UNIVERSITY OF MUMBAI

Syllabus for Sem V & VI
Program: B.Sc.
Course: Computer Science

(Credit Based Semester and Grading System with
effect from the academic year 2013–2014)

T.Y.B.Sc. Computer Science Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2013-2014

SEMESTER V

Course	TOPICS	Credits	L / Week
USCS501	Data Communication, Networking & Security-I	2.5	4
USCS502	Advanced Java – I	2.5	4
USCS503	Operating Systems	2.5	4
USCS504	Database Management System - II	2.5	4
USCSP05	Practicals of USCS501 + USCS502	3	8
USCSP06	Practicals of USCS503 + USCS504	3	8

Theory

Course: USCS501	TOPICS (Credits : 2.5 Lectures/Week: 4) Data Communication, Networking & Security-I	
Unit I	**Introduction -** Data Communication, Networks, Internet, Intranet, Protocols, OSI & TCP/IP Models, Addressing **Physical Layer** – Signals, Analog, Digital, Analog VS Digital, Transmission Impairment, Data Rate Limits, Performance **Digital Transmission** – Line Coding (Unipolar, Polar, Biphase), Block Coding(4B/5B Encoding), Analog to digital conversion, PCM, Transmission Modes, **Analog Transmission** – Digital to analog conversion(ASK,FSK,PSK, QAM), Analog to Analog conversion	15 L
Unit II	**Multiplexing** – FDM, WDM, Synchronous TDM(time slots & frames, interleaving, data rate management), **Spread Spectrum** – FHSS, DSSS **Transmission Media** – Guided & Unguided **Switching** – Switching, Circuit-Switched Networks, Datagram networks, Concept of Virtual circuit networks, structure of circuit switch & packet switch, Concepts of DSL & ADSL	15 L
Unit III	**Data Link Layer** –Error correction & detection, Types of errors, Detection	15 L

	VS Correction, Block Coding, Hamming Distance, Linear Block codes(single parity check, hamming codes), Cyclic codes, CRC Encoder & Decoder, CRC Polynomial & its degree, Checksum **Data Link Control & Protocols** – Framing, Flow & Error Control, Simplest, Stop-N-Wait, Stop-N-Wait ARQ, Go Back N ARQ, Selective Repeat ARQ, Piggybacking **HDLC & PPP**– HDLC Modes, HDLC Frames, PPP, PPP Transition states	
Unit IV	**Multiple Access** – Random(CSMA), Controlled(Reservation, Polling, Token Passing), Channelization(FDMA, TDMA, CDMA) **Wired LAN –** LLC, MAC, Ethernet, Ethernet frame, Addressing, Concept of *M*Base*N* Ethernet, Bridged, Switched, Full Duplex Ethernet, Concept of Fast & Gigabit Ethernet **Wireless LAN -** Introduction to WLAN(Architecture, Hidden, Exposed Station Problem), Introduction to Bluetooth & Architecture, Cellular telephony, Concept of 1G, 2G, 3G cellular telephony **Connecting Devices** – Repeaters, Hubs, Bridges, Spanning tree algorithm, Two & Three layer Switches, Routers, Gateways, Backbone networks, Concept of VLAN	15 L

References
1) Data Communication & Networking (Forouzan), Tata McGraw-Hill Education
Additional Reference
1) Computer Networks and Internets - Douglas Comer, Prentice Hall
2) Computer Networks - Andrew Tanenbaum, Prentice Hall

Course: USCS502	TOPICS (Credits : 2.5 Lectures/Week: 4) **Advanced Java – I**	
Unit I	**Swing Components – I:** cIntroduction to JFC and Swing, Features of the Java Foundation Classes, Swing API Components, JComponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, Check Boxes, Menus, Pane, JScrollPane, Desktop pane, Scrollbars, Lists and Combo Boxes, Text-Entry Components.	15 L
Unit II	**Swing Components – II:**Toolbars, Implementing Action interface, Colors and File Choosers, Tables and Trees, Printing with 2D API and Java Print Service API. Threads and Multithreading, The Lifecycle of a thread, Creating and running threads, Creating the Service Threads, Schedules Tasks using JVM, Thread-safe variables, Synchronizing threads, Communication between threads.	15 L

Unit III	**JDBC:** JDBC Introduction, JDBC Architecture, Types of JDBC Drivers, The Connectivity Model, The java.sql package, Navigating the ResultSet object's contents, Manipulating records of a ResultSet object through User Interface , The JDBC Exception classes, Database Connectivity, Data Manipulation (using Prepared Statements, Joins, Transactions, Stored Procedures), Data navigation.	15 L
Unit IV	**Networking with JAVA:** Overview of Networking, Working with URL, Connecting to a Server, Implementing Servers, Serving multiple Clients, Sending E-Mail, Socket Programming, Internet Addresses, URL Connections. Accessing Network interface parameters, Posting Form Data, Cookies, Overview of Understanding the Sockets Direct Protocol. Introduction to distributed object system, Distributed Object Technologies, RMI for distributed computing, RMI Architecture, RMI Registry Service, Parameter Passing in Remote Methods, Creating RMI application, Steps involved in running the RMI application, Using RMI with Applets.	15 L

References

1) Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology (SPD)
2) Cay S. Horstmann, Gary Cornell, Core Java™ 2: Volume II–Advanced Features Prentice Hall PTR
3) Herbert Schildt, Java2: The Complete Reference, Tata McGraw-Hill

Additional Reference

1) The Java Tutorials of Sun Microsystems Inc.

Course: USCS503	**TOPICS (Credits : 2.5 Lectures/Week: 4)** **Operating Systems**	
Unit I	**Introduction:** Overview of Operating System, Evolution of Operating System, Different Services of Operating System, Operating System for Main frame Computer Systems: Batch Processing Systems, Micro programmed Systems, Time-Sharing System. Understanding Multiprogramming, Multiprocessing and Multitasking. Operating System for Multiprocessor Systems and Distributed Systems, Operating System for Client Server & Peer-to-Peer Systems, Clustered Systems. Real time Operating System **Components of Operating System:** Process Management, Main memory Management, Secondary storage Management, File Management, I/O Management. Operating System Services, Command Interpreter, Interface between user and Operating System. Introduction to System calls: Types of system calls	15 L

	System programs and Operating System Structure: Layered approach, Kernel based approach, Operating system design and Implementation. **Process Management:** Introduction to Process. Process states: two state and five state model, processes & resources, concurrent processes, process description, process control block and its role. Operation on processes, Cooperating processes	
Unit II	**Interprocess Communication and light weight process:** Direct & indirect communication, message passing, synchronization, buffering. Threads, single & multithreaded processes, user and kernel threads, multithreaded models, Threading issues, Creation of threads **CPU Scheduling and Process synchronization:** Need for Process scheduling, queuing diagram, scheduler and its types, Scheduling queues. Need for Process switching, context switching, process synchronization, CPU scheduling algorithms, General structure of a typical process, Critical Section Problem and its solutions, Two and multiple process solutions, Need for Mutual Exclusion, Classifying process interactions and Achieving mutual exclusion: Dekker's Algorithm, Peterson's Algorithm and their final correct solution for two processes. **Tools for process synchronization:** Semaphores, Binary semaphores, monitors, message passing: their use & implementation for mutual exclusion.	15 L
Unit III	**Classical Problems of Process synchronization:** Producer-Consumer problem for infinite and bounded buffers and its bounded buffer solution using Semaphore monitor and messages Reader-writer problem and its solutions with readers' priority and writers' priority, Dinning-Philosophers Problem and its solutions **Concurrency and Deadlock:** Deadlocks and their Characteristics, Resource Allocation Graph, methods of handling deadlocks. Deadlock prevention techniques, Deadlock detection and avoidance: safe and unsafe state, resource allocation algorithm, Banker's algorithm, Recovery from deadlock. **Memory management:** Memory Management and its need, swapping technique, Contiguous memory allocation. Paging and Segmentation, Segmentation with paging, Introduction to Virtual memory, Demand paging technique, Need for page replacement, Basic scheme, replacement algorithms, Thrashing and its cause.	15 L
Unit IV	**File System:** File Concept: attributes, operations, types, structure. File access methods, Different directory structure, File system structures, File system implementations. Directory implementations, Allocation methods, Free space management.	15 L

	I/O System: Principles of I/O hardware and Software: typical bus structure, polling, interrupts, direct memory access, application I/O Interface
	Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN. Examples related to disk arm movement.
	Operating System Security: Introduction to security problem, Program and system threats, Intrusion Detection, Computer –Security Classifications.

References

1) Operating System Concepts- Silberschatz, Galvin, Gagne, John wiley & Sons
2) Operating Systems- William stallings, Pearson-Prentice Hall.

Additional Reference

1) Operating Systems- Andrew Tanenbaum & Albert WoodHull, PHI.
2) Operating Systems – Achyut S Godbole, Tata Mc-Graw Hill,

Course: USCS504	TOPICS (Credits : 2.5 Lectures/Week: 4) Database Management System - II	
Unit I	**Decomposition:** Functional dependency, Closure of a set of functional dependency, Lossless-Join decomposition, Multi valued dependency and fourth normal form, Join dependency, Fifth normal form. **Concurrency Control:** Concept of a transaction, ACID properties, Serial and serializable schedules, Conflict and View serializabilty, Precedence graphs and test for conflict seralizability.	15 L
Unit II	**Enforcing serializability by locks:** Concept of locks, the locking scheduler, Two phase Locking, upgrading and down grading locks, Concept of dead locks, Concurrency control by time stamps, The Thomos Write rule. **Crash Recovery:** ARIES algorithm. The log based recovery, recovery related structures like transaction and dirty page table, Write-ahead log protocol, check points, recovery from a system crash, Redo and Undo phases.	15 L
Unit III	**Fundamentals of PL/SQL:** Defining variables and constants, PL/SQL expressions and comparisons: Logical Operators, Boolean Expressions, CASE Expressions Handling, Null Values in Comparisons and Conditional Statements, PL/SQL Datatypes: Number Types, Character Types, Boolean Type, Datetime and Interval Types. **Overview of PL/SQL Control Structures:** Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IF-THEN-ELSIF Statement, CASE Statement, Iterative Control: LOOP and	15 L

	EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements, Concept of nested tables.	
Unit IV	**Sequences:** creating sequences, referencing, altering and dropping a sequence. **Query evaluation:** System Catalog, Evaluation of relational operators like selection, projection, join and set, introduction to query optimization. **Cursors:** Concept of a cursor, types of cursors: implicit cursors; explicit cursor, Cursor for loops, Cursor variables, parameterized cursors, **Transactions in SQL:** Defining a transaction, Making Changes Permanent with COMMIT, Undoing Changes with ROLLBACK, Undoing Partial Changes with SAVEPOINT and ROLLBACK, Defining read only transactions, explicit locks: transaction and system level, Choosing a Locking Strategy: ROW SHARE and ROW EXCLUSIVE Mode.	15 L

References

1) Ramakrishnam, Gehrke, "Database Management Systems", McGraw- Hill.
2) Ivan Bayross, "SQL,PL/SQL -The Programming language of Oracle", B.P.B. Publications
3) Michael Abbey, Michael J. Corey, Ian Abramson, Oracle 8i – A Beginner's Guide, Tata McGraw-Hill.

Additional Reference

1) Elsmasri and Navathe, "Fundamentals of Database Systems", Pearson Education.
2) Peter Rob and Coronel, "Database Systems, Design, Implementation and Management", Thomson Learning
3) C.J.Date, Longman, "Introduction to database Systems", Pearson Education.
4) Jeffrey D. Ullman, Jennifer Widom, "A First Course in Database Systems", Pearson Education.
5) Martin Gruber, "Understanding SQL",B.P.B. Publications.
6) George Koch and Kevin Loney ,ORACLE "The Complete Reference", Tata McGraw Hill,New Delhi

Practicals

USCSP05	**Practicals of USCS501 + USCS502 (Credits: 3, Pract/Week: 8)**
	1. Study of URL, InetAddress and its members 2. Study of URLConnection & to read the contents. 3. Study of URLConnection & to write to it. 4. Study of Connection-less approach using datagram-approach 5. Study of connection-oriented approach using ServerSocket 6. Creating server process using ServerSocket 7. Sending Email through Java 8. Designing RMI Application
	1. Using Basic Swing Controls 2. Using JScrollPane, JTabbedPane, JDesktopPane

	3. Using Common Dialog Boxes 4. Using JTable and JTree 5. Creating Table in database 6. Inserting data in tables & Displaying data 7. Using ResultSetMetaData 8. Using Prepared Statements
USCSP06	**Practicals of USCS503 + USCS504 (Credits: 3, Pract/Week: 8)**
	1. Demonstrate round-robin/ priority-based scheduling using thread 2. For any of the scheduling algorithm that uses thread, calculate turn-around time for each job. 3. Demonstrate the concept of synchronized access to shared resource 4. Demonstrate the use of inter-process communication 5. Demonstrate any one of deadlock avoidance algorithm 6. Demonstrate the use of memory management with first fit/best fit/worst fit using arrays. 7. Demonstrate any one of the page replacement algorithm. 8. Demonstrate any of the disk scheduling algorithms.

	1. Writing PL/SQL Blocks with basic programming constructs by
	including following:
	    a. Sequential Statements
	    b. unconstrained loop
	    c. If...then...Else, IF...ELSIF...ELSE... END IF
	2. Writing PL/SQL Blocks with basic programming constructs by
	including following:
	    a.. Insert value in while loop
	    b. CASE WHEN statement with variable
	    c. Use GoTO to jump out of a loop, NULL as a statement inside IF
	3. Procedures in PL/SQL Block
	    a. Create an empty procedure, replace a procedure and call procedure
	    b. Create a stored procedure and call it
	    c. Define procedure to insert data
	    d. A forward declaration of procedure
	4. Functions in PL/SQL Block
	    a. Define and call a function
	    b. Define and use function in select clause,
	    Call function in dbms_output.put_line
	    c. Recursive function
	    d. Count Employee from a function and return value back
	    e. Call function and store the return value to a variable
	5. Cursors with
	    a. Types: Implicit Cursor and Explicit Cursor
	    b. Cursor for loops

	c. A program for simple loop and fetching the cursor.
	d. Create a cursor in for statement.
	6. Cursors with
	    a. A cursor with sub queries
	    b. Combination of PL/SQL, cursor and for loop
	    c. Parameterized cursors
	    d. Cursor Variables
	7. Creating and working with Sequences
	8. Study of transactions and locks

T.Y.B.Sc. Computer Science Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2013-2014

SEMESTER VI

Course	TOPICS	Credits	L / Week
USCS601	Data Communication, Networking & Security-II	2.5	4
USCS602	Advanced Java - II	2.5	4
USCS603	Linux	2.5	4
USCS604	Software Engineering	2.5	4
USCSP07	Practicals of USCS601 + USCS602	3	8
USCSP08	Practicals of USCS603 + USCS604	3	8

Theory

Course: USCS601	TOPICS (Credits : 2.5 Lectures/Week: 4) Data Communication, Networking & Security-II	
Unit I	**Network Layer** –Logical addressing, IPv4 Addresses, Classful & Classless addresses, NAT, IPv6 Addressing, **Network layer protocol** – Internetworking, IPv4, IPv4 protocol packet format, IPv6 Protocol & Packet format, IPv4 VS IPv6, Transition from IPv4 to IPv6, Address Resolution protocols(ARP, RARP), BOOTP, DHCP, **Routing Protocols** - Delivery, forwarding, routing, types of routing, routing tables, Unicast Routing, Unicast Routing protocols, RIP, Concepts of OSPF, BGP & Multicast Routing	15 L
Unit II	**Transport Layer -** Process to process delivery, UDP, TCP **Congestion Control & Quality of Service**- Data traffic, Congestion, Congestion Control(Open Loop, Closed Loop & Congestion control in TCP), QoS and Flow Characteristics **Application Layer** - DNS, Remote Logging(Telnet), SMTP, FTP, WWW, HTTP	15 L
Unit III	**Introduction:** Introduction to system and network security, security attacks, security services and mechanisms. **Malicious software and Internet Security:** viruses and related threats, virus countermeasures, denial of service attacks, *Hacking,* Security policies and plan, Strategies for a secure network.	15 L

	Firewall and Intrusion Detection: Firewalls and their types, DMZ, Limitations of firewalls, Intruders, Intrusion detection (Host based, Networked, Distributed), IDS.	
Unit IV	**Cryptography:** Traditional and Modern Symmetric-Key Ciphers, DES and AES, Asymmetric –Key Cryptography, RSA and ELGAMAL cryptosystems. Message Digest, Digital Signature, Key Management **Network Security:** Security at Application Layer (E-MAIL, PGP and S/MIME), Security at Transport Layer (SSL and TLS), Security at Network Layer (IPSec).	15 L

References

1) Data Communication & Networking (Forouzan) , Tata McGraw-Hill Education
2) Cryptography & Network Security, Behrouz A. Forouzan, Tata McGraw-Hill,
3) Network security essentials-applications and standards, William Stallings, Third Edition, Pearson Education

Additional Reference

1) Computer Networks and Internets - Douglas Comer, Prentice Hall
2) Computer Networks - Andrew Tanenbaum, Prentice Hall

Course: USCS602	**TOPICS (Credits : 2.5 Lectures/Week: 4)** **Advanced Java - II**	
Unit I	What Is a Servlet? The Example Servlets, Servlet Life Cycle, Sharing Information, Initializing a Servlet, Writing Service Methods, Filtering Requests and Responses, Invoking Other Web Resources, Accessing the Web Context, Maintaining Client State, Finalizing a Servlet.	15 L
Unit II	What Is a JSP Page?, The Example JSP Pages, The Life Cycle of a JSP Page, Creating Static Content, Creating Dynamic Content, Unified Expression Language, JavaBeans Components, JavaBeans Concepts, Using NetBeans GUI Builder Writing a Simple Bean, Properties: Simple Properties, Using Custom tags, Reusing content in JSP Pages, Transferring Control to Another Web Component, Including an Applet.	15 L
Unit III	Introduction to EJB, Benefits of EJB, Types of EJB, Session Bean: State Management Modes; Message-Driven Bean, Differences between Session Beans and Message-Driven Beans, The Contents of an Enterprise Bean, Naming Conventions for Enterprise Beans, The Life Cycles of Enterprise Beans, The Life Cycle of a Stateful Session Bean, The Life Cycle of a Stateless Session Bean, The Life Cycle of a Message-Driven Bean	15 L
Unit IV	Defining Client Access with Interfaces: Remote Access, Local Access, Local Interfaces and Container-Managed Relationships, Deciding on Remote or Local Access, Web Service Clients, Method Parameters and Access. Building Web Services with JAX-WS: Setting the Port, Creating a	15 L

Simple Web Service and Client with JAX-WS.

References

1) Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology (SPD)
2) Eric Jendrock, Jennifer Ball, D Carson and others, The Java EE 5 Tutorial, Pearson Education
3) Bryan Basham, Kathy Sierra, Bert Bates, Head First Servlets and JSP, O'reilly (SPD)
4) The Java Tutorials of Sun Microsystems Inc.

Additional Reference

1) Cay S. Horstmann, Gary Cornell, Core Java™ 2: Volume II–Advanced Features Prentice Hall PTR, 2001
2) Ivan Bayross, Web Enabled Commercial Applications Development Using Java 2, BPB Publications

Course: USCS603	TOPICS (Credits : 2.5 Lectures/Week: 4) Linux	
Unit I	**Linux System:** History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File system, I/O. **Linux Basics:** Looking into the Linux Kernel, GNU Utilities, Desktop environments, The Linux console The Unix/Linux architecture, Features of Unix/Linux. **Basic bash shell commands:** Starting the shell, Shell prompt, File system Navigation, File and directory listing, File handling, Directory handling, Viewing file contents **More bash shell commands:** Monitoring programs, Monitoring disk space, Working with data files: Sorting, Searching, Compressing, Archiving **The Linux environment variable:** Environment variables, setting environment variables, Removing environment variables, Default shell environment variables, setting the PATH environment variables, Locating system environment variables, Variable arrays, Using command aliases	15 L
Unit II	**Understanding Linux file permission:** Linux security, Using Linux groups, Decoding file permissions, Changing security settings, Sharing files **Basic script building:** Using multiple commands, Creating a script file, Displaying messages, Using variables, Redirecting Input and Output, Pipes, Performing math, Exiting the script. **Using structured commands:** Working with the if-then, if-then-else and nesting if statements, test command, Compound condition testing, advanced if then features, the case command.	15 L

	More structured commands: for command, C-style for command, while command, until command, nesting loops, Looping on file data, controlling the loop, processing the o/p of a loop. **Handling user input:** Command line parameters, Special parameter variables, shift command, working with options, Standardizing options, Getting user I/P	
Unit III	**Presenting data:** Understanding I/O, Redirecting O/p in scripts, Redirecting I/p in scripts, Creating your own redirection, Listing open file descriptors, Suppressing command o/p, Using temporary files, Logging Messages. **Script control:** Handling signals, Running scripts in background mode, Running scripts without a console, Job control, Job Scheduling Commands: nice, renice, at, batch, cron table, Running the script at boot. **Editors:** Sed and awk **TCP/IP networking:** TCP/IP Basics, TCP/IP Model, Resolving IP addresses, Applications, telnet, ftp, Berkeley commands.	15 L
Unit IV	**Linux Firewall:** Introduction to firewall, Displaying status of firewall, Turning an iptables Firewall on/off, Testing firewall, Configuring the firewall for Remote SSH Administration **Essential System Administration:** root: The system administrator's login, The administrator's privileges, Startup & Shutdown. **Advanced System Administration:** Partitions & file systems, /etc/fstab, fsck, System startup and init, Shutdown & sync operation	15 L

References

1) Unix Concepts and Applications, Sumitabha Das., TMH.
2) Linux Command line and Shell Scripting: Bible, Richard Blum, Wiley-India.
3) Linux Networking Cookbook, Carla, Schroder, O'reilly.

Additional Reference

1) Unix Complete Reference, TMH.
2) Linux Complete Reference, TMH.
3) Linux Command Reference – Shroff

Course: USCS604	**TOPICS (Credits : 2.5 Lectures/Week: 4)** **Software Engineering**	
Unit I	**Project management**: Revision of Project Management Process, Role of Project Manager, Project Management Knowledge Areas, Managing Changes in requirements, **Role of software Metrics** **Size & Effort Estimation:** Concepts of LOC & Estimation, Function Point, COCOMO Model, Concept of Effort Estimation & Uncertainty **Project Scheduling**: Building WBS, Use of Gantt & PERT/CPM chart	15 L

Unit II	**Staffing Configuration Management** Process & Functionality & Mechanism, Process Management, CMM & its levels, Risk Management & activities **Management of OO software** Projects - Object oriented metrics, Use-Case Estimation, Selecting development tools, Introduction to CASE **Changing Trends In Software Development** - Unified Process, Its phases & disciplines, Agile Development – Principles & Practices, Extreme programming- Core values & Practices Frameworks, Components, Services, Introduction to Design Patterns, Open Source	15 L
Unit III	**Software Testing:** Introduction to Quality Assurance, Six Sigma, Testing Fundamentals, Common Terms(like Error, Fault, Failure, Bug, Crash) Objectives of testing, Challenges in Testing, Principles of Testing, **Static Testing** – Introduction & Principles. **Types of Testing** – Levels of testing such as Unit testing, Integration testing, System testing, Validation Testing, Acceptance testing, Types of testing such as Black box, White Box, Functional, Performance, Regression, Acceptance, Volume, Stress, Alpha, Beta testing **Planning Software Testing** – Test Plan, Test Plan Specification, Test Case Execution and Analysis, Defect logging and tracking	15 L
Unit IV	**Black Box Testing** : Introduction, Equivalence partitioning, Boundary-value analysis, Robustness testing, Cause Effect Graph **White Box Testing** :Statement Coverage, Branch/Decision Coverage, Condition Coverage, Graph Matrix, Cyclomatic complexity, Mutation Testing **Object Oriented Testing & Web site testing –** Object Oriented Testing Strategies, Testing methods, Overview of web site testing	15 L

References

1) System Analysis & Design – Satzinger, Jackson,Burd,Cengage Learning, India.
2) Software Engineering- A Practitioner's Approach, McGraw Hill Int.
3) Integrated Approach to Software Engineering - Pankaj Jalote (Narosa)

Additional Reference

1) Design Patterns – Elements of Reusable Object-Oriented Software, Pearson By – Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides,
2) Software Engineering: Waman Jawadekar, TMH
3) Software Engineering : Sommerville, Pearson Education

Practicals

USCSP07	Practicals of USCS601 + USCS602 (Credits: 3, Pract/Week: 8)
	1. Basic Linux commands such as file and directory manipulation, redirection and piping 2. Basic filter commands such as head, tail, more, cat, sort, cut, grep 3. Advanced filters such as egrep, fgrep, tr, sed, awk 4. File operation commands such as – split, tar, find, zip, ln, chmod 5. Basic shell scripting such as – defining variables, reading user input, conditions, loops, string operations, arithmetic operations 6. Advanced shell scripting such as - environment variables, shell features, command line arguments, file tests, using backticks, 7. Process management such as –ps, jobs, nice, fg, bg, at 8. Linux system administration such as – user management, mounting, job control(crontab), chown, chgrp etc
	1) Simple Server-Side Programming using Servlets 2) Advance Server-Side Programming using Servlets 3) Simple Server-side programming using JSP 4) Advance Server-side programming using JSP 5) Developing Simple Enterprise Java Beans 6) Developing Advance Enterprise Java Beans 7) Developing Simple Web services in Java 8) Developing Advance Web services in Java
USCSP08	Practicals of USCS603 + USCS604 (Credits: 3, Pract/Week: 8)
	Project Documentation 1) **Acknowledgement** 2) **Preliminary Investigation** - Organizational Overview, Description of System, Limitations of present system, Proposed system and its adv. [For web project, URL can be mentioned], Feasibility Study, Stakeholders, Technologies used, Gantt Chart 3) **System Analysis** - Fact Finding Techniques (Questionnaire, Sample Reports, Forms...), Prototypes(if any), Event Table, Use Case Diagram, Scenarios & Use Case Description, ERD, Activity Diagram, Class diagram, Object Diagram, Sequence diagram/Collaboration Diagram, State diagram 4) **System Design** - Converting ERD to Tables, Design Class diagram[with UI classes, Persistent classes etc…], Component Diagram, Package Diagram, Deployment Diagram 5) **System Coding**- Menu Tree / Sitemap, List of tables with attributes and constraints, Design Patterns used (if any), Program Descr[Programs /Classes and their responsibilities in brief] with Naming Conventions, Validations, Test Cases, Test Data and Test Results [Write test cases for all important programs], Screen Layouts & Report Layouts, Program Listing[for dummy project] 6) **System Implementation / Uploading** 7) **Future Enhancements** 8) **References and Bibliography**

	Note – **Project documentation will carry 50 marks. They will be distributed as follows** – 1. Preliminary Investigation – 10 marks 2. System Analysis – 10 marks 3. System Design – 10 marks 4. System Coding & Implementation – 20 marks

	Project Development
	1) Faculties should arrange project demos for SY students at the end of the year or just at the beginning of TY. The demos can be of some good students of previous TY batches or it can be a project developed by faculties themselves.
	2) SY students should be encouraged to start finding projects in the vacation. Faculties may take one or two introductory sessions for SY students before the vacation which will help students to work on preliminary investigation phase during vacation.
	3) It can be Stand Alone, Multi-user or Web Based. Projects can be done in **any technology** and should have data stored in **DBMS**.
	4) Each student shall do the project **individually**, though a project with the same topic name could be done by more than one student.
	5) A project guide should be assigned to students. He/she will assign a schedule for each phase of the project and hand it over to students. The guides should oversee the project progress on a weekly/fortnightly basis. The guides should control iteration if any non-linear technique is used for project development. Sample phases can be as follows – Preliminary investigation, System Analysis, System Design, Coding, Implementation, Project Report Submission
	6) College can arrange few sessions by experienced industry people on project management/best practices/technologies etc.
	7) After the completion of phase/projects, demos can be planned in front of faculties/clients/students.
	8) **Projects should have at least following:**
	   a) Good content management, presentation & meaningful images
	   b) Data Entry with Validations
	   c) Suitable navigation scheme(menus/toolbars/tabs/links etc)
	   d) Record Manipulation(add, update, delete, display, search ,sort)
	   e) Transactions / Sessions /Reports / Feedback/Registration whichever applicable
	   f) Login accounts(Admin & User) with separate functionalities for administrators and users
	9) A certificate should be added in the project report which should contain the following information –
	   a) The fact that the student has successfully completed the project as per the syllabus and that it forms a part of the requirements for completing the BSc degree in computer science of University of Mumbai.
	   b) The name of the student and the project guide,
	   c) The academic year in which the project is done,

	d) Date of submission,
	e) Signature of the project guide and the head of the department with date along with the department stamp,
	f) Space for signature of the university examiner and date on which the project is evaluated.
	10) Project should be evaluated by External Examiner as follows (Project Quality →20 marks, Working of Project → 20 marks, Student's Presentation → 10 marks)
	Note →
	i. **Evaluating "Project Quality"**: It involves overall modules included in the project, whether it was sufficiently large enough, whether validations were done for data entry, variety of reports etc.
	ii. **Evaluating "Working of the Project"**: It involves error-free execution of the project.
	iii. **Evaluating Student's Presentation:** Marks can be given based on the presentation skills of a student. A student can prepare a power point presentation for the project.