

Jabalpur Engineering College, Jabalpur
(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)
(AICTE Model Curriculum Based Scheme) with Provision for Internship
Bachelor of Technology (B.Tech.) VIII Semester (Computer Science & Engineering)

w.e.f. July 2024

w.e.f. July 2024													
S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical			L	T	P	
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work					
1	CS801M	PEC-III	Professional Elective Course-III	70	20	10	-	-	100	3	1	-	4
2	CS802M	OEC-IV	Open Elective Course-IV	70	20	10	-	-	100	3	1	-	4
3	CS803M	PI	Major Project / Internship	-	-	-	150	100	250	-	-	16	8
Total				140	40	20	150	100	450	6	2	16	16

Note: 1. Departmental BOS will conduct the exam.

Note: 1. Departmental BOS will decide list of three optional subjects for PEC III as well as for OEC IV.

Professional Elective Course-III		
S.No.	Subject Code	Subject Name
1	CS801M A	Distributed Systems and Cloud Computing
2	CS801M B	Network Management
3	CS801M C	Data Warehousing & Mining

Open Elective Course-IV		
S.No.	Subject Code	Subject Name
1	CS802M A	Advanced Mobile Communication
2	CS802M B	Data Analytics
3	CS802M C	Ethical Hacking

Note: 2. Students going for internship would have to opt MOOC/NPTEL subjects decided / listed by the HOD / Coordinator.

Professional Elective Course-III		
S.No.	Subject Code	Subject Name
1	CS801M D	NPTEL-1
2	CS801M E	NPTEL-2
3	CS801M F	NPTEL-3

Open Elective Course-IV		
S.No.	Subject Code	Subject Name
1	CS802M D	NPTEL-4
2	CS802M E	NPTEL-5
3	CS802M F	NPTEL-6

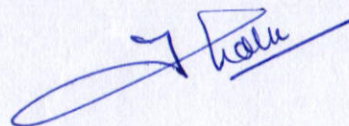
Note: 3. For Major Project / Internship, evaluation is based on work done, quality of report, presentation and performance in viva-voce through department project supervisor / Industry Project Coordinator.

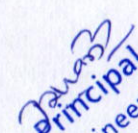
1 hour lecture (L) = 1 credit

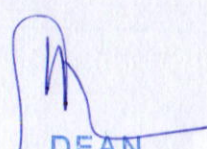
1 hour Tutorial (T) = 1 credit

2 hour Practical (P) = 1 credit

PEC: Professional Elective Course, OEC: Open Elective Course, PI: Project and Internship




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CS801M A	Distributed Systems & Cloud Computing	70	20	10	-	-	100	3	1	-	4

Module-I: Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks; Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, and termination detection.

Module-II: Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non-token based algorithms, performance metric for distributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized deadlock detection, distributed deadlock detection, path pushing algorithms, edge chasing algorithms.

Module-III: Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system. Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Module-IV: Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols

Module-V: Cloud Computing Definition: Cloud Types: private, public and hybrid cloud. Cloud computing Services: IaaS, PaaS, SaaS. Introduction to cloud Virtualization concepts. Types of Virtualization & its benefits. Benefits and challenges of cloud computing, Next generation Cloud Applications.

Suggested Books:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna, Gehrke, "Database Management Systems", McGraw Hill
3. Vijay K. Garg Elements of Distributed Computing, Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tanenbaum, Steen, "Distributed Systems", PHI
5. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, .
6. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security, CRC Press.



Distributed System & Cloud Computing (CS801M A)

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

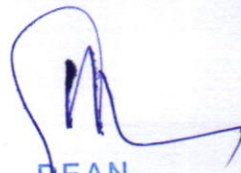
CO1: Explain fundamental concepts of Distributed System and Cloud Computing.

CO2: Classify various architectural and fundamental models of distributed system design.

CO3: Apply the election algorithms in a given scenario to select the coordinator.

CO4: Analyze different agreement protocols and communication protocols like RPC, RMI etc. in Distributed systems.

CO5: Examine various deadlock handling mechanisms in distributed environment.



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CS801M B	Network Management	70	20	10	-	-	100	3	1	-	4

Module-I: Introduction to Network Managements: Network Management Framework, Network Based Managements, Evolution of Network Management: SGMP, CMIP, SNMP. Network Implementation and Management Strategies, Network Management Categories: Performance Management, Fault Management, Configuration Management, Security Managements, Accounting Managements. Network Management Configuration: Centralized Configuration, Distributed Configuration. Selected Management Strategy.

Module-II: Management Information Base (MIB), Structure of Management Information, NMS Presentation of the SMI, NMS Meter-ware Network View. Remote Monitoring (RMON), RMON Group.
 Desktop Management: Desktop Management Interface (DMI), DMI Architecture, DMI Browser, DMI/SNMP Mapping, Desktop SNMP Extension Agents. Setting up LAN Access, SNMP Configuration.

Module-III: OSI Layering, TCP/IP Layering, Protocols & Standards, Internet standards, Internet administration, Internet Addresses, Internet protocol: introduction, IP header, IP routing, Subnet addressing, subnet mask, special case of IP addresses, Comparative Study of IPV4 & IPV6, port numbers Address Resolution Protocol, ARP packet format, Proxy ARP, ARP command, ARP Example, Reverse Address Resolution Protocol (RARP): Introduction, RARP Packet format, RARP Examples, RARP server design.

Module-IV: Delivery and Routing of IP Packets, Routing Methods, Static versus Dynamic Routing, Routing table and Routing Module, Classless Addressing: CIDR. Internet Protocol (IP), Datagram, Fragmentation, Options, IP Package. Interior and Exterior Routing, Routing information protocol (RIP), Open shortest path first protocol (OSPF), BGP, GGP. Private Networks. Virtual Private Network (VPN), Network Address Translation (NAT).

Module-V: Internet Control Message Protocols (ICMP):- Types of message, message format, error reporting, query, checksum, ICMP Package. IGMP, IGMP Message and its Operation, IGMP Package.

Transmission control protocol, Process-to-Process Communication, TCP Services Flow Control, TCP Timers. TCP Operation, TCP Package. Application layers protocols Telnet Protocol, File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP), X-Window system protocol, Remote procedure call, and Network file system.

Suggested Books:

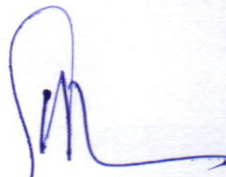
1. Forouzan, TCP/IP Protocol Suite 4th edition, TMH
2. J.Richard Burkey, Network Management Concept and Practice, PHI
3. Stevens, TCP/IP Illustrated Volume-I, Pearson
4. Tittel: TCP/IP, Cenage Learning
5. Uyless Black, TCP/IP and related protocols, McGraw Hill.
6. Doughals E. Comer, Internetworking with TCP/IP Vol. I, Principles, Protocols, and Architecture, Prentice Hall, India.

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Network Management (CS 801M B)

Course Outcomes: On successful completion of the course, the students will be able to:

- C01: Explain and demonstrate Network Management Architecture, Routing & Protocols used for Network Management.
- C02: Select Routing methods and Protocols for Network Based Management and Construct Computer Network.
- C03: Compare Routing Strategies, Network Configuration and various Protocols.
- C04: Select Network Management Protocols and maintain the network by performing a routine maintenance task



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CS801M C	Data Warehousing & Mining	70	20	10	-	-	100	3	1	-	4

Module-I: Data Warehousing: Introduction, Delivery Process, Data warehouse Architecture, Data Preprocessing: Data cleaning, Data Integration and transformation, Data reduction. Data warehouse Design: Data warehouse schema, Partitioning strategy Data warehouse Implementation, Data Marts, Meta Data, and Example of a Multidimensional Data model. Introduction to Pattern Warehousing.

Module-II: OLAP Systems: Basic concepts, OLAP queries, Types of OLAP servers, OLAP operations etc. Data Warehouse Hardware and Operational Design: Security, Backup and Recovery.

Module-III: Introduction to Data & Data Mining: Data Types, Quality of data, Data Preprocessing, Similarity measures, Summary statistics, Data distributions, Basic data mining tasks, Data Mining V/s knowledge discovery in databases. Issues in Data mining. Introduction to Fuzzy sets and fuzzy logic.

Module-IV: Supervised Learning: Classification: Statistical-based algorithms, Distance-based algorithms, Decision tree-based algorithms, neural network-based algorithms, Rule-based algorithms, Probabilistic Classifiers
Advanced techniques: Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing).
Bayesian approach to classifying text Web mining: classifying web pages, extracting knowledge from the web
Data Mining software and applications

Module-V: Clustering & Association Rule mining: Hierarchical algorithms, Partitional algorithms, Clustering large databases BIRCH, DBSCAN, CURE algorithms, Association rules: Parallel and distributed algorithms such as Apriori and FP growth algorithms.

Suggested Books:

1. Pang-Ning Tan, Steinbach & Kumar, "Introduction to Data Mining", Pearson Education.
2. Data Mining Techniques; Arun K.Pujari; University Press.
3. Jaiwei Han, Micheline Kamber, "Data Mining : Concepts and Techniques", Morgan Kaufmann Publishers.
4. Anahory & Murray, "Data Warehousing in the Real World", Pearson Education.
5. Margaret H. Dunham, "Data Mining : Introductory and Advanced topics", Pearson Education.
6. Data Mining; Adriaans & Zantinge; Pearson education.
7. Mastering Data Mining; Berry Linoff; Wiley.

Data Warehousing & Mining (CS801M C)

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

CO1: Understand the functionality of the various data mining and data warehousing components.

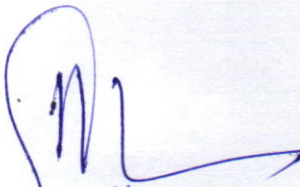
CO2: Analyse OLAP tools.

CO3: Apply Data Mining Techniques and methods on large data sets.

CO4: Compare and contrast classification and prediction techniques.

CO5: Explain data mining tools on various applications and understand the basics of big data analytics.




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CS 802M A	Advanced Mobile Communication	70	20	10	-	-	100	3	1	-	4

Module-I: Mobile Communications Overview: Evolution from 1G to 5G, Analog voice systems in 1G, digital radio systems in 2G, voice and messaging services, TDMA based GSM, CDMA, 2.5G (GPRS), 2.75G (EDGE); IMT2000, 3G UMTS, W-CDMA, HSPA, HSPA+, 3G services and data rates, IMT Advanced, 4G, LTE, VoLTE, OFDM, MIMO, LTE Advanced Pro (3GPP Release 13+), IMT2020, enhancements in comparison to IMT Advanced.

Module-II: Introduction to 5G Communication: 5G potential and applications, Usage scenarios, enhanced mobile broadband (eMBB), ultra reliable low latency communications (URLLC), massive machine type communications (MMTC), D2D communications, V2X communications.

Module-III: 5G Radio access technologies: Spectrum for 5G, spectrum access/sharing, millimeter Wave communication, channels and signals/waveforms in 5G, carrier aggregation, small cells, dual connectivity. New Radio (NR), Standalone and non-standalone mode, non-orthogonal multiple access (NOMA).

Module-IV: 5G Network: Massive MIMO, beam formation, PHY API Specification, flexible frame structure, Service Data Adaptation Protocol (SDAP), centralized RAN, open RAN, multi-access edge computing (MEC); Introduction to software defined networking (SDN), network function virtualization (NFV), network slicing; restful API for service-based interface, private networks.

Module-V: Current state and Challenges ahead: 5G penetration in developed countries; deployment challenges in low-middle income countries, stronger backhaul requirements, dynamic spectrum access and usage of unlicensed spectrum, contrasting radio resource requirements, large cell usage, LMLC, possible solutions for connectivity in rural areas (BharatNet, TVWS, Long-range WiFi, FSO); non-terrestrial fronthaul / backhaul solutions: LEOs, HAP/UAV.

Suggested Books:

1. Mobile Communications by Jochen Schiller Pub: Financial Times / Imprint of Pearson
2. Mobile Communications Design Fundamentals by William Lee, Pub: Wiley India Pvt. Ltd.
3. Wireless Communications: Principles and Practice by Theodore S. Rappaport, Pub: Pearson
4. Fundamentals of 5G Mobile Networks Jonathan Rodriguez Wiley First Edition.
5. 5G NR: The Next Generation Wireless Access Technology Erik Dahlman, Stefan Parkvall, Johan Skold Elsevier

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Advanced Mobile Communication (CS 802M A)

Course Outcomes: On successful completion of the course, the students will be able to:

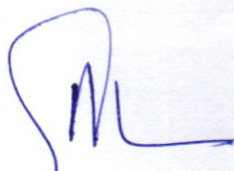

CO1: Understand the evolution of mobile communication standards developed over the years.

CO2: Evaluate the use of advanced techniques in cellular communications and understand D2D, MMTC, V2X communication and standardization.

CO3: Study the in-depth functioning of 5G radio access technologies.

CO4: Draw and explain 5G architecture, its components and functional criteria.

CO5: Understand current issues and future challenges in 5G.



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CS 802M B	Data Analytics	70	20	10	-	-	100	3	1	-	4

Module-I: 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 R-Programming Descriptive Statistics Measures of central tendency Measures of location of dispersions.

Module-II: Basic Data analysis techniques: Statistical hypothesis generation and testing, Chi-Square test, t-Test Analysis of variance Correlation analysis, Maximum likelihood test

Module-III: Advance Data analysis techniques: Regression Modelling, Multivariate Analysis, Bayesian Modeling, Inference And Bayesian Network, Regression analysis, Classification techniques, Clustering Techniques Clustering Association rules analysis

Module-IV: Frameworks and Visualization: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed File Systems – Visualizations – Visual Data Analysis Techniques, Interaction Techniques; Systems and Applications

Module-V: Case studies and projects: Understanding business scenarios, Feature engineering and visualization, Scalable and parallel computing with Hadoop and Map-Reduce Sensitivity Analysis, Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

Suggested Books:

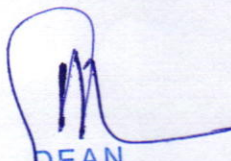
1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer.
2. Anand Rajaraman And Jeffrey David Ullman, Mining Of Massive Datasets, Cambridge University Press.
3. Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics, John Wiley & Sons.
4. Glenn J. Myatt, Making Sense Of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly.
5. Jiawei Han, Micheline Kamber "Data Mining Concepts And Techniques", Second Edition, Elsevier, Reprinted.



Data Analytics (CS802M B)

Course Outcomes:

- CO1: Demonstrate specialist knowledge of how a range of data sources and analytical methods are used to inform decision making across multiple domains.
- CO2: Understand Big Data and its analytics in the real world.
- CO3: Analyse the Big Data framework like Hadoop and NOSQL to efficiently store and process Big Data to generate analytics.
- CO4: Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm.



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CS 802M C	Ethical Hacking	70	20	10	-	-	100	3	1	-	4

Module-I: Ethical Hacking: Types of Data Stolen From the Organizations, Elements of Information Security, Authenticity and Non-Repudiation, Security Challenges, Effects of Hacking, Hacker – Types of Hacker, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks – Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors.

Module-II: Foot Printing And Social Engineering: Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering – shoulder surfing, Dumpster Diving, Piggybacking.

Module-III: Data Security: Physical Security – Attacks and Protection, Steganography – Methods, Attacks and Measures, Cryptography – Methods and Types of Attacks, Wireless Hacking, Windows Hacking, Linux Hacking.

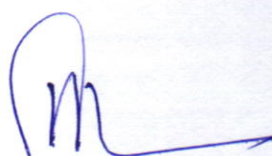
Module-IV: Network Protection System & Hacking Web Servers: Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking.

Module-V: Ethical Hacking Laws And Tests: An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing.

Suggested Books:

1. Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Network Defense", Second Edition, CENGAGE Learning.
2. Steven DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", CENGAGE Learning.
3. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series –Elsevier.
4. Whitaker & Newman, "Penetration Testing and Network Defense", Cisco Press, Indianapolis.

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Ethical Hacking (CS 802M C)


Course Outcomes: Upon completion of the course, the students will be able to.

CO1: Understand how intruders escalate privileges.

CO2: Understand intrusion Detection, Policy Creation, Social Engineering, Buffer.

CO3: Define overflows and different types of Attacks and their protection mechanism.

CO4: Learn about ethical laws and tests.



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