

OPTIONAL CORE I & OPTIONAL CORE II

Any 2 from the basket of...

1. Banking Technology & Payment Systems
2. Data Engineering
3. Computer Networks

Banking Technology & Payment Systems

Credits : 4

Brief description of the course:

This course is intended to provide the students an insight into the role played by technology in enhancing the effectiveness of the banking sector and also to provide a strong foundation in the various technologies used for delivering Banking & Financial Services. Apart from tracing the evolution of Banking Technology, this course will focus on the current technologies as well as banking technologies of the future. Ultimately, it will enable the student to envision the current and future requirements, architecture of banks and accordingly develop roadmap and strategies. It will help students appreciate the fact that technology cannot be viewed in isolation, which will be a crucial step in integrating the technology and business goals of banks.

Module A: Banking Operations – Overview

Introduction to Banking, Evolution of Banking Technology, Impact of technology on Banking Operations, Centralised Banking – concepts, and opportunities, Centralised Banking – Architectures, Challenges, and implementation & management issues

Module B: Delivery Channels

Products, Services and Delivery Technologies, ATM – technology and operations, Electronic cards – debit and credit, Smart cards in banking / e-Money / Internet Banking architecture and implementation, Internet Banking / Mobile banking management, Phone Banking and Call centres, Electronic Delivery Channels Integration

Module C: Back Office Operations

Credit Appraisal System, Forex Management/SWIFT, Treasury Management, Asset Liability Management, Risk Management – Operational risk, MIS / DSS / EIS for Banks, Data Centre and Business Continuity Management, Internal Workflow Applications, Corporate Intranet and Knowledge Management, Technology and Human Resources Management, IT overnance.

Module D : Electronic and Mobile Commerce

Introduction to Electronic Commerce, Business Models, Market Research and E-Commerce, Advertising in E-Commerce, Legal and Public Policy Issues relating to E-Commerce,

Introduction to mobile commerce, Mobile payment systems, Mobile banking, Mobile micro payments and mobile macro payments. Auctions, Agents in E-Commerce, E-Trading, B2B, B2C

Module E: Payment Systems

Introduction to Payment Systems, Payments through the Internet – privacy issues – Card based, net based payment systems, SET Protocol MICR, ECS, EFT, Global Payment Scenario – Interbank / Intra bank, RTGS, History of Money/Electronic Money/Electronic Cheques, Micro payments

References:

1. Bank 3.0, Brett King; John Wiley,, 2013
2. The Art of Better Retail Banking; Hugh Croxford, Frank Abramson, Alex Jablonowski, John Wiley, 2005
3. Business Knowledge for IT in Retail Banking – Bizle Professional Series, UK Edition, Essvale Corporation Ltd, 2007
4. Financial services information systems; Jessica Keyes, Auerbach; 2000
5. Technology management in financial services; Ross McGill; Palgrave Macmillan; 2008
6. Financial technology management. Vol. 1, Gulati, V.P, Srivastava, Shilpa; ICFAI University Press; 2008
7. Financial technology management. Vol. 2; Gulati, V.P, Srivastava, Shilpa; ICFAI University Press; 2008
8. Information system for banks; Bhaskaran R; Taxmann | IIBF; 2005
9. Electronic Commerce : A Managerial Perspective, Efraim Turban, Jae Lee, David King, H. Michael Chang, Pearson Education, New Delhi, 2001.
10. Electronic Commerce, Bhasker, Bharat, Tata McGraw-Hill, New Delhi, 2008.
11. M-commerce: technologies, services, and business models, Sadeh, Norman, John Wiley & Sons, 2002
12. Electronic Payment Systems for E-Commerce, Mahony, D., Peirce M., Tiwari, H., Artech House computer security series, 2001

Data Engineering

CREDITS: 4

Although relational database systems are almost commodity software now, researchers are even more fascinated by general data management issues. This course exposes students to use data as the means for understanding a process and learn advanced data management system design principles and concepts.

COURSE CONTENTS

Module 1: Relational data model, Relational Database Design, Indexing, Storage and File Structure, Indexing and Hashing, Query Processing, Query Optimization, Transactions, Concurrency, Recovery System

Module 2: Foundations of NoSQL, Data models, Distribution models, Consistency, Map-Reduce, Key-Value databases, Document Databases, Column-Family Stores, Graph Databases, Schema migrations, Beyond NoSQL

Module 3: Database Security within the General Security Landscape and a Defense-in-Depth Strategy, Database as a Networked Server, Authentication and Password Security, Application Security, Using Granular Access Control, Securing database-to-database communications, Encryption, Regulations and Compliance, Auditing Categories, Auditing Architectures

Module 4: Fundamentals of big data and big data analytics, Concepts of Hadoop, Related Technologies, Applications

Module 5: Introduction to Data Quality, Data Quality Dimensions, Models for Data Quality, Activities and Techniques for Data Quality, Data Quality Issues in Data Integration Systems, Methodologies for Data Quality Measurement and Improvement, Tools for Data Quality, Open Problems, Case studies

TEXT BOOKS & REFERENCES:

1. Readings in Database Systems (4th Ed.) by Michael Stonebraker and Joe Hellerstein, Morgan Kaufmann. The MIT Press (2005)
2. Database System Concepts (6th Ed.) Avi Silberschatz, Hank Korth, and S. Sudarshan. McGraw Hill, 2010.
3. Implementing Database Security and Auditing : A guide for DBAs, information security administrators and auditors, Ron Ben Natan 2005. ISBN: 978-1-55558-334-7
4. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pramod J. Sadalage, Martin Fowler. Addison Wesley 2012
5. Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information. Jules J. Berman. Morgan Kaufmann (2013)
6. Data Quality: Concepts, Methodologies and Techniques. Carlo Batini, Monica Scannapieco. Springer 2006.

SUGGESTED ASSIGNMENTS

Developing mini projects using RDBMS, NoSQL, and Hadoop

COMPUTER NETWORKS (M.Tech. Optional Core)

Course Syllabus

July 2014

Credits: 4

Prerequisites: C programming, Basic Networking Principles, Data Communications.

UNIT - I: DATA LINK LAYER

PPP, PPPoE, MAC Layer: Ethernet, Switched Ethernet, VLANs, Spanning Tree Protocol and its variants such as Rapid Spanning Tree.

UNIT - II: NETWORK LAYER: DATA PLANE

Internet Protocol Addressing: CIDR, Internet Protocol Datagram (including fragmentation and reassembly, routing options), IP Forwarding Algorithm, ARP, ICMP (including ICMP Redirect, ICMP Path MTU discovery, ICMP Destination Unreachable options).

UNIT - III: TRANSPORT LAYER

UDP, TCP sliding window protocol, TCP connection establishment, TCP reliability including cumulative and delayed acknowledgements, Nagle algorithm, Karn's algorithm for RTT and RTO estimation, TCP AIMD Congestion Control Algorithm, TCP half-close connections including TCP keepalive timer and probe timer, TCP Fast Retransmit and Fast Recovery.

UNIT - IV: NETWORK LAYER: CONTROL PLANE

Distance Vector Algorithm and Routing Information Protocols V1 and V2, Link State Algorithm and Open Shortest Path First Protocol (OSPF).

UNIT - V: APPLICATION LAYER

Domain Naming System (DNS) and Dynamic Host Configuration Protocol (DHCP). Telnet, SSH, FTP, HTTP, SMTP, Network Management using SNMP, P2P (Bittorrent and DHT).

TEXTBOOKS

1. Douglas Comer. *Computer Networks And Internets Sixth Edition*, 2014. ISBN 0133587932/9780133587937, Pearson Education.
2. Douglas Comer. *Internetworking With TCP/IP Volume 1: Principles Protocols, and Architecture, 6th edition*, 2013. ISBN-10: 0-13-608530-X ISBN-13: 9780136085300, Pearson Education.
3. Kevin R. Fall and W.Richard Stevens. *TCP/IP Illustrated, Volume 1: The Protocols, 2/E*, 2012, ISBN-10: 0321336313 ISBN-13: 9780321336316, Pearson Education.
4. James F. Kurose and Keith W. Ross. *Computer Networking: A top-down approach, 6th edition*, Pearson Education.
5. Radia Perlman. *Interconnections: Bridges, Routers, Switches, and Internetworking Protocols, 2/E*, 2000, ISBN-10: 0201634481 ISBN-13: 9780201634488. Pearson Education.

SUGGESTED ASSIGNMENTS

1. Implement the IP fragmentation and reassembly algorithm.
2. Implement the IP forwarding algorithm.
3. Implement the simplest sliding window protocol of TCP.
4. Connect two systems using a switch and configure private IP addresses to the systems and *ping* them from each other. Using *Wireshark*, capture packets and analyze all the header information in the packets captured.
5. Convert a system with two network interface cards (NICs) into a router by configuring each NIC in a different LAN and enabling forwarding. Use two switches to connect one NIC each of the router to these two switches. Connect two other systems, one each to each switch. Now, we have two VLANs. Ping from one system to the other through the router after configuring the required default routes in the hosts and static routes in the router.
6. Install *Telnet Server* on one of the systems connected by a switch and telnet to it from the other system. Using *Wireshark*, capture the packets and analyze the TCP 3-way Handshake for connection establishment and tear down.
7. Use Mininet to create multiple compute nodes, multiple VMs in each compute node, an OVS to connect VMs in a compute node and one OVS that connects the nodes. Configure IP addresses to these VMs in different VLANs, configure static routes in the VMs and *ping* them from one another.
8. Once the initial Mininet assignment is successful, try commands like *traceroute* to trace the route from one VM to another.