OADV, DSDV, DSR, ZRP etc.

**Unit 4**

Mobile transport layer: unsuitability of Traditional TCP; I-TCP, S-TCP, M-TCP. Wireless Cellular networks: Cellular system, Cellular networks v/s WLAN, GSM – Services, system architecture, Localization and calling, handover and Roaming.

**Unit 5**

Mobile Device Operating Systems: Special Constraints & Requirements, Commercial Mobile Operating Systems. Software Development Kit: iOS, Android etc. MCommerce: Structure, Pros & Cons, Mobile Payment System, Security Issues

**TEXTBOOKS RECOMMENDED:**

1. Comer, “Internetworking with TCP/ IP Vol-I”, 5th edition, Addison Wesley, 2006.
2. Jochen Schiller “Mobile communication”, 2nd edition, Pearson education, 2008

**REFERENCE:**

1. W. Richard Stevens, “TCP/IP Illustrated Vol-I”, Addison-Wesley.
2. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education.
3. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”,

Springer

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**CD702 (C) Cloud Computing**

**Course Objective:** The objective of this course is to provide students with 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 versus 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, Microarchitectures; 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