LECTURE PLAN

MCA

SEMESTER V

FOR PRIVATE CIRCULATION

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LECTURE PLAN

LINUX PROGRAMMING

MCA 301

COURSE OUTLINE
MCA-V SEMESTER
LINUX PROGRAMMING - MCA 301

L – 03 T - 01 Credit - 04

OBJECTIVE:

Alone among open-source Operating Systems, Linux has achieved critical mass. It's a strategic platform for big hardware and software vendors like Oracle, HP, and IBM. There are thriving Linux vendors like Red Hat and SuSE (now part of Novell). Linux really can be a substitute for UNIX. Linux is having a dramatic effect on the balance of power between vendors and between users and vendors.

The objective of the course is to make students learn the basics of Linux, user management, file management, shells available in Linux, shell scripting and the concepts of socket programming and its applications.

INTERNAL ASSESSMENT AND ASSIGNMENT (40 Marks)

1. Class Test-I – (Written Test) 15 marks
2. Class Test-II - (Written Test) 15 marks
3. Class Assessment + Attendance 10 marks

COURSE CONTENTS

A. INTRODUCTION TO LINUX (10 Hours)

- Linux – The Operating System
- Linux history
- Linux features
- Linux distributions
- Linux's relationship to Unix
- Overview of Linux architecture
- Installation, Start up scripts, system processes (an overview)
- Linux Security
- The Ext2 and Ext3 File systems :General Characteristics of, The Ext3 File system
- User Management: Types of users, The powers of Root, managing users

B. RESOURCE MANAGEMENT IN LINUX (10 Hours)

- Resource Management in Linux: file and directory management
- System calls for files
- Process Management, Signals, IPC: Pipes, FIFOs, System V IPC, Message Queues, system calls for processes,
- Memory Management

C. SHELL PROGRAMMING (10 Hours)

- Shell Programming: Available shells under Linux (viz. Bash, TCSH, Korn or so on)
- Different Shell features, editors, shell commands

- Shell scripts: shell variables, environmental variables, purpose of shell scripts, writing, storing and executing scripts
- Filters- The grep family, advanced filters-sed and awk.

D. NETWORKING IN LINUX (10 Hours)

- Socket introduction
- Elementary TCP sockets (socket function, connect function, bind, listen, accept, fork and exec)
- TCP client server example
- Elementary UDP sockets.

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Linux programming, and students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOKS:**

1. **Author's Name(s):** Cox K
   Title: Red Hat Linux Administrator's Guide
   Edition: I **Year:** 2009
   Publisher:PHI (ibid 1)

2. **Author's Name(s):** Sumitabha Das
   Title: UNIX Concepts and application
   Edition: IV Year**:** 2013
   Publisher: Tata McGraw Hill Publishing Co. Ltd (ibid 2)

3. **Author's Name(s):** W R Stevens
   Title: UNIX Network Programming
   Edition: II **Year:** 2013
   Publisher: PHI
   (ibid 3)

- **REFERENCE BOOKS:**

1. **Author's Name(s):** Peterson Richard
   Title: The Complete References Linux
   Edition: VI **Year:** 2010
   Publisher: Tata McGraw Hill Publishing Co. Ltd (ibid 4)

2. **Author's Name(s):** K. L. James
   Title: Linux – Learning the Essentials
   Edition: I **Year:** 2012
   Publisher: PHI (ibid 5)

- **PERIODICAL:**

1. Linux Journal
2. Linux Magazine

LECTURE 1

LINUX - THE OPERATING SYSTEM

OBJECTIVE:

The objective is to understand the basics of Linux operating system. Linux is freeware as a result its importance is immense in today's world where everything comes at a price. Linux holds a unique place as it is a free software.

CONTENTS:

- Introduction to Linux
  - Linux Overview
  - Linux distributions
    - RPM Based Distributions
    - Deb Based Distributions
- Linux History
- Linux Features
  - Multitasking
  - Multiprocessing
  - Architecture Independence
  - Demand Load Executables
  - Paging, Dynamic Cache for Hard disk
  - Shared Libraries
  - Memory Protected Mode
  - Support for National keyboards and fouls

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q1 – 4
2 Refer Unit 1 Section 3 Q1- 6

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 4, Page No. 3-13
2 ibid 5, Page No. 1-20

ARTICLES:

1 Bill Childers, "Ubuntu 10.10, Maverick Meerkat in Amazon EC2", Linux Journal, Issue 202, February 2011, Page 41-47
2 Ian McDonald, "Linux Kernel Development", http://wand.net.nz/~iam4/papers/linuxdev.pdf
3 MelekamTsegaye,Richard Foss,"A Comparison of the Linux and Windows Device Driver Architectures", http://www.cs.ru.ac.za/research/g98t4414/static/papers/oscomposr.pdf

LECTURE 2

LINUX INSTALLATION

OBJECTIVE:

To make the students understand the basics of Linux installation. Linux uses two different boot loaders LILO and GRUB. In this lecture students will be taught about these two boot loaders.

CONTENTS:

- Recommended partitioning Scheme
- Partitioning with disk
- Formatting Partitions
- Installing LILO
- Configuring LILO
- Network Configuration
- Firewall configuration
- Selecting Individual Packages
    - A Brief Introduction to GHOME
    - A brief Introduction to KDL
- Linux's Relationship to Unix
- Difference between Linux , Unix and Windows Operating System

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q 1 – 4, 23-36
2 Refer Unit 1 Section 3 Q 9 – 28

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 20-36

REFERENCE BOOKS:

1 ibid 4, Page No. 17-27
2 ibid 5, Page No. 38-64

ARTICLES:

1 Rick Rogers, "Create Your Own Linux Desktop and Take it with you", Linux Journal, Issue 202, February 2011, Page 60-67.
2 Klaus Knopper, "Live Linux", Linux Magazine, April 2015, Page 34-37.
3 Martin Loschwitz, " War of Succession", Linux Magazine, July 2015, Page 30-31.

LECTURES 3-4

LINUX ARCHITECTURE

OBJECTIVE

To understand the architecture and installation of Linux Operating System. In these lectures students will be taught about the booting process of the Linux.

CONTENTS:

- Overview of Linux Architecture
- Booting the Installation Program
- Selecting an Installation Method
- Beginning the Installation
- Installing from CD-ROM
- Installing Red Hat Linux
- Language Selection
- Keyboard Configuration
- Mouse Configuration
- Install Option
- Automatic Partitioning
    - Partitioning the system
    - Partition fields

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q18, 20, 31
2 Refer Unit 1 Section 3 Q1, 17, 19

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 5-36

REFERENCE BOOK:

1 ibid 5, Page No. 21-37

WEBSITE:

1 www.wireless.ictp.trieste.it/school.../linux/linux.../install_guide_3.2.pdf

ARTICLES :

1. Ronald W. McCarty Jr., “Security Search”, Linux Magazine, July 2015, Page No. 20-25.
2. Ferdinand Thommes, “ Snap Stack”, Linux Magazine, July 2015, Page No.34-36.

LECTURES 5-7

LINUX PROCESSES

OBJECTIVE:

To make students understand the rudimentary principles of starting and stopping the Linux system. Also, an overview of the start up scripts will be given. Start up scripts are used to initialize the system.

CONTENTS:

- Boot up process
  - Understanding how Linux boots up
- Linux system processes
  - Running Daemons in the Background
  - Starting Daemons with inetd.
  - System-specific Daemons
  - Choosing & Controlling Generic Daemons
- Start up scripts
  - Introduction of Run control
  - Description of Run levels
  - Comparing Run Levels
  - Initialization scripts
  - Running program specific scripts
- Log-in Process
  - Init Process
  - Getty
  - Login
- Shutting Down
  - From the command line
  - Options with shut down
  - Rebooting the OS

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q 23-25
2 Refer Unit 1 Section 3 Q2, 3, 6, 9, 17

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 41-88

REFERENCE BOOK:

1 ibid 5, Page No. 65-77

WEBSITE:

1 http://bash.cyberciti.biz/guide/Startup_scripts

LECTURES 8-9

SECURITY

OBJECTIVE:

To understand the importance of securing the system and different security measures. In these lectures students will be taught about the user management.

CONTENTS:

- Understanding basic security under Red Hat Linux.
- Managing users and keeping accounts secure.
- Using packet sniffers and tracking users' history files.
- Security remote connections with ssh
- Logging unique events
- Creating simple firewalls for keeping out introducers.

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q 14
2 Refer Unit 1 Section 3 Q20 - 21, 25, 27

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 665-704

REFERENCE BOOK:

1 ibid 4, Page No. 551-570

WEBSITE:

1 www.certconf.org/presentations/2006/files/RC2.pdf

LECTURES 10-12

NETWORKING IN LINUX

OBJECTIVE:

The objective of these lectures is to teach the students about networking in Linux, IP addressing, identifying the system in a network.

CONTENTS:

- Networking on Linux
  - Preparing Linux for networking
  - Moving information across networks via routes and packets
  - Assigning identification number or IP addresses to a networked machine.
  - Examining basic configuration files for creating networked devices
  - Dynamically providing IP addresses and host names.
  - Creating domains and giving machine an identity.
  - Communicating and sharing files with other machines.
  - Creating name servers for hostname lookups.
- Starting Network installation
  - Configuring network settings after installation.
  - Connecting across different platforms.

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q 10
2 Refer Unit 1 Section 3 Q17, 19

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 481-555

REFERENCEBOOK:

1 ibid 5, Page No. 192-218

ARTICLE:

1 Jes Fraser, “Puppet”, Linux Journal, Issue 207, July 2011, Page No. 72-78.
2. Klaus Knopper, “ Ask Klaus !”, Linux Magazine, July 2015, Page No.62-65.

LECTURES 13-18

MANAGING USERS

OBJECTIVE:

Linux is a true multitasking environment; more than one user can be logged into the system at one time. So, the students will learn to manage the users on the system properly.

CONTENTS:

- Types of users
  - Users
  - Groups
  - Others
- The powers of Root
  - The powers associated with root
  - File Ownerships
  - Password Files
- Managing users
  - Managing New Users
  - Using GUI Tools
  - The Linux file system

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q 23 - 38

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 151-203

ARTICLE:

1 Dirk Elmendorf. "Organizing a Library", Linux Journal, Issue 194, June 2010, Page No. 34-38.
2 Markus Feilner and Thomas Schraitle, " Git Going", Linux Magazine, July 2015, Page No. 48-53.

LECTURES 19-20

OBJECTIVE:

The objective is to introduce students a hierarchical file system of Linux which includes the arrangement of files and folders. It also explains the regular files and directories of the system.

CONTENTS:

- The File Structure
    - System Directories
    - The complete hierarchical file structure
    - Mounting and unmounting file system
- Regular files
    - Directories
    - Character devices
    - Block devices
    - Named Pipes

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit 1 Section 2, 23-27
2 Refer Unit 1 Section 3 Q3- 6

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 90-119

REFERENCEBOOK:

1 ibid 5, Page No. 79-96

LECTURES 21-22

FILE PERMISSIONS

OBJECTIVE:

To learn the affect of assignment file permissions to each file in the system and how to modify file permissions and ownership and how the amount of disk space on a Linux drive can be controlled and monitored.

CONTENTS:

- Introduction
- File Permissions
    - Changing permissions
    - Chmod command with various options
    - Chown command (changing the ownership of files)
    - Setting setuid permissions
- Disk Usage Limits
    - Assigning Quotas
    - Monitoring Disk Use
    - Checking Partition Use

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q1, 3
2 Refer Unit II Section 3 Q28

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 110 - 118

WEBSITE:

1 www.nersp.cns.ufl.edu/~dicke3/nerspcs/chown.html

LECTURES 23-24

EXT2 AND EXT3 FILE SYSTEM

OBJECTIVE:

To learn the representation of file system in Linux. Extended file systems, their importance, features and structure will be taught to the students.

CONTENTS:

- Virtual file system
  - Introduction
  - Basic principles
- Schematic structure of a UNIX file system
- The EXT2 file system
  - The structure of the EXT2 file system
  - Directories in the EXT2 file system
  - Block allocation in the EXT2 file system.
  - Target-oriented allocation.
- The EXT3 file system
  - The structure of the EXT3 file system.
  - Directories in the EXT3 file system
  - Advantages of EXT3 file system over EXT2 file system
  - Check and Repair file systems.

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q5, 22
2 Refer Unit II Section 3 Q6, Q9, Q13, Q15-20

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 665-704

WEBSITE:

1 www.frankdrews.com/public_filetree/cs458_558.../shangyouzeng.pdfSimilar

UNIT II

LECTURES 25-28

RESOURCE MANAGEMENT IN LINUX

OBJECTIVE:

To teach the students how resources are managed in Linux. In Linux all the directories, device drivers etc. are treated as files.

CONTENTS:

- Files and Directory Management
- Files and their Metadata
- Directories
- Links : The ln Command
- Copying and moving files
- Device Nodes
- Out-of-band Communication
- Monitoring File Events

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q1, 4,6,16,17,20
2 Refer Unit II Section 3 Q5,14

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 90-119

REFERENCEBOOK:

1 ibid 4, Page No. 115-138

WEBSITE:

1 https://computing.llnl.gov/linux/slurm/slurm_design.pdf

LECTURES 29-31

SYSTEM CALL FOR PROCESS MANAGEMENT

OBJECTIVE:

To help the students in understanding the system calls that are used in process management like Fork, Exec, Exit etc.

CONTENTS:

- Process Creation and Management
  - Fork System Call – Parent Process and Child Process
- Terminating a Process
  - Exit System Call
- Process Groups
  - Setgid and setuid, getpid and getpgrp
- Basic Interprocess Communication : Pipes and FIFOs

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 2 Q 1-5
2 Refer Unit 1V Section 3 Q1-10

SUGGESTED READING:

TEXT BOOKS:

1 ibid 1, Page No.205-234
2 ibid 2, Page No. 534-566
3 ibid 3, Page No. 54-85

LECTURES 31-33

SIGNALS

OBJECTIVE:

To help the students in understanding the system calls that are used in signal management like SIGIO, SIGQUIT, SIGPRO etc.

CONTENTS:

- Signal Actions
- Standard C signals: signal() and raise()
- Signals for Inter process Communication
- Signals Across fork() and exec()
- System V IPC

- Pipes and FIFOs
- PosixMessage Queues
- System V Message Queues

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 2 Q 1,3,18
2 Refer Unit 1V Section 3 Q6

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 3, Page No. 43-54

ARTICLE:

1 John Thelin, "Quick User Interfaces with QT", Linux Journal, Issue 204, April 2011, Page No. 71-74.

UNIT III

SHELL IN LINUX

LECTURES 34-36

INTRODUCTION TO LINUX SHELL

OBJECTIVE:

To introduce the concept of shells available with Linux and the importance of shell script.

CONTENTS:

- The Shells
  - BASH
  - TCSH
  - Korn
- Features of shell
- Shell Scripts
  - User defined Commands
  - Executing Scripts
  - Script Arguments
- Environment Variables and Subshells : export and setenv
- Shell Configuration
  - The bash shell – initialization and configuration files
  - Configuration Directories and Files

- Shell commands
    - Displaying Directory Contents
    - Moving Through Directories
    - File and Directory Operations
    - Erasing Files and Directories
    - Links: The ln Commands
    - The mtools Utilities : msdos
    - Archiving and Compressing Files
- The role of shells in the Linux environment

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section 2 Q1 - 8
2 Refer Unit III Section 3 Q1 - 29

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 122-129
2 ibid 2, Page No. 146-190

REFERENCEBOOK:

1 ibid 4, Page 65-141

ARTICLE:

1 Dave Taylor, "Simple Scripts to Sophisticated HTML Forms", Linux Journal, Issue 194, June 2010, Page No. 24-25.

LECTURES 37-40

DIFFERENT TYPES OF SHELLS

OBJECTIVE:

To learn the difference between different types of shells available in Linux.

CONTENTS:

- BASH Shell
- TCSH
- KSH
- CSH
- ZSH
- SCSH

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit 1 Section 2 Q9-12

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 122-129
2 ibid 2, Page No. 194-205

REFERENCEBOOK:

1 ibid 4, Page No. 56-63

WEBSITE:

1 http://bash.cyberciti.biz/guide/The_role_of_shells_in_the_Linux_environment".

LECTURES 41-45

SHELL PROGRAMMING

OBJECTIVE:

When a group of commands have to be executed regularly, they should be stored in a file, and the file itself executed as a shell script or shell program. The objective is to make students learn shell programming.

CONTENTS:

- Variables in shell
- Perform arithmetic operations
- Bash variable existence check
- Control Structures
    - Test Operation
    - Conditional Control Structures
        - If-then-fi
        - If-then-else-fi
        - If-then-elif-then-else-fi
        - Case-in-esac
    - Loop Control Structures:
        - While, until, for, for-in, select
- Simple Filters-Pr, head, tail
- Filters using regular expressions
    - Grep and Sed
- An Advanced Filter

- Awk filter

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit III Section 4 Q 1 – 22

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2, Page No. 227-302, 382-398

ARTICLE:

1 Michael J. Hammel, "Automating Remote Backups", Linux Journal, Issue 194, June 2010, Page Nos. 68-72
2. Dmitri Popov, "Build a simple and handy solution for recording and tracking locations; in the process, learn how to automate Android and build a simple Python-bases app", Linux Magazine Feb 2016, Page Nos. 64-68

LECTURES 41-45

NETWORKING IN LINUX

OBJECTIVE:

To help the students to learn about socket programming and various functions that are used in socket programming.

CONTENTS:

- Socket Introduction
- Socket Address structures
- Value-Result Arguments
- Byte ordering Functions
- Byte Manipulation functions
- Input and output functions read ,write
- Read line functions

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 1 Q1-5
2 Refer Unit IV Section 2 Q1-10

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 3, Pages 258-340

ARTICLE:

1 Chuck Elliot, "Is Your Personal Area Network Giving you the Bluez?",Linux Journal, Issue 203, March 2011, Page No. 75-78

WEBSITE:

1 beej.us/guide/bgnet/

LECTURES 46-50

OBJECTIVE:

To help the students to learn about socket programming and various functions for elementary TCP and UDP sockets.

CONTENTS:

- Elementary TCP sockets
  - Socket Function
  - Connect Function
  - Bind
  - Listen
  - Accept
  - Fork
  - Exec
- TCP Client Server Example
- Elementary UDP Sockets

ASSIGNMENTS FROM THE QUESTION BANK:

1 Refer to Unit IV Section 1 Q6-7
2 Refer to Unit IV Section 2 Q 4-10

OTHER ASSIGNMENTS:

1 Refer to ibid 3, Page No. 110 Q4.1-4.5

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 3, Page No. 258-340, 392-419

ARTICLES:

1 Mick Bauer, “Linux VPNs with Open VPN, Part V”, Linux Journal, Issue 194, June 2010, Page 26-29
2 PasiSarolahti, Alexey Kuznetsov,”Congestion Control in LinuxTCP”,http://www.sarolahti.fi/pasi/papers/linuxtcp.pdf
3 Uwe Vollbracht, “ Tool tests on the fast track”, Linux Magazine, February 2016, Page Nos. 22-24

WEBSITES:

1 www.thegeekstuff.com/2011/12/c-socket-programming/
2 http://cs.ecs.baylor.edu/~donahoo/practical/Csockets

LECTURE PLAN

SOFTWARE TESTING

MCA - 303

COURSE OUTLINE
MCA –V SEMESTER
SOFTWARE TESTING - MCA 303

L – 03 T - 01 Credit - 04

OBJECTIVE:

This course aims at enabling students to understand the concept of software testing, to explain the importance, objectives, and limitations of software testing and the broad approaches for it. The course also covers the aspects involved in planning for software testing and in selecting the test strategy for a software project.

INTERNAL ASSESSMENT AND ASSIGNMENT **40 marks**

1. Class Test-I – (Written Test) 15 marks
2. Class Test-II - (Written Test) 15 marks
3. Class Assessment + Attendance 10 marks

COURSE CONTENTS

A. INTRODUCTION **(12 Hours)**

- What is software testing and why it is so hard?
- Error, Faults, Failure and incidents
- Test Cases, Testing Process
- Limitation of testing
- No absolute proof of correctness
- V shaped Software Life Cycle Model
- Overview of Graph Theory
- Verification Testing:
  - Verification Methods
  - SRS Verification
  - Software Design Document Verification
  - Code Reviews
  - User Documentation Verification
  - Software Project Audits.

B. FUNCTIONAL TESTING AND STRUCTURAL TESTING **(13 Hours)**

- Functional Testing:
  - Boundary Value Analysis
  - Equivalence Class Testing
  - Decision Table based testing
  - Cause - Effect graphing technique
- Structural Testing:
  - Path Testing

- DD – Paths
- Cyclomatic Complexity
- Graph Metrics
- Data Flow Testing
- Mutation Testing

C. USECASE TESTING AND REGRESSION TESTING (12 hours)

- Use Case Testing:
  - Use Case Diagrams
  - Use Cases
  - Generation of Test Cases from Use Cases
  - Applicability
  - Validity Checks
  - Strategy for Data Validity
  - Guidelines for Generating Validity Checks
  - Database testing

- Selection, Minimization, Prioritization of test cases for Regression Testing
  - Regression Testing
  - Regression Test Case Selection
  - Prioritization guidelines
  - Priority category Scheme
  - Code Coverage Techniques for Prioritization of Test Cases
  - Risk Analysis

D. OBJECT ORIENTED TESTING AND METRICS (13 Hours)

- Testing Activities:
  - Unit Testing
  - Levels of Testing
  - Integration Testing
  - System Testing
  - Debugging
- Object Oriented Testing:
  - Issues in Object Oriented Testing
  - Path testing
  - Class Testing
  - State based testing
  - Object Oriented Integration
  - System Testing.
- Metrics and Models in Software Testing:
  - What are Software Metrics
  - Categories of Metrics
  - Object Oriented Metrics used in testing
  - What should we measure during testing?
  - Software Quality Attributes.

- Prediction Model:
  - Reliability Modes
  - Fault Prediction Model.

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Software Testing, and students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOK:**

1. **Author's Name(s):** Yogesh Singh
   Title: Software Testing
   Edition: I **Year:** 2013
   Publisher: Cambridge University Press (ibid 1)

- **REFERENCE BOOKS:**

1. **Author's Name(s):** Rajiv Chopra
   Title: Software Testing
   Edition: III **Year:** 2012
   Publisher: S.K Kataria& Sons (ibid 2)

2. **Author's Name(s):** K.K. Aggarwal and Yogesh Singh
   Title: Software Engineering
   Edition: III **Year:** 2014
   Publisher: New Age International Publications (ibid 3)

3. **Author's Name(s):** Roger S Pressman
   Title: Software Engineering
   Edition: VII Year: 2014
   Publisher: McGraw Hill Education (ibid 4)

- **PERIODICAL:**

1. Journal on Software Engineering
2. International Journal of Computer Applications
3. International Journal of Software Engineering
4. International Journal of Computer Science Issues
5. Journal of Emerging Trends in Engineering and Applied Sciences
6. Journal of Emerging Trends in Computing and Information Sciences
7. Journal of Software Engineering and Technology
8. International Journal of Software Computing and Engineering
9. International Journal of Advanced Research in Computer Science and Software Engineering
10. International Journal of Engineering Research and Applications
11. International Journal of Advance Research in Computer Science and Management Studies

UNIT 1

LECTURE 1

INTRODUCTION

OBJECTIVE:

The objective of this lecture is to give an insight on what is software testing and understand the process of software testing.

CONTENTS:

- What is Software Testing?
  - Definitions of testing
  - Goal of testing
  - Necessity of testing
- Process of Software Testing.
  - Assess development plan
  - Develop the test plan
  - Report test results
  - Test software installations
  - Evaluate test effectiveness
- Terminologies used in software testing
  - Error
  - Mistake
  - Bug
  - Fault
  - Failure

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q1-3,5,7,10,11,16,24
2 Refer Unit I Section 3 Q 1,6,7,12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 4-23

REFERENCE BOOKS:

1 ibid 2, Page 1-7
2 ibid 3, Page 365-369

LECTURE 2

SOFTWARE TESTING PROCEDURES

OBJECTIVE:

The objective of this lecture is to understand the essential steps required in software testing procedure and analyze the results.

CONTENTS:

- Developing Test Plan
- Developing Test Cases & Test Data Requirements
- Setting up Test Environment
- Performing Test and Recording Testing Data
- Analyzing Test Results
- Approving or Rejecting the Software

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q12, 19,23
2 Refer Unit I Section 3 Q 4,5,9,16
3 Refer Unit IV Section 2 Q 12

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page 4-23

ARTICLE:

1 Praveen RanjanSrivastava, G. Raghurama, "Function and Path Coverage Based Technique for Prioritizing Test Cases for Regression Testing", Journal of Software Engineering and Technology, Volume 6, Number 2, July-December 2014, Page 89-95
2 Maneela Tuteja , Gaurav Dubey , " A Research Study on Importance of Testing and Quality Assurance in Software Development Life Cycle (SDLC) Models ,International Journal of Software Computing and Engineering (IJSCE), ISSN: 2231-2307, Vol. 2 , Issue 3 , July 2012, http://www.ijsce.org/attachments/File/v2i3/C0761062312.pdf

LECTURE 3

LIMITATIONS OF SOFTWARE TESTING

OBJECTIVE:

Testing does not assure success or even prove that a product will be usable. Even the most strictly conducted formal test cannot ensure that a product will be usable when released. The objective of this lecture is to discuss the limitations of software testing.

CONTENTS:

- Limitations of Software Testing
  - Predefined Testing time not allocated when testing phase begins
  - 100% Testing not possible in case of complex systems
  - Lack of formal testing and reviews at requirement and design stage
  - Lack of formal unit testing methodology
  - Lack of efficient and effective automation testing
  - Testing implicit requirements and obvious functionality needs more experienced testers
  - Difficult to ensure the product's stability in all environments and end to end testing
  - Testing does not assure success or even prove that a product will be usable.
  - Testing can be used to show the presence of errors, but never to show their absence
  - Exhaustive testing is not possible in current scenario

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit I Section 2 Q4, 17

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 24-26

REFERENCE BOOKS:

1 ibid 2, Page 10
2 ibid 3 , Page 55-87

ARTICLES:

1 SandeepDalal, Rajender Singh Chhillar, "Software Testing-Three P'S Paradigm and Limitations", International Journal of Computer Applications, Volume 54, No.12, September 2012, http://research.ijcaonline.org/volume54/number12/pxc3882488.pdf
2 S.M.K Quadri, Sheikh Umar Farooq, "Software Testing – Goals, Principles, and Limitations", International Journal of Computer Applications, Volume 6, No.9, September 2010, www.ijcaonline.org/volume6/number9/pxc3871448.pdf
3 Shikha Maheshwari , Dinesh Ch. Jain , " A Comparative Analysis of Different Types of Models in Software Development Life Cycle ", International Journal of Advanced Research in Computer

Science and Software Engineering , Vol. 2 , Issue 5 , May 2012 , http://www.ijarcsse.com/docs/papers/May2012/Volum2_issue5/V2I500405.pdf

LECTURE 4

VERIFICATION & VALIDATION (V&V)

OBJECTIVE:

In software testing verification and validation (V&V) is the process of checking that a software system meets specifications and that it fulfills its intended purpose. The lecture focuses on verification and validation activities, techniques and their limitations.

CONTENTS:

- What is Verification
- What is Validation
- V& V Limitations
    - Theoretical Foundations
    - Impracticality of Testing All Data
    - Impracticality of Testing All Paths
    - No Absolute Proof of Correctness
- Difference between Verification and Validation
- V&V Techniques
    - Static Methods
        - Walkthroughs
        - Code Inspections
        - Reviews
        - Formal Proofs
    - Dynamic Methods
        - Functional Testing
        - Structural Testing
        - Heuristic Testing
        - Interface Testing

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 2 Q6, 9, 14, 15, 22
2 Refer Unit I Section 3 Q11, 14,17

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 230-232

REFERENCE BOOKS:

1 ibid 2, Page 15-20
2 ibid 3, Page 370

WEBSITES:

1 www.sei.cmu.edu/reports/89cm013.pdf
2 http://www.softwaretestinghelp.com/
3 http://www.aptest.com/resources.html
4 http://www.istqb.org/certification-path-root/foundation-level/foundation-level-material-for-download.html

LECTURES 5-6

SOFTWARE TESTING LIFECYCLE MODEL

OBJECTIVE:

Software testing life cycle (STLC**)** model is basically develop to identify which testing activities needs to be carry out and what's the best time to perform them to accomplish those test activities. The objective of these lectures is to understand the Software Testing Life cycle (STLC) model in detail.

CONTENTS:

- What is Software Testing Lifecycle
- Phases of Software Testing Lifecycle
    - Requirements stage
    - Test Plan
    - Test Design
    - Design Reviews
    - Code Reviews
    - Test Cases preparation
    - Test Execution
    - Test Reports
    - Bugs Reporting
    - Reworking on patches
    - Release to production

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section II: Q 8, 13
2 Refer Unit II Section III: Q 8
3 Refer Unit I Section III: Q 18
4 Refer Unit III Section II: Q 16

SUGGESTED READING:

REFERENCE BOOKS:

1 ibid 2, Page 8-9
2 ibid 3, Page 30-45

WEBSITE:

1 http://www.nickjenkins.net/prose/testingPrimer.pdf
2 https://saucelabs.com/resources/white-papers/sauce-labs-state-of-testing-report-2016.pdf

LECTURES 7 - 8

V SHAPED SOFTWARE LIFE CYCLE MODEL AND W MODEL

OBJECTIVE:

The objective of these lectures is to understand the two types of Software Testing Life Cycle models –V shaped and W model along with their limitations. The lectures also discuss the comparison between the two models.

CONTENTS:

- V shaped Software Life Cycle Model
- W Model
- Comparison of V-shaped and W model

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit I Section 3 Q3
2 Refer Unit I Section 3 Q13

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page 26-27
2 ibid 2, Page 48-67

LECTURES 9-12

OVERVIEW OF GRAPH THEORY

OBJECTIVE:

Graph theory has a very wide range of applications in several fields of computer science and other areas. A graph can be used to represent almost any physical situation involving discrete objects and relationship among them. Hence, the study of graph properties can be valuable in many ways for understanding the characteristics of the underlying software engineering. The lectures aim to provide the essentials of graph theory and its usage in software testing.

CONTENTS:

- What is a graph?
- Matrix Representation of Graphs
    - Adjacency Matrix
    - Incidence Matrix
- Paths and Independent Paths
    - Cycles
    - Connectedness of a Graph
- Generation of a Graph from Program
    - DD path Graph
- Identification of Independent Paths
    - Cyclomatic Complexity
    - Graph Matrices

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q3,4,5
2 Refer Unit II Section 3 Q3

SUGGESTED READING:

TEXT BOOK:

1 ibid 1, Page 110-150

LECTURES 13-18

FUNCTIONAL TESTING

OBJECTIVE:

Functional testing is a quality assurance (QA) process and a type of black box testing that bases its test cases on the specifications of the software component under test. The objective of these lectures is to understand the testing methods to develop the test cases using functional testing.

CONTENTS:

- Meaning of Functional Testing
- Types of Functional Testing
    - Boundary Value Analysis
        - Robustness Testing
        - Worst-case Testing
        - Robust-worst case testing
        - Applicability
    - Equivalence Class Testing
        - Creation of equivalence classes
        - Applicability
    - Decision Table Based Testing
        - Parts of Decision Table
        - Limited Entry and Extended Entry Decision Table
        - 'Do Not Care' conditions and Rule count
        - Impossible conditions
        - Applicability
    - Cause Effect Graphing Technique
        - Identification of causes and effects
        - Design
        - Use of constraints
        - Writing of test cases
        - Applicability

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q1, 6,12,13
2 Refer Unit II Section 3 Q1, 2, 5, 11,14

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 37-99
2

REFERENCE BOOKS:

1 ibid 2, Page 36-78
2 ibid 3, Page 371-406
3 ibid 4, Page 434-441

WEBSITE:

1 http://www.cs.utoronto.ca/~sme/papers/2007/SelectingEmpiricalMethods.pdf

LECTURES 19- 24

STRUCTURAL TESTING

OBJECTIVE:

The objective of these lectures is to discuss the strategies of structural testing. These strategies use the control structure of the program as the basis for developing test cases as opposed to alternative classes of strategies that emphasize the specifications, specific types of errors, or combinations thereof.

CONTENTS:

- Meaning of Structural Testing
- Types of Structural Testing
  - Control Flow Testing
    - Statement Coverage
    - Branch Coverage
    - Condition Coverage
    - Path Coverage
  - Data Flow Testing
    - Define/Reference Anomalies
    - Identification of du and dc paths
    - Testing Strategies using du paths
    - Generation of Test Cases
  - Slice Based Testing
    - Guidelines for Slicing
    - Creation of Program Slices
    - Generation of Test Cases
  - Mutation Testing
    - Mutation and Mutants
    - Mutation Operators
    - Mutation Score

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit II Section 2 Q 2,7,8-11,12,13,15,16

2 Refer Unit II Section 3 Q 4,6,7,8
3 Refer Unit I Section 2 Q 21
4 Refer Unit IV Section 3 Q 32, 33

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 165-216

REFERENCE BOOKS:

1 ibid 2, Page 79-124
2 ibid 3, Page 406-434
3 ibid 4, Page 424-441

WEBSITE:

1 https://ifs.host.cs.st-andrews.ac.uk/Research/Publications/Papers-PDF/2005-09/TKDE-Ponpit-2009.pdf

ARTICLE:

1 Hashim J. Hasan, Mohammad A. Aishraideh, Basel A. Mahafzah, " Branch Coverage Testing using Anti-Random Technique, Journal on Software Engineering, Volume 8, No. 2, October-December 2013.

LECTURES 25-28

USECASE TESTING

OBJECTIVE:

Use cases represent the high-level functionalities provided by the system to the user. These are good sources for deriving test requirements of the system. The objective of these lectures is to understand use cases creation and test case generation from them.

CONTENTS:

- Use Case Testing:
  - Use Case Diagrams and use Cases
    - Identification of Actors and use cases
    - Drawing of use case diagram
    - Writing of description
  - Generation of Test Cases from Use Cases
    - Scenario Diagrams
    - Creation of use case scenario matrix
    - Identification of variables and input states of variable
    - Design of test case matrix

- Guidelines for generating validity checks
    - Data type
    - Data range
    - Special Data Conditions
    - Mandatory Data Inputs
    - Domain Specific Checks
- Strategies for Data Validity
    - Accept only known valid data
    - Reject known bad data
    - Sanitize all data
- Database testing

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section 2 Q 9-15,22
2 Refer Unit III Section 3 Q 12,13,14,15
3 Refer Unit IV Section 2 Q 12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 285-326

REFERENCE BOOKS:

1 ibid 3, Page 370-374, 382-385
2 ibid 2 , Page 420-430

WEBSITE:

1. http://actoolkit.unprme.org/wp-content/resourcepdf/software_testing.pdf

ARTICLES:

1 Santosh Kumar Swain, Durga Prasad Mohapatra, Rajib Mall, "Test Case Generation Based on Use case and Sequence Diagram", International Journal of Software Engineering, IJSE, Vol.3 No.2 , July 2010, http://www.ijse. org.eg/Content/ Vol3/No2/Vol3_ No2_2.pdf? origin = publication_detail
2 Muhammad Touseef , ZahidHussainQaisar, "A Use Case Driven Approach for System Level Testing", International Journal of Computer Science Issues, Vol. 9, Issue 5, No. 1, September 2012, http://ijcsi.org/papers/IJCSI-9-5-1-78-88.pdf
3 Ashwini Mujumdar , Gayatri Masiwal , P/M Chawan ," Analysis of Various Software Process Model ", International Journal of Engineering Research and Applications (IJERA) , ISSN :2248-9622,Vo. 2 Issue 3 , May – June 2012 , pp.2015 2021, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.416.770&rep=rep1&type=pdf

LECTURES 29-33

SELECTION, MINIMIZATION AND PRIORITIZATION OF TEST CASES FOR REGRESSION TESTING

OBJECTIVE:

Regression testing is a testing activity that is performed to provide confidence that changes do not harm the existing behavior of the software. Test suites tend to grow in size as software evolves, often making it too costly to execute entire test suites. A number of different approaches are available to maximize the value of the accrued test suite: minimization, selection and prioritization. These lectures discuss various minimization, selection and prioritization techniques in detail.

CONTENTS:

- Regression Testing
  - Definition
  - Comparison of development and regression testing
  - Steps of regression testing Process
- Selection of Test Cases
  - Select all test cases
  - Select Test Cases Randomly
  - Select Modification Traversing Test Cases
- Reducing the number of test cases
  - Minimization of Test Cases
  - Prioritization of Test Cases
- Risk analysis
  - Definition
  - Risk Matrix
- Code Coverage Prioritization Technique
  - Modification Algorithm
  - Deletion Algorithm

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit III Section 2 Q 1-8, 17,20,21
2 Refer Unit III Section 3 Q 1-11
3 Refer Unit I Section 3 Q 15
4 Refer Unit IV Section 2 Q 12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 335-347

REFERENCE BOOK:

1 ibid 2, Page 130-142

ARTICLES:

1 SwarnenduBiswas, Rajib Mall, "Regression Test Selection Techniques: A Survey", Informatica, Vol. 35, 2011, http://www.cse.ohio-state.edu/ ~biswass/ files/ papers/ informati casurvey.pdf

2 ÁrpádBeszédes, TamásGergely, LajosSchrettner, JuditJász, LászlóLangó, TiborGyimóthy, Code Coverage-Based Regression Test Selection and Prioritization in WebKit, IEEE, 2012, http://www.inf.u-szeged.hu/~beszedes/research/rtp-beszedes-arpad-code-coverage.pdf

3 Vaibhav E. Pawar , Amol K . Kadam , Dr S .D Joshi , "Analysis of Software Reliability Using Testing Time and Testing Coverage ", International Journal of Advance Research in Computer Science and Management Studies " , ISSN :2321-7782, Vo./ 3 , Issue 5 ,May 2015 , http://www.ijarcsms.com/docs/paper/volume3/issue5/V3I5-0029.pdf

LECTURES 34-35

LEVELS OF TESTING

OBJECTIVE:

Levels of testing include the different methodologies that can be used while conducting software testing .The objective of these lectures is to explain the usage of different levels of testing involved in testing process.

CONTENTS:

- Levels /Strategies of testing
  - Unit testing
  - Integration testing
    - Top down integration
    - Bottom up integration
  - Validation testing
    - Acceptance testing
    - Alpha testing
    - Beta testing
  - System testing
    - Recovery testing
    - Security testing
    - Stress testing
    - Performance testing

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 2 Q3-8
2 Refer Unit IV Section 3 Q23-31
3 Refer Unit III Section 2 Q18

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 368-373

REFERENCE BOOKS:

1 ibid 2, Page 143-183
2 ibid 3, Page 435-439
3 ibid 4, Page 394-404

LECTURE 36

DEBUGGING

OBJECTIVE:

Debugging is the routine process of locating and removing computer program bugs, errors or abnormalities, which is methodically handled by software programmers. It checks, detects and corrects errors or bugs to allow proper program operation according to set specifications. The aim of this lecture is to discuss the debugging process and approaches in detail.

CONTENTS:

- Debugging
  - Meaning
  - Process
  - Approaches
    - Trial and Error Method
    - Backtracking
    - Brute Force
    - Cause Elimination

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit IV Section 3 Q16

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 374-378

REFERENCE BOOKS:

1 ibid 3, Page 441-446
2 ibid 4, Page 411-416

WEB SITE:

1 http://www.diku.dk/forskning/performance-engineering/Courses/Software-development-2008/Slides/testing.pdf

LECTURES 37-41

OBJECT ORIENTED TESTING

OBJECTIVE:

Object-orientation has rapidly become accepted as the preferred paradigm for large-scale system design. These lectures discuss about how testing is being carried out in the Object Oriented environment.

CONTENTS:

- Object Oriented Concepts
  - Classes and Objects
  - Inheritance, Polymorphism and Encapsulation
- Meaning of Object Oriented Testing
- Levels of Testing
  - Method Testing
  - Class Testing
  - Inter-Class Testing
  - System Testing
- Types of Testing
  - Path testing
    - Activity diagram
    - Calculation of Cyclomatic Complexity
    - Generation of Test Cases
  - State based testing
    - State Machine
    - State chart diagram
    - State Transition Tables
    - Generation of Test Cases
  - Class Testing
    - Issues Related to Class Testing

- Generating Test Cases

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 2 Q1, 10,15
2 Refer Unit IV Section 3 Q1-15, 21

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 389-412

REFERENCE BOOKS:

1 ibid 2, Page 185-256
2 ibid 4, Page 404-405, 442-451

ARTICLES:

1 Leonard Gallagher, Jeff Offutt, Anthony Cincotta, "Integration Testing of Object-oriented Components using Finite State Machines ",http://www. cs.gmu. edu/~offutt/rsrch /papers/ oocomptest.pdf
2 Bakhshish Singh Gill, Manjit Singh Gill, Ashok Kumar, "Cost of Re-engineering (Object-Oriented Software Systems) versus Developing new One- A Comparison", Journal of Software Engineering and Technology, Volume 6, Number 2, July-December 2014, Page 109-113

LECTURES 42-45

METRICS AND MODELS IN SOFTWARE TESTING

OBJECTIVE:

Software metrics plays an important role in measuring attributes that are critical to the success of a software project. Measurement of these attributes helps to make the characteristics and relationships between the attributes clearer. The aim of the lectures is to discuss the various software metrics used in software testing.

CONTENTS:

- Software Metrics
  - Measure, Measurement and Metrics
  - Applications
- Categories of Metrics
  - Product Metrics for Testing
  - Process Metrics for Testing

- Object Oriented Metrics used in Testing
    - Coupling Metrics
    - Cohesion Metrics
    - Inheritance Metrics
    - Size Metrics
- What should we measure during testing?
    - Time
    - Quality of Source Code
    - Coverage
    - Test Case Defect Density
    - Review Efficiency

ASSIGNMENTS FROM QUESTION BANK:

1 Refer Unit IV Section 2 Q9, 11,13,14
3 Refer Unit IV Section 3 Q17,18, 22,34,35

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 420-429,450-465

ARTICLES:

1 Amjan Shaik, C. R. K. Reddy, Bala Manda, Prakashini. C, Deepthi. K(2010), "Metrics for Object Oriented Design Software Systems: A Survey", Journal of Emerging Trends in Engineering and Applied Sciences, Volume 1, No. 2, pp 190-198, http://jeteas. Scholarlink research.org/articles/Metrics%20for%20Object%20Oriented%20Design%20Software%20Systems.pdf
2 Seyyed Mohsen Jamali, "Object Oriented Metrics",http://www.cs. sfu.ca/~sja25/personal /resources/papers/ ObjectOrientedMetrics.pdf
3 Nadia Bhuiyan , Habib A. Elsabbagh , "A Quality Assurance Model for Airborne Safety –Critical Software ", Journal of Software Engineering and Applications , Vol. 7 , ISSN -162-176 , June 2014 , http://file.scirp.org/pdf/JSEA_2014032713433911.pdf

LECTURES 46-47

SOFTWARE QUALITY ATTRIBUTES PREDICTION MODELS

OBJECTIVE:

A software reliability growth model is one of the fundamental techniques used to assess software reliability quantitatively. The software reliability growth model is required to have a good performance in terms of goodness-of-fit, predictability, and so forth. The objective of these lectures is to provide the in depth knowledge of reliability models in testing.

CONTENTS:

- Reliability Models:
  - Basic Execution Model
  - Logarithmic Poisson Execution Time Model
  - The Jelinski-Moranda Model
  - Fault Prediction Model.

ASSIGNMENT FROM QUESTION BANK:

1 Refer Unit IV Section 3 Q19, 20,36,37
2 Refer Unit III Section 2 Q19

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 430-437

REFERENCE BOOK:

1 ibid 3, Page 328-344

ARTICLES:

1 RazeefMohd., MohsinNazir, "Software Reliability Growth Models: Overview and Applications", Journal of Emerging Trends in Computing and Information Sciences, Vol. 3, No. 9, September 2012, http://cisjournal. org/journalof computing/ archive/vol3 no9/ vol3 no 9_7.pdf
2 Pankaj P. Waghrakar, Chitra G. Desai, "Analyzing the Role of Software Testing in SQA, Manual Vs Automation: A Case Study", Journal of Software Engineering and Technology, Volume 6, Number 2, July-December 2014, Page 105-107

LECTURE PLAN

ENTERPRISE COMPUTING IN JAVA

MCA - 305

COURSE OUTLINE
MCA-V SEMESTER
ENTERPRISE COMPUTING IN JAVA– MCA 305

L – 03 T - 01 Credit - 04

OBJECTIVE:

The growth of Java during the last few years has been phenomenal. The purpose of this course is to increase the advanced java skills and helps the students as programmers to utilize the advance features of Java technology. This course will explain the basic J2EE technology and to develop dynamic websites which contain the application's business logic and business data.

INTERNAL ASSESSMENT AND ASSIGNMENT	**40 Marks**
1. Class Test-I – (Written Test)	15 marks
2. Class Test-II - (Written Test)	15 marks
3. Class Assessment + Attendance	10 marks

COURSE CONTENTS:

UNIT-I **(10 Hours)**

1. **Introduction to J2EE**
- Introduction to J2EE
- Building J2EE applications
- MVC architecture

2. **Introduction to Servlets and it's life cycle**
- Introduction to Servlet
- Servlet Life cycle
- Problems with cgi-perl interface
- Generic and http servlet
- Servlet configuration,
- Various session tracking techniques
- Servlet context
- Servlet collaboration

UNIT-II **(12 Hours)**

3. **JSP Basics And Architecture**
- JSP Basics
- JSP Architecture
- JSP Directives
- Scripting Elements
- Standard Actions
- Implicit Objects
- JSP Design Strategies

4. Struts

- Introduction of Struts
- Struts Architecture
- Advantages & Disadvantages of Struts.
- Application of Struts

UNIT-III **(10 Hours)**

5. EJB Fundamentals

- Motivation for EJB
- EJB Echo System
- J2EE technologies
- Enterprise beans and types
- Distributed Objects
- Middleware
- Developing EJB components
- Remote and Local Interface
- Home Interface
- Beans Class
- Deployment Descriptor

UNIT-IV **(10 Hours)**

6. Introduction to Session Beans

- Introduction
- Session beans life time
- Statefull and Stateless Session beans
- Lifecycle of Session beans

7. Entity Bean

- Introduction
- Persistence Concepts
- Features of Entity Beans
- Entity Context

8. Java Message Service (JMS)

- Introduction to JMS
- Java Message Driven beans
- Java Mail

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of J2EE, JSP, EJB, and students are advised to go through the material for thorough understanding of the subject.

- **MAIN TEXT BOOKS:**

1. **Author's Name(s):** Rima Patel Sriganesh, Gerald Brose, Micah Silverman
   Title: Mastering Enterprise Java Beans
   Edition: 1st **Year:** Reprint 2011
   Publisher: Wiley Computer Publishing (ibid 1)

2. **Author's Name(s):** Sharanam Shah and Vaishali Shah
   Title: Java EE 6 Server Programming
   Edition: 1st Year**:**Reprint 2011
   Publisher: Shroff Publishers & Distributors Pvt Ltd (ibid 2)

- **REFERENCE BOOK:**

1. **Author's Name(s):** Jason Hunter with William Crawford
   Title: Java Servlet Programming
   Edition: 2nd **Year:** 2011
   Publisher: Shroff Publishers and Distributors Pvt. Ltd. (ibid 3)

- **PERIODICAL:**

1. International Journal of Computer Applications
2. International Journal of Computer Science Issues
3. International Journal of Computational Engineering & Management
4. Journal of Emerging Trends in Engineering and Applied Sciences
5. Journal of Emerging Trends in Computing and Information Sciences
6. IEEE Conference Publications

LECTURES 1-4

INTRODUCTION TO J2EE

OBJECTIVE:

The objective of these lectures is to make the students understand the extended version of Java's creation, the forces that shaped it, and the legacy that it inherits in J2EE.

CONTENTS:

- Introduction to J2EE
- Enterprise Application

- Java EE Technologies
- Enterprise Application Technologies
- Web Services Technologies
- Security Technologies
- Java EE Evolution
- Features of JAVA EE6
- Sun Glassfish Enterprise Server v3

ASSIGNMENT FROM QUESTION BANK:

1 Unit I, Section II Q1-3

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 27-31
2 ibid 2,Page No. 15-34

WEBSITES:

1 http://java.sun.com/j2ee/overview.html
2 http://www.w3schools.com/ado/default.asp
3 https://docs.oracle.com/javaee/7/tutorial/

ARTICLES:

1 Aleksandar Beserminji, Violeta Vukobrat, Bore Sari, Duan Okanovi, "Implementation of runtime pluginable system in JBoss application server", IEEE 5th International Conference on Consumer Electronics - Berlin (ICCE-Berlin), 6-9 Sept. 2015, PP 221 - 223, INSPEC Accession Number 15753118
2 H. C. Zhang, J. He, "Network Management System Design of Education Based on J2EE and JSP Network Framework", Applied Mechanics and Materials, Vols 651-653, pp. 2475-2480, Sep. 2014
3 Ding Wenwen ,Chen Yan, Jiang Zhuoren, "Design of Contract Management System Based on J2EE Architecture", IEEE Conference Publications, 2012,http://ieeexplore.ieee.org.
4 Zhou Xiaojian, Zou Xiao "Research on J2EE-based Enterprise Application Architecture", IEEE Conference Publications, http://ieeexplore.ieee.org.
5 AnkurBawiskar, PrashantSawant, VinayakKankate, B.B. Meshram, "Spring Framework: A Companion to JavaEE", IJCEM International Journal of Computational Engineering & Management, Vol. 15 Issue 3, May 2012

LECTURES 5-6

JAVA EE6 ARCHITECTURE

OBJECTIVE:

The objective of these lectures is to make student understand about the architecture of Enterprise Edition computing with JAVA.

CONTENTS:

- Type of System Architecture
  - Single Tier Architecture
  - Two Tier Architecture
  - Three Tier Architecture
  - Multi-Tier Architecture
  - Enterprise Architecture
- The Client Tier
- The Web Tier
- The Business Tier
- The Enterprise Information Tier System Tier
- Java EE Server
- Java EE Containers
- Container Types

ASSIGNMENT FROM QUESTION BANK:

1 Unit I, Section II Q1-5

SUGGESTED READING:

TEXT BOOKS:

1 ibid 1, Page No. 7-23
2 ibid 2,Page No. 35-49

ARTICLES:

1 Eric Jendrock, Ricardo Cervera-Navarro, Ian Evans, Kim Haase, William Markito, "The Java EE 7 Tutorial", Volume 1 , 5th Ed., Oracle, May 2014
2 William G. J. Halfond, "Identifying Inter-Component Control Flow in Web Applications", 15th International Conference, ICWE 2015, Rotterdam, The Netherlands, June 23-26, 2015, Proceedings, pp 52-70, ISBN 978-3-319-19889-7

LECTURES 7-11

INTRODUCTION TO SERVLETS

OBJECTIVE:

The objective of these lectures is to make student understand how to work with servlets in order to create dynamic environment in JAVA.

CONTENTS:

- Introduction to JAVA Servlet
- Need for Dynamic Content
- Java Servlet Technology
- Why Servlets
- What can Servlets do
- Java Servlet API
- Javax Servlet Packages
- Servlet Interface
  - Servlet Context Interface
  - Servlet Config Interface
  - Servlet Request and Servlet Response Interface
- Generic Servlet Class
  - Servlet Input Stream and Servlet Output Stream Classes
  - Request Dispatcher Interface
  - Javax Servlet Http Packages
- Http Servlet Class
  - Http Servlet Request and Http Servlet Response Interface
  - Http Session Interface
- Servlet Skeleton
- Servlet Life cycle
- Problems with cgi-perl interface
- Various session tracking techniques
- Servlet Collaboration

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q-6,7,8,10
2 Unit I, Section III Q-11-15

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2,Page No. 63-68, 71-98

REFERENCE BOOK:

1 ibid 3,Page No. 366-379

WEBSITE:

1 http://www.tutorialspoint.com/servlets/servlets-life-cycle.htm

LECTURES 12-18

WORKING WITH SERVLETS

OBJECTIVE:

The objective of these lectures is to make student understand how to work with Servlets in Enterprise computing with JAVA.

CONTENTS:

- Getting Started
- What is a web application
- Web Resources
- WEB_INF
- Deployment Descriptor
- Context Path
- Creating A web Application using NetBeans
- Creating Servlet
- Compiling and Building Web Application
- Compiling and Building Using NetBeans
- Running Web Application
- Using Cookies
  - Kinds of Cookies
  - Permanent/ Persistent Cookies
  - Where Cookies are used
  - Creating Cookies using Servlets
- What are Sessions
  - Lifecycle of HTTP Session
  - Session Tracking with Servlets API
  - Methods of Session Tracking
- Cookies
- URL Rewriting
- Hidden Form Fields
- Secure Socket Layer
- Working with Sessions
  - Creating Session
  - Destroying Session
  - Managing Session Lifetime

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q-12-20
2 Unit I, Section III Q-1-10

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2,Page No. 63-68, 71-98, 163-187, 199-227

WEBSITE:

1 http://www.oracle.com/technetwork/java/javaee/downloads/java-ee-sdk-6u3-downloads-439814.html

REFERENCE BOOK:

1 ibid 3, Page No. 200-220

LECTURES 19-23

JAVA SERVER PAGES BASICS AND ARCHITECTURE

OBJECTIVE:

The objective of these lectures is to make student understand about the Java Server Pages and to explore on the Architecture of JSP in Enterprise computing with JAVA.

CONTENTS:

- Why use JAVA SERVER PAGES
- Disadvantages of JSP
- JSP/ SERVLETS
- Life cycle of JSP Page
- JSP Function
- Features of JSP
- JSP Directives
  - Page Directive
  - Include Directive
  - Taglib Directive
- Scripting Elements
- Declarations
- Scriptlets
- Expressions
- Action Elements
- Forwarding JSP Page to Another Page
- Passing Parameters for Other Actions
- Implicit Objects
  - Request
  - Response
  - Out
  - Session
  - Application

- Config
- Page Context
- Page
- Exception

- Scope
  - Application Scope
  - Session Scope
  - Request Scope
  - Page Scope
- JSP Design Strategies

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q1-10
2 Unit II, Section III Q1-7, 10

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2,Page No. 371-388, 393-406, 423-428, 435-445

WEBSITE:

1 http://www.tutorialspoint.com/jsp/index.htm

LECTURE 24

INTRODUCTION TO STRUTS

OBJECTIVE:

The objective of this lecture is to make student understand about Struts in Enterprise computing with JAVA.

CONTENTS:

- Introduction to Struts
  - Standard Application Flow
  - What is Struts
  - History of struts
  - Why Struts?- MVC Design Pattern
  - Advantages & Application of Struts

ASSIGNMENT FROM QUESTION BANK:

1 Unit II, Section III Q8,9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 2,Page No. 895-902

WEBSITE:

1 http://www.tutorialspoint.com/struts_2/index.htm

LECTURES 25-27

INTRODUCTION TO ENTERPRISE JAVA BEANS

OBJECTIVE:

The objective of these lectures is to make student understand what Enterprise Java beans is and what their basic fundamentals in J2EE technologies are.

CONTENTS:

- Introduction to Enterprise Java Beans
  - Enterprise Bean Architecture
  - Enterprise Bean Server
  - Enterprise Bean
  - EJB Evolution
  - Enterprise Bean Containers
  - Enterprise Bean Clients
  - Benefits of Enterprise Bean
  - Types of Enterprise Bean
    - Session Beans
    - Message Driven Beans
  - Accessing Enterprise Beans
  - Enterprise Bean Application
  - Enterprise Bean Class
  - Business Interfaces
  - Helper Classes

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q-1-7
2 Unit III, Section III Q-1-5

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 42-46, 51-59
2 ibid 2, Page No. 633-645

ARTICLES:

1 Wu He, Li Da Xu, "Integration of Distributed Enterprise Applications: A Survey", IEEE Transactions on Industrial Informatics, Volume:10 , Issue: 1 , Pages 35 - 42 , Feb 2014.
2 Jun Luo,Wang Yu, "Implement of Component Application System based on Java Technology",http://ieeexplore.ieee.org.
3 Felix Willnecker, Andreas Brunnert, Wolfgang Gottesheim, Helmut Krcmar, "Using Dynatrace Monitoring Data for Generating Performance Models of Java EE Applications" ICPE '15 Proceedings of the 6th ACM/SPEC International Conference on Performance Engineering, Pages 103-104, ACM New York, NY, USA 2015, ISBN: 978-1-4503-3248-4

LECTURES 28-29

GETTING STARTED WITH ENTERPRISE JAVABEANS

OBJECTIVE:

The objective of these lectures is to make student understand how to create Enterprise application with Enterprise Javabeans.

CONTENTS:

- Creating A Web Application
- Creating An Enterprise Bean
- Creating A Web Client [Servlet]
- Creating A JSP File
- Build the Web Application

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q-8-10
2 Unit III, Section III Q-6-10

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 69-82, 86-90, 94-95
2 ibid 2, Page No. 647-659

ARTICLES:

1 Zhang Zhenyou, Wang Honghui, “Research of Heterogeneous Database Integration Based on XML and JAVA Technology”, http://ieeexplore.ieee.org.
2 Samir R. Thakkar, Hiren D. Joshi, "E-Learning Systems: A Review", 2015 IEEE Seventh International Conference on Technology for Education (T4E), Warangal, 10-12 Dec. 2015, Pages 37 - 40, INSPEC Accession Number 15774387

LECTURES 30-35

SESSION BEANS

OBJECTIVE:

The objective of these lectures is to make student understand how to work with Session Beans in the Enterprise Javabeans.

CONTENTS:

- When to use Session Beans
- Types of Session Beans
  - Statefull Session Beans
  - Stateless Session Beans
  - Singleton Session Bean
- Remote And Local Interfaces
- Accessing Interfaces
- Lifecycle of Enterprise Beans
- Packaging Enterprise Beans
- EJB JAR Modules
- WAR Modules
- Creating Web Application
  - Statefull Session Bean
  - Stateless Session Beans
  - Singleton Session Beans

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q-2-5, 7-11
2 Unit IV, Section III Q-1, 3-8, 10-11

SUGGESTED READING:

TEXT BOOKS:

1 ibid 1, Page No.83-86, 90-91, 97-113, 115-130
2 ibid 2,Page No. 661-713

LECTURES 36-37

INTRODUCTION TO ENTITY BEANS

OBJECTIVE:

The objective of these lectures is to make student understand what Entity Beans in Enterprise computing with JAVA.

CONTENTS:

- Persistence Concepts
- Features of Entity Beans
- Entity Context Book

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q-1, 6
2 Unit IV, Section III Q-2,9

SUGGESTED READING:

TEXT BOOKS:

1 ibid 1, Page No. 179-202, 207-210, 237-240
2 ibid 2,Page No. 763-769

LECTURE 38

INTRODUCTION TO JMS

OBJECTIVE:

The objective of this lecture is to make student understand what java mail in Enterprise computing with JAVA is.

CONTENTS:

- Introduction to Java Mail
  - Mail Protocols
  - Components of Java Mail
  - Getting Started with Java Mail API
  - Creating a Web Application
  - Creating an Enterprise Bean
  - Creating the Mail Dispatcher Form Using API
  - Creating a Servlet to Process the Mail

- Build the Web Application
- Running the Web Application
- Java Naming Service
- Directory Service
- Java Naming And Directory Interface
- Java Message Driven beans

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q-12-14
2 Unit IV, Section III Q 12

SUGGESTED READING:

TEXT BOOK:

1 ibid 2,Page No. 1061-1079, 1083-1087

LECTURE PLAN

ADVANCED DATABASE MANAGEMENT SYSTEMS

MCA 307

COURSE OUTLINE
MCA –V SEMESTER
ADVANCED DATABASE MANAGEMENT SYSTEMS- MCA 307

L – 3 P - 1 Credit - 04

OBJECTIVE:

Advanced database management systems as a subject is an extension to database management systems which deals with complex concepts in databases and developments in the field. The purpose of the course is to help students understand databases at deeper level and understand its related concepts comprehensively. Also course focus on providing conceptual background necessary to design and develop distributed database system for real life applications.

INTERNAL ASSESSMENT AND ASSIGNMENT	**40 marks**
1. Class Test-I – (Written Test)	15 marks
2. Class Test-II - (Written Test)	15 marks
3. Class Assessment + Attendance	10 marks

UNIT – I

- Review of traditional DBMS's
- Relational algebra and relational calculus,
- Design principles & normalization,
- Transaction and concurrency control,
- Recovery management.

[No. of Hrs. 10]

UNIT – II

- Design Process: Process and evaluation
- Entity-Relationship model, Semantic data model and Object oriented model
- Normalization and Denormalization.
- Data warehousing, OLAP and data mining.

[No. of Hrs. 12]

UNIT – III

- Oracle Architecture, Logical Data Structures Physical Data Structure,
- Architecture of SQL server
- Oracle sever tuning,
- SQL server tuning,
- OS tuning (Microsoft OS's).

[No. of Hrs. 8]

UNIT – IV

- Distributed Database Management Systems: Concept & Components
- Levels of data & process distribution
- Features of DDBMS: Transparency features, data fragmentation, data replication
- Client Server Systems: Principles & components
- Connectivity: ODBC, ADO, JDBC and JSQL overview.

[No. of Hrs. 12]

STUDY MATERIAL FOR THE SUBJECT

TEXT BOOKS:

1. **Author's Name(s):** Korth , Silberschatz
Title: "Database System Concepts"
Edition: 6th **Year: seventh reprint** 2015
Publisher: TMH
(ibid 1)

2. **Author's Name(s) :** Elmsari and Navathe
Title: "Fundamentals of Database Systems"
Edition: 6th Year: Third impression 2015
Publisher: Pearson Education
(ibid 2)

REFERENCE BOOKS:

1. **Author's Name(s) :** Chakrabarti, Dasgupta & Kogent learning solutions
Title: "Advanced Database Management Systems"
Edition: 1st **Year:** 2013
Publisher: Wiley Publications (Dreamtech press)
(ibid 3)

2. **Author's Name(s):** Elmsari and Navathe
Title: "Database Systems: Models, Languages, Design and application" Programming"
Edition: 6th **Year:** 2015
Publisher: Pearson
(ibid 4)

3. **Author's Name(s):** S.K.Singh
Title: "Database System"
Edition: 2nd **Year:** 2011
Publisher: Pearson Education
(ibid 5)

4. **Author's Name(s):** Paulraj Pooniah
Title: Data Warehousing Fundamentals
Edition: 1st **Reprint Year:** 2013
Publisher: John Wiley & Sons (ibid 6)

- **PERIODICALS**

1 SIGMOD Record
2 International Journal of Data Warehousing
3 National Journal of System and Information Technology
4 International Journal of Data Analysis and Information System
5 ACM Transactions on Database Systems
6 National Journal of System and Information Technology

LECTURE-1

UNIT-I

REVIEW OF TRADITITONAL DATABASE MANAGEMENT SYSTEMS

OBJECTIVE:

The objective is to review the basic concepts of database management systems. This lecture will focus on revision of various concepts and approaches related to DBMs. The concept includes characteristics, types and applications.

CONTENTS:

- Basics of Database Management Systems
    - Introduction to data, database & database Management Systems
    - Database Users
    - Database applications
    - Advantages of using the Database Approach
    - Characteristics of the Database Approach
    - Types of Databases and Database Applications
    - When not to use Databases

ASSIGNMENT FROM QUESTION BANK:

1 Unit 1, Section II Q 47-50

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 1- 14
2 ibid 2, Page No. 3-28

REFERENCE:

1 ibid 3, Page No. 3-10
2 ibid 4, Page No. 1-25
3 ibid 5, Page No. 3-37

ARTICLES:

1 Yahia Chabane , Launentd'Orazio ,Le Gruen - Wald, Baraa Mohammad and Christophe Reej, "Medical Data Management in the S4Seo Project", SIGMOD Record , June 2013, Vol. 42,No. 2 , PP No. 48-53.
2 Stephane Bressan.Chee Yong Chan, Wynne Hsu, Mong-Li Lee ,Tok –Wang Ling, Beng Chin Ooi, Kian-Lee Tan,AnthaonyK.h. Tunj, "Database Research at the National University of Singapore",SIGMOD Record , June 2013, Vol. 42,No. 2 , PP No. 48-53.

LECTURE-2-3

RELATIONAL ALGEBRA AND CALCULUS

OBJECTIVE:

The objective of these lectures is to revise the Relational Algebra and Calculus. It provides a formal foundation for relational model operations and it is used as a basis for implementing and optimizing queries in relational database management systems.

CONTENTS:

- Relational Algebra
  - Unary Relational Operations
    - SELECT (symbol: σ (sigma))
    - PROJECT (symbol: π (pi))
    - RENAME (symbol: ρ (rho))
  - Relational Algebra Operations From Set Theory
    - UNION (∪), INTERSECTION (∩), DIFFERENCE (or MINUS, –)
    - CARTESIAN PRODUCT (**x**)
  - Binary Relational Operations
    - JOIN (several variations of JOIN exist)
    - DIVISION
  - Additional Relational Operations
    - OUTER JOINS, OUTER UNION
    - AGGREGATE FUNCTIONS (These compute summary of information: for example, SUM, COUNT, AVG, MIN, MAX)
  - Relational Algebra Expressions
  - Examples of Queries in Relational Algebra
- Relational Calculus
  - Tuple Relational Calculus
  - Domain Relational Calculus
- Example Database Application

ASSIGNMENTS FROM QUESTION BANK:

1 Unit 1, Section II Q8-10

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 217-248
2 ibid 2, Page No. 173-212

REFERENCE BOOKS:

1 ibid 3, Page No. 81-99
2 ibid 4, Page No. 145-185
3 ibid 5, Page No. 152-169

ARTICLES:

1 Rabia Nuray-Turan, Dmitri V. Kalashnikov, Sharad Mehrotra, "Attribute and Object with Probabilistic Attribute", ACM Transactions on Database Systems, Feb. 2012, Vol. 37, No. 1, pp 3:1-3:41.
2 Guoliang Li, Dong Deng and Jianhua Feng,"A partition Based Method for String Similarity Joins with Edit Distance Constraints", June 2013 , Vol : 38, No. 2, PP : 9:1- 9:33
3 Jan Chomkki, Paolo Ciaccia, NIccoloMeneegheette, "Skyline Queries Front and Back:SIGMOD Record , Sept, 2013, Vol. 42, No. 3 , PP – 6-17.
4 Larissa R .Lautent, Marcelo M .Scheildt, Carina F- Donneles, "Web Table Taxonomy nad Formalization " , SIGMOD Record , Sept, 2013, Vol. 42, No. 3, P - 28 – 33.
5 Andrew Eisenberg, "X Query 3.0 is Nearing Completion", SIGMOD Record , Sept, 2013, Vol. 42, No. 3 , PP – 34-41.
6 Ndapandula Nakashole, Gerhand Weibum, Falian Suchanek, "Discovery Semantic Relations from the Web and Organizing them with PATTY", SIGMOD Record , June 2013, Vol. 42, No. 2 , PP - 29-35.
7 Florin Rusu, Zixuan Zhuang, Mingxi Wu. Chris Jermaine, "Workload-Driven Antijoin Cardinality Estimation", ACM Transactions on Database Systems, 2015, Volumne 40, Number 3, Pg Nos. 16-16:41

LECTURES 4-6

RELATIONAL DATA BASE DESIGN

OBJECTIVE:

The objective of these lectures is to discuss several pitfalls in relational database design and to describe the normalization process for achieving good designs by testing relations for undesirable types of problematic functional dependencies. These lectures will focus on understand sound design practices.

CONTENTS:

- Informal Design Guidelines for Relational Databases
  - Semantics of the Relation Attributes
  - Redundant Information in Tuples and Update Anomalies
    - Insertion anomalies
    - Deletion anomalies
    - Modification anomalies
  - Null Values in Tuples
    - Reasons for nulls
  - Spurious Tuples
- Functional Dependencies (FDs)
  - Definition of FD
  - Inference Rules for FDs

- Equivalence of Sets of FDs
- Minimal Sets of FDs
- Computing the Minimal Sets of FDs
- Examples of FD constraints

- Normal Forms Based on Primary Keys
  - Normalization of Relations
  - Practical Use of Normal Forms
  - Definitions of Keys and Attributes Participating in Keys
  - First Normal Form
  - Second Normal Form
  - Third Normal Form
  - General Normal Form Definitions (For Multiple Keys)
  - BCNF (Boyce-Codd Normal Form)
    - A relation that is in 3NF but not in BCNF

ASSIGNMENT FROM QUESTION BANK:

1 Unit I, Section II Q1-Q17
2 Unit I, Section III Q1-Q5, Q10(a)

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 323-338
2 ibid 2, Page No. 339-374

REFERENCE BOOKS:

1 ibid 3, Page No. 41-52
2 ibid 4, Page No. 57-77
3 ibid 5, Page No. 317-350

LECTURES 7-8

TRANSACTION & CONCURRENCY CONTROL

OBJECTIVE:

The objective of these lectures is to revise transactions and understand how concurrency can lead to better throughput. Also various concurrency control techniques will be discussed that are used to ensure the non-interference or isolation property of concurrently executing transactions.

CONTENTS:

- Purpose of Concurrency Control
- Two-Phase locking
  - Essential components
  - The algorithm
    - Basic
    - Conservative

- Dealing with Deadlock and Starvation
    - Deadlock prevention
    - Deadlock detection and resolution
    - Deadlock avoidance
    - Starvation
- Timestamp based concurrency control algorithm
    - Timestamp
    - Basic Timestamp Ordering
    - Strict Timestamp Ordering
    - Thomas's Write Rule
- Granularity of data items and Multiple Granularity Locking
- Limitations of CCMs
- Index Locking
- Lock Compatibility Matrix
- Lock Granularity

ASSIGNMENT FROM QUESTION BANK:

1 Unit I, Section II Q 18-41
2 Unit I, Section III Q 10(b),11,14-21

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 661-708
2 ibid 2, Page No. 644 - 669

REFERENCE BOOK:

1 ibid 3, Page No. 323-356

ARTICLES:

1 Goetz Graefe, "A Survey of B-tree Logging and Recovery Techniques", ACM Transactions on Database Systems, Feb. 2012, Vol. 37, No. 1, pp 1:1-1:35.
2 Erez Shmuali, Ronen Vaiseiberg, Yuval Elovici, Chanan Glezer, "Database Encryption-An Overview of Contemporary Challenges and Design Considerations", Sigmod Record, Vol. 38, No.3, September 2009, pp 29-34.

LECTURES 9-10

DATABASE RECOVERY TECHNIQUES

OBJECTIVE:

The objective of these lectures is to discuss the ways to deal with failed transactions. The lectures will also help students to comprehend some of the techniques that can be used for database recovery from failures such as system crash and transaction errors.

CONTENTS:

- Purpose of Database Recovery
- Types of Failure
  - Transaction failure
  - System failure
  - Media failure
- Transaction Log
- Data Updates
  - Immediate Update
  - Deferred Update
  - Shadow update
  - In-place update
- Data Caching
- Transaction Roll-back (Undo) and Roll-Forward
  - Write-Ahead Logging
- Check pointing
  - Steal/No-Steal and Force/No-Force
- Recovery schemes
  - Deferred Update (No Undo/Redo)
  - Recovery Techniques Based on Immediate Update and Undo/No-redo Algorithm
  - Shadow Paging
- ARIES Recovery Scheme
  - The ARIES Recovery Algorithm
- Recovery in Multidatabase System

ASSIGNMENT FROM QUESTION BANK:

1 Unit 1, Section II Q 42-46
2 Unit 1, Section III Q 12,22-27

SUGGESTED READING:

TEXT BOOKS:

1 ibid 1, Page No. 721-759
3 ibid 2, Page No. 672 – 694

REFERENCE BOOK:

1 ibid 3, Page No. 357-373

LECTURES 11-13

Unit II

DESIGN PROCESS & ER MODELLING

OBJECTIVE:

The objective of these lectures is to understand the Data Modeling using the Entity-Relationship (ER) Model which is popular high level conceptual data modeling software design it is common to use data flow diagram, sequence diagram, scenarios and other techniques to specify functional requirements.

CONTENTS:

- Overview of Database Design Process
  - Two main activities
    - Database design
    - Applications design
  - Example Database Application (COMPANY)
- ER Model Concepts
  - Entities and Attributes
  - Types of Attributes
- Entity Types, Value Sets, and Key Attributes
- Relationships and Relationship Types
  - Relationship type vs. relationship set
  - Weak Entity Types
  - Constraints on Relationships
  - Many-to-one (N:1) Relationship
  - Many-to-many (M:N) Relationship Displaying a recursive relationship
  - Attributes of Relationship types
  - Notation for Constraints on Relationships
  - Alternative (min, max) notation for relationship structural constraints
  - The (min,max) notation for relationship constraints
  - Relationships of Higher Degree
  - Discussion of n-ary relationships
- ER Diagrams - Notation
- ER Diagram for COMPANY Schema
- Data Modeling Tools

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q1-26
2 Unit II, Section III Q4-9

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 259-290
2 ibid 2, Page No. 57-91

REFERENCE BOOKS:

1 ibid 3, Page No. 30-36
2 ibid 4, Page No. 199-253
3 ibid 5, Page No. 237-248

LECTURE 14-16

OBJECT ORIENTED MODEL

OBJECTIVE:

The objective of these lectures is to introduce the Concepts of Object Oriented Database Management Systems. These lectures would focus on introducing object oriented model and comparing it with object relational databases.

CONTENTS:

- Object-Oriented Data Model
  - Object Structure
  - Messages and Methods
  - Object Classes
  - Inheritance
  - Object Identity
  - Object-Oriented Languages
  - ODMG(Object Database Management Group) C++ Object Definition Language
  - ODMG C++ Object Manipulation Language

ASSIGNMENT FROM QUESTION BANK:

1 Unit II, Section III Q7,9,10

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 27, 973-974
2 ibid 2, Page No. 703-722, 876-892

REFERENCE BOOKS:

1 ibid 3, Page No. 10
2 ibid 4, Page No. 343-398

LECTURES 17-19

MODEL MAPPING, NORMALIZATION AND DENORMALIZATION

OBJECTIVE:

The objective of these lectures is to present the procedure to create a relational schema from an entity relationship schema. The lectures would focus on discussing several normalization algorithms using additional type of dependencies like multi-valued dependencies, join dependencies. These lectures will also introduce concept of de-normalization which is preferred in a specific type of databases

CONTENTS:

- ER-to-Relational Mapping Algorithm
  - Step 1: Mapping of Regular Entity Types
  - Step 2: Mapping of Weak Entity Types
  - Step 3: Mapping of Binary 1:1 Relation Types
  - Step 4: Mapping of Binary 1:N Relationship Types.
  - Step 5: Mapping of Binary M:N Relationship Types.
  - Step 6: Mapping of Multivalued attributes.
  - Step 7: Mapping of N-ary Relationship Types.
- Mapping EER Model Constructs to Relations
  - Step 8: Options for Mapping Specialization or Generalization.
  - Step 9: Mapping of Union Types (Categories).
- Designing a Set of Relations
  - The Approach of Relational Synthesis (Bottom up Design)
- Properties of Relational Decompositions
  - Relation Decomposition and Insufficiency of Normal Forms
  - Dependency Preservation Property of a Decomposition
  - Lossless (Non-additive) Join Property of a Decomposition
- Multivalued Dependencies and Fourth Normal Form
  - Inference Rules for Functional and Multivalued Dependencies
- Join Dependencies and Fifth Normal Form
- Inclusion Dependencies
- Denormalization

ASSIGNMENT FROM QUESTION BANK:

1 Unit II, Section III Q12-17

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 283-310, 338-367
2 ibid 2, Page No. 382- 410

REFERENCE BOOKS:

1 ibid 3, Page No. 53-76
2 ibid 5, Page No. 329-332

ARTICLE:

1 Arun Kumar, Robert McCann, Jeffrey Naughton, Jignesh M. Patel, "Model Selection Management Systems : The Next Frontier of Advanced Analytics", SIGMOD Record, December 2015, Vol. 44, No. 4, Pg. Nos. 17-22.

LECTURE 20

OLTP & OLAP

OBJECTIVE:

The objective of this lectures is to familiarize the students with Online Analytical Processing and Online Transactional Processing. Organizations use On-Line Transaction Processing (OLTP) servers for their day-to-day business operations. This only stores current data and very recent transactional data. OLAP deals with Historical Data or Archival Data. Historical data are those data that are archived over a long period of time.

CONTENTS:

- OLAP
  - Online Analytical Processing
  - Definition
  - Characteristics
  - OLAP models
- OLTP
  - Online Transactional Processing Systems
  - Definition
  - Comparison between OLTP and Decision Support Systems

ASSIGNMENTS FROM QUESTION BANK:

1. Unit II, Section II Q32
2. Unit II, Section III Q25

OTHER ASSIGNMENTS:

1. ibid 6, Page No. 375, Q1, 2, 4, 5

SUGGESTED READING:

TEXT BOOK:

1. ibid 1, Page No. 1046-1047

REFERENCE BOOKS:

1. ibid 3, Page No. 611-612
2. ibid 4, Page No. 1114-1115
3. ibid 6, Page No. 343-373

ARTICLES:

1. Hoda A. Abdelhafez", Advanced Data Warehouse in Telecommunication Industries", International Journal of Data Analysis and Information System, Vol. 4, No. 1, Jan-Jun 2012, pp. 1-9
2 Zhoujie Zhou, Nan Zhang, Zhiguo Gong, Gautam Das, " Faster Random Walks by Rewiring Online Social Networks On-the-fly ",ACM Transactions on Database Systems, Vol. 40, No. 4, Article 26, January 2016.

WEBSITES:

1 http://www.infogoal.com/datawarehousing/olap.htm2
2 http://www.dwreview.com/OLAP/Introduction_OLAP.html
3 http://msdn.microsoft.com/en-us/library/aa197702(SQL.80).aspx
4 http://www.thefreedictionary.com/hypercubes
5 http://ycmi.med.yale.edu/nadkarni/Warehouse_Fr.htm

LECTURES 21-22

DATA WAREHOUSE ARCHITECTURE

OBJECTIVE:

These lectures discuss the architecture of data warehouse. These will explain as how data is moved from databases used in operational systems into a data warehouse staging area, then into a data warehouse and finally into a set of conformed data marts.

CONTENTS:

- Data Warehouse Architecture
  - Features
    - Subject Oriented
    - Integrated
    - Time variant
    - Non volatile
    - Data Granularity
  - Data marts and Data warehouse
    - Definition of Data marts and Data warehouse
    - Difference between Data marts and Data warehouse
    - Top down approach
    - Bottom up Approach
    - Enterprise wide
    - Departmental
    - Dependent or independent data marts
    - Practical approach
      - Overview of Components
    - Source data component
      - ✓ Production data
      - ✓ Internal data
      - ✓ Archived data
      - ✓ External data
    - Data Staging Component
      - ✓ Data extraction

        - ✓ Data transformation
        - ✓ Data Loading
    - Data storage
    - Information Delivery
    - Metadata component
    - Management and control
    - Types of metadata
        - ✓ Operational metadata
        - ✓ Extraction and Transformation Metadata
        - ✓ End User Metadata

ASSIGNMENTS FROM QUESTION BANK:

1. Unit II, Section II Q29
2. Unit II, Section III Q24

OTHER ASSIGNMENTS:

1 ibid 6, Page No. 38, Q 3, 4, 5

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No.889-892

REFERENCE BOOKS:

1. ibid 3, Page No.604-606
2. ibid 4, Page No. 1103-1118
3. ibid 6, Page No.19-36

ARTICLE:

1 Nakul Vachhrajani "Defining a Database Upgrade Design Methodology "National Journal of System and IT, Volume 4, No.1, June 2011, Page Nos. 88—108

LECTURES 23-24

DATA MINING

OBJECTIVE:

Data mining plays a very important role in business – sales, marketing, and customer support. It is being used to discover implicit and useful knowledge from vast datasets. These lectures cover the fundamental to the understanding and applications of data mining methods to business problems.

CONTENTS:

- Data Mining Techniques
    - Definition of Data mining
    - Understanding the concept of data mining

- Features of data mining
- The Knowledge Discovery Process
  - Define Business Objectives
  - Prepare Data
  - Perform Data Mining
  - Evaluate Results
  - Present Discoveries
  - Incorporate Usage Of Discoveries
- OLAP versus Data Mining
- Comparison of Data Mining and Data Warehouse
- Functions of data mining
  - Credit Card Faults
  - Internal Audits
  - Mortgage Loans
  - Customer Relationship Marketing
  - Target Marketing

ASSIGNMENTS FROM QUESTION BANK:

1. Unit II, Section II Q28,30-36
2. Unit II, Section III Q18-23

OTHER ASSIGNMENT:

1. ibid 6, Page No. 427, Q2, 3

SUGGESTED READINGS:

TEXT BOOK:

1. ibid 1, Page No. 893-909

REFERENCE BOOKS:

1. ibid 3, Page No. 613-622
2. ibid 4, Page No. 1071-1099
3. ibid 6, Page No. 399-408

ARTICLES:

1 M. Ravisankar, P. Premchand , M. Srinivas, "Multirelational Data Mining in Medical history: A review", International Journal of Data Warehousing, Vol. 3 No. 1, Jan- June 2011, pp 7-72.

2 S. Narmadha, S. Vijayarani, "Privacy Preserving Data Mining based on Ant Colony Optimization", International Journal of Data Warehousing, Vol. 3 No. 2, December 2013, ISSN: 0975-6124, pp 87-96.

3 A.Pravin, Dr. S. Srinivasan, "Detecting of Software Bugs in Source code using Data Mining Approach", National Journal of System and Information Technology, Vol. 6 No. 1, June 2013, ISSN: 0974-3308, pp 1-8

4. Huy Pham, Cyrus Shahabi, Yan Liu, " Inferring Social Strength from Spatiotemporal Data", ACM Transactions on Database Systems, Vol. 41, No. 1, Article 7, March 2016.

UNIT III

LECTURES 25-28

SQL ARCHITECTURE

OBJECTIVE:

The objective of these lectures is to describe the main components of the SQL Server architecture and its logical and physical data structures. It also discusses Database Storage, Software Structures, Shared Database Access Mechanism, and Database Protection.

CONTENTS:

- Features of SQL Server 2000
- Relational Database Components
- Database Architecture .
- Relational Database Engine Architecture
- Administration Architecture
- Replication Architecture .
- Data Warehousing and Online Analytical Processing
- Application Development Architecture
- Implementation details

ASSIGNMENT FROM QUESTION BANK:

1 Unit III, Section II Q1-8

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1223-1253

ARTICLE:

1 Markus Winand, " Surprises in SQL : State-of-the-art options in the standard query language", Linux Magazine, February 2016, issue 183, Pg nos. 26-30.

UNIT III

LECTURES 29-32

SQL & ORACLE TUNING

OBJECTIVE:

A bad database design can be a major enterprise-level bottleneck. These lectures would focus on configuring the database for optimal performance by following the tuning guidelines. The lectures would discuss basic tuning suggestions and then specific techniques for Oracle and SQL database tuning.

CONTENTS:

- Basic tuning suggestions
- SQL Tuning
  - Query Optimizer Modes
  - Types of Tuning Analysis
  - SQL Tuning advisor
  - SQL Tuning sets
  - SQL Profiles
  - SQL Tuning Information Views
- Oracle Tuning
  - Server Tuning
  - Instance workload tuning
  - Instance object tuning
  - SQL statement tuning

ASSIGNMENT FROM QUESTION BANK:

1 Unit III, Section II Q9-Q16
2 Unit III, Section III Q4-Q18

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page Nos. 1172, 1207

REFERENCE BOOKS:

1 ibid 3, Page No. 306 -319
2 ibid 4, Page No. 663-707,711-723

ARTICLES:

1 Adreen Guitte, Habein Hacid,Ceeile Favre, Djamel A. ZIghed, " Information Diffusion In Online Social Networks : Summary", SIGMOD Record , June 2013, Vol. 42,No. 2 , pp. 17-28.
2 Hyunjung Park, Richard Pang, Aditya Parmeshwaran, Hector Garcia- Molinam Neoklies Polyzotes, Jennifer Widom, "An Overview and Query Language; Query Processing and Optimization", SIGMOD Record , June 2012, Vol 41,No. 4 , pp. 22-27.
3 Eleftherios Tiakas, George Valkanas, Apostolos N. Papadopoulos and Yannis Manopoulos, Dimitrios Gunopulos, " Processing Top-k Dominating Queries in Metric Spaces" ACM Transactions on Database Systems, Vol. 40, No. 4, Article 23, January 2016.

UNIT IV

LECTURES 33-36

DISTRIBUTED DATABASE MANAGEMENT SYSTEMS

OBJECTIVE:

Reliability and computation of the system increases drastically if collection of multiple, logically interrelated databases are distributed over a computer network. These lectures focus on this type arrangement called distributed databases. The lectures would cover Distributed databases and how they are managed using D-DBMS.

CONTENTS:

- Introduction
  - What is a distributed DBMS
  - Problems
  - Current state-of-affairs
- Distributed Databases
  - Heterogeneous and Homogeneous Databases
  - Distributed Data Storage
  - Distributed Transactions
  - Commit Protocols
  - Concurrency Control in Distributed Databases
  - Availability
  - Transparency features
  - Data fragmentation
  - Data replication
  - Distributed Query Processing
  - Heterogeneous Distributed Databases

ASSIGNMENT FROM QUESTION BANK:

1 Unit IV, Section II Q1-Q26
2 Unit IV, Section III Q1-Q21

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 825-875

REFERENCE BOOKS:

1 ibid 3, Page No. 395-420
2 ibid 4, Page No. 977-1019

UNIT IV

LECTURES 37-41

CLIENT SERVER SYSTEMS

OBJECTIVE:

The essence of client-server computing is that two kinds of processes (units of program code) that are specialized for different tasks, running on possibly different hardware, applications software and operating systems co-operate to solve a computing problem. These lectures would focus on such systems and how they can used to achieve modularity and economy of communication.

CONTENTS:

- Client Server Systems,
- Architecture
- Principles
- Components
  - Database services
  - Transaction services
  - Miscellaneous services
- Overview of ODBC,
- Overview of ADO,
- Overview of JDBC
- Overview of JSQL

ASSIGNMENT FROM QUESTION BANK:

1 Unit IV, Section II Q27

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 1157-1189

REFERENCE BOOK:

1 ibid 3, Page No. 400-401

ARTICLES:

1. Leonid Libkin, " SQL's Three- Valued Logic and Certain Answers", ACM Transactions on Database Systems, Vol. 41, No. 1, Article 7, March 2016.
2. Yu Cheng, Florin Rusu, "SCANRAW: A Database Meta-operator for Parallel In-Situ Processing and Loading" , ACM Transactions on Database Systems, Vol. 40, No. 4, Article 19, October 2015.

LECTURE PLAN

MULTIMEDIA TECHNOLOGIES

MCA - 313

COURSE OUTLINE
MCA –V SEMESTER
MULTIMEDIA TECHNOLOGIES - MCA 313

L – 03 T - 01 Credit - 04

OBJECTIVE:

The objective of this course is to enable the students know about the concepts related to study and develop a generic interactive distributed multimedia framework, which will take advantage of recent advances in a number of related areas such as: multimedia modeling and development, middleware platforms and coordination models, parallel and distributed software engineering, digital libraries, and networking techniques.

INTERNAL ASSESSMENT AND ASSIGNMENT **(40 marks)**

1. Class Test-I – (Written Test) 15 marks
2. Class Test-II - (Written Test) 15 marks
3. Class Assessment + Attendance 10 marks

COURSE CONTENTS:

A. INTRODUCTORY CONCEPTS (12 Hours)

- Definition
- CD-ROM and the Multimedia Highway
- Uses of Multimedia
- The Stages of project
- Requirements to make good multimedia
- Multimedia skills and training
- Training Opportunities in Multimedia
- Multimedia Hardware
- Hardware Peripherals
- Memory and Storage devices
- Media software
- Multimedia software and Authoring tools

B. MULTIMEDIA – MAKING IT WORK (13 Hours)

- Multimedia building blocks
- Digitization of Audio and Video objects
- Data Compression
- Working Exposure on Tools

C. MULTIMEDIA AND THE INTERNET (13Hours)

- History
- Internet working
- Connections
- Internet Services
- World Wide Web
- Tools For WWW
- Designing for Multimedia Applications

D. MULTIMEDIA-LOOKING TOWARDS FUTURE (12 Hours)

- Digital Communication and New Media
- Interactive Television
- Digital Broadcasting
- Digital Radio
- Multimedia Conferencing
- Planning and costing
- Designing and Producing
- Content and talent
- Delivering
- CD-ROM technology

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Multimedia, and students are advised to go through the material for thorough understanding of the subject.

- **TEXT BOOK:**

1. **Author's Name(s):** Tay Vaughan
Title: Multimedia: Making It Work
Edition: VIII **Year:** Reprint 2012
Publisher: Tata McGraw Hill (ibid 1)

2. **Author's Name(s):**Prabhat K. AndleighKiranThakrar
Title: Multimedia Systems Design
Edition: I **Year:** 2012
Publisher: Prentice Hall (ibid 2)

- **REFERENCE BOOKS:**

1. **Author's Name(s):** Ranjan Parekh
Title: Principles of Multimedia
Edition: II **Year:** Reprint 2013
Publisher: Tata McGraw Hill (ibid 3)

2. **Author's Name(s):**Pradeep K. Sinha, PreetiSinha
Title: Computer Fundamentals
Edition: VI **Year:** Reprint 2013
Publisher: BPB Publications (ibid 4)

3. **Author's Name(s):** Fred Halsall
Title: Multimedia Communications: Applications, Networks, Protocols and Standards
Edition: XVI Year**:** 2013
Publisher: Pearson Education **(**ibid 5)

- **PERIODICALS**

1. ACM SIGCOMM Computer Communication Review
2. International Journal of Computing and Applications
3. IUP Journal of Telecommunications
4. The Journal of International Institute of Management Studies
5. National Journal of System and technology
6. The IUP Journal of Computer Sciences

LECTURES 1-2

DEFINITION, USES, CD ROM AND MULTIMEDIA HIGHWAY

OBJECTIVE:

The main aim of these lectures is to tell the students about the basics of Multimedia and its applications.

CONTENTS:

- Definitions
- Uses-
  - Creative industries
  - Commercial
  - Entertainment and fine arts
  - Education
  - Engineering
  - Industry
  - Medicine etc.
- CD ROM and Multimedia Highway
- Stages of a MM Project
  - Planning and Costing,
  - Designing and producing,
  - Testing
  - Delivering
- Requirements to make a good MM Presentation

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q1-3, 28
2 Refer to Unit I Section III Q1-2

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page 1-12, 196-197, 222-234
2 ibid 2, Page 4-7, 33-35

REFERENCE BOOKS:

1 ibid 3, Page 1-2, 9-12
2 ibid 4, Page 392-393
3 ibid 5, Page 23-33

ARTICLES :

1. Bedre Heeramani1 , B.Nagaraj2, "Research Issues of Interactive Multimedia for Advanced Computing &Communication for Challenging Applications", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 4, ISSN: 2277 128X, April 2012.
2. Rynson W. H. Lau & Neil Y. Yen & Frederick Li & Benjamin Wah, "Recent development in multimedia e-learning technologies", Research Gate, IISN:11280-013-0206-8,PP No. 189–198,Feb 2013.

LECTURES 2-4

MULTIMEDIA SKILLS AND TRAINING, TRAINING OPPORTUNITES IN MULTIMEDIA

OBJECTIVE:

These lectures will help the students in understanding the lifecycle of Multimedia project development and the prerequisites that are required for it. It tells the students about the key personnel's involved in MM Project development.

CONTENTS:

- Multimedia Skills and Training
  - Multimedia Team
    - Project Manager
    - MM designer
    - Interface Designer
    - Writer
    - Webmaster
    - Computer Graphic Artist
    - Audio And video Specialist
- Training opportunities in multimedia

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q7, 8,9,10,11,15,20
2 Refer to Unit I Section III Q4, 5

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page 241-254

REFERENCE BOOK:

1 ibid 5, Page 55-60

WEBSITE:

1 http://web.science.mq.edu.au/~cassidy/comp449/html/ch06.html
2 https://www.researchgate.net/deref/http%3A%2F%2Fsecondlife.com%2F

ARTICLES :

1 Dimitris N. Kanellopoulos , "Intelligent multimedia engines for multimedia content adaptation", International Journal of Multimedia Intelligence and Security , Vol. 1, No.1 pp. 53 - 75, Nov 2010.Mouna Torjmen, Karen Pinel-Sauvagnat, Mohand Boughanem, "Using textual and structural context for searching Multimedia Elements", International Journal of Business Intelligence and Data Mining, Vol. 5, No.4 pp. 323 - 352, May 2010.Antonio M. Rinaldi, "A complete framework to manage multimedia ontologies in digital ecosystems", International Journal of Business Process Integration and Management Vol. 7, No.4 pp. 274 - 288, Jun 2015.

LECTURES 5-7

MULTIMEDIA HARDWARE

OBJECTIVE:

The objective of these lectures would be to discuss the various hardware devices associated with Multimedia.

CONTENTS:

- Multimedia Hardware
  - Macintosh
  - Windows
  - Connections
  - IDE
  - USB
  - Firewire
  - Storage devices

- Input Devices
- CD-Rom
- Scanners
- OCR Devices
- Output Devices
- Printers
- Projectors
- Communication Devices
- ISDN

ASSIGNMENT FROM QUESTION BANK:

1 Refer to Unit I Section II Q12, 14, 29

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 200-210
2 ibid 2, Page No. 43

REFERENCE BOOKS:

1 ibid 3, Page No. 7-10
2 ibid 4, Page No. 149-168

LECTURES 8-9

MULTIMEDIA SOFTWARE

OBJECTIVE:

The objective of these lectures is to discuss about the software involved with Multimedia.

CONTENTS:

- Multimedia Software
  - Text Editing and Word Processing Tools
  - OCR Software
  - Painting And Drawing Tools
  - 3D Modeling and Animation Tools
  - Image Editing Tools
  - Plug Ins
  - Sound Editing Tools
  - Movie editors
  - Animation Video and Digital Movie tools

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q5, 29 &Section III Q13
2 Refer to Unit II Section I (a) Q6 & Section III Q14

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 212-222
2 ibid 2, Page No. 43

REFERENCE BOOK:

1 ibid 3, Page No. 7-10

LECTURES 10-12

AUTHORING TOOLS

OBJECTIVE:

The objective of these lectures is to give an insight of the various authoring tools used and the production standards followed.

CONTENTS:

- Authoring Tools
  - Definition
  - Types
  - Uses
  - Different Objects
  - Detailed study of all the Authoring Tools
  - Choosing an Authoring Tool
- Production Standards

ASSIGNMENT FROM QUESTION BANK:

1 Refer to Unit I Section II Q13
2 Refer to Unit III Section II Q 30

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 227-234
2 ibid 2, Page No. 433-447

REFERENCE BOOK:

1 ibid 3, Page No. 667-670

WEBSITES:

1 http://www.brennerbooks.com/deskstand.html
2 http://www.jotuts.com/multimedia-fundamentals/multimedia-authoring-tools/

ARTICLES:

1 Kaskalis, T. H., Tzidamis, T. D., & Margaritis, K. , "Multimedia Authoring Tools: The Quest for an Educational Package" , Educational Technology & Society, Vol. 10 (3), Page 135-162, 2007, Link : http://www.ifets.info/journals/10_3/10.pdf.
2 Pamela Rogerson-Revell, "Directions in e-learning tools and technologies and their relevance to online distance language education", The Journal of Open, Distance and E-Learning, Vol. 22, Issue 1, Page 57-74 , Published online: 05 Jun 2008.

UNIT – II

LECTURES 13-15

MULTIMEDIA BUILDING BLOCKS (TEXT)

OBJECTIVE:

The objective of these lectures is to have an insight of the various building blocks of MM & also to discuss the two building blocks namely text and sound.

CONTENTS:

- Multimedia Building Blocks
    - Definition
    - Types of text
    - Insertion of text
    - Text compression
    - File Formats

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit II Section 1(c) Q7
2 Refer to Unit II Section II Q1,2,4,5,6,7,10,11,12,13,20 Section III Q10

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 20-60
2 ibid 2, Page No. 124-170
3 ibid 3, Page No. 76-90

REFERENCE BOOKS:

1 ibid 4, Page No. 394
2 ibid 5, Page No.138-192

WEBSITES:

1. http://www.forums.pctechguide.com/glossary/bycat.php?catSelected=7&catSearchSubmit=View+Category
2. http://www.shorewalker.com/pages/seven_rules-1.html
3. http://www.colin.mackenzie.org/webdesign/
4. http://www.wpdfd.com/index.htm
5. http://www.december.com/web/develop/elements.html

ARTICLES :

1. André Santanchè, Claudia Bauzer Medeiros, Gilberto Zonta PastorelloJr, "User-author centered multimedia building blocks", SpringerLink, , Volume 12, Issue 4, pp 403–421, March 2007.
2. M.Prensky, "The Role of Technology in teaching and the classroom," Educational Technology, Nov.-Dec. 2008.
3. M. Neo and T.K. Neo, Engaging students in multimedia-mediated Constructivist learning – Students‟ perceptions. Educational Technology & Society, vol.12, no. 2, pp. 254–266, (2012). Available: http://www.ifets.info/journals/12_2/18.pdf

LECTURES 16-18

MULTIMEDIA BUILDING BLOCKS (SOUND)

OBJECTIVE:

The objective of these lectures is to have an insight of the various building blocks of MM & also to discuss the two building blocks namely text and sound.

CONTENTS:

- Multimedia Building Blocks
  - Sound
    - Definition
    - Nature
    - Characteristics
    - Study On Sound Waves
    - Digital Audio
    - MIDI
    - Comparison of MIDI and Digital Audio
    - Sound Card
    - File Formats Supported by Sound

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit II Section II Q1,2,4,5,6,7,10,11,12,13,20 Section III Q10
2 Refer to Unit IV Section III Q 8-10

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 104-131
2 ibid 2, Page No. 224-242

REFERENCE BOOKS:

1 ibid 3, Page No. 180, 181, 202, 207-209,220,235
2 ibid 5, Page No. 195-196

LECTURES 19-21

MULTIMEDIA BUILDING BLOCKS (VIDEO, ANIMATION)

OBJECTIVE:

The objective of these lectures is to discuss the other building blocks of MM namely animation & video.

CONTENTS:

- Video
  - Definition
  - Transmission of video signals
  - File Formats
  - Video Editing Software
- Animation
  - Definition
  - Uses
  - Key frames and Tweening
  - Types of Animation,
  - Techniques of Animation
  - File Formats

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit II Section I (c) Q8
2 Refer to Unit II Section II Q14, 15, 16 Sections III Q1, 4, 9

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 164-188, 140-155
2 ibid 2, Page No. 247-258

REFERENCE BOOKS:

1 ibid 3, Page 289,292-297,312- 321,339-381
2 ibid 5, Page 195-253

ARTICLES:

1 Jagdev Singh Rana, "Study on Computer Generated Electtromagnetic Interference on Video Data Processing", The Journal of International Institute of Management Studies, Volume 7, Issue 2, December 2012, ISSN- 0974-7144 Page No. 125-129.
2 S. H. Park, S. Y. Kim, J. H. J. Choo, W. J. Lee, and J. S. Kang, "Using New Media to Create Integrating Art Therapy: Animation Therapy," in Proc. of SIGGRAPH Asia , no. 14, 2011.
3 A. Buaud, H. Svensson, D. Archambault, D. Burger, K. Miesenberger, J. Klaus, and W. Zagler, "Multimedia Games for Visually Impaired Children," ICCHP 2002, Lecture Notes in Computer Science, 2398, pp. 173–180, 2006.
4 E. I. Konstantinidis, A. Luneski, and M. M. Nikolaidou. "Using Affective Avatars and Rich Multimedia Content for Education of Children with Autism," presented at Petra'09, Corfu, Greece. June 9–13, 2013.

LECTURE 22

MULTIMEDIA BUILDING BLOCKS (IMAGES)

OBJECTIVE:

The objective of this lecture is to discuss the last building block namely Images and the various color models used.

CONTENTS:

- Images-
  - Definition
  - Image types
  - Color Models
  - Steps for Image Processing
  - Scanner
  - Digital Camera
  - Image Processing Software
  - File Formats.

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section II Q 24-27
2 Refer to Unit II Section II Q8, 9, 29, 31, 32
3 Refer to Unit III Section II Q 31& Section III Q 10, 12, 14

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 68-97
2 ibid 2, Page No. 216-224

REFERENCE BOOKS:

1 ibid 3, Page No. 91-131
2 ibid 5, Page No. 162-194, 261-267

ARTICLES:

1 R.Harini and C. Chandarasekar,"Implementing Bayesian Classifiers for Segmented Image Classification", International Journal of Computing Applications, Volume 7, No 2, July-December 2012, ISSN- 0973-5704, Page No. 59-66.
2 Ramesh Reddy, K Yateendranath, "Retrieving of Image Based on Histogram Modification" IUP Journal of Telecommunications, Volume 5, Issue No. 1, Feb 2013, ISSN 0975-5551, Page No. 56-65

LECTURE 23

DIGITIZATION OF AUDIO AND VIDEO OBJECTS

OBJECTIVE:

The objective of this lecture is to discuss the concepts related to digital and analog signals.

CONTENTS:

- Digitization of Audio and Video objects
  - Analog Representation
  - Waves
  - Digital Representation
  - Need For Digital Representation
  - Analog to digital conversion
  - Digital to analog Conversion
  - Advantage
  - Disadvantage

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit I Section III Q12
2 Refer to Unit II Section II Q17& Section III Q 16

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 108-113
2 ibid 2, Page No. 260-265

REFERENCE BOOKS:

1 ibid 3, Page No. 22-37
2 ibid 5, Page No. 195-260

LECTURES 24-30

DATA COMPRESSION

OBJECTIVE:

The objective of these lectures is to discuss a very important concept called compression and the various techniques followed in order to compress the data.

CONTENTS:

- Data Compression
  - Definition
  - Types of Compression
    - Lossy
    - Lossless
  - Concept of CODEC
  - Techniques of Lossless Compression
    - Entropy
    - Arithmetic Coding
    - Run Length Encoding
    - Huffman Coding
    - LZ Coding
    - LZW Coding
    - Differential Pulse Code Modulation (DPCM)
    - Delta Modulation(DM)
    - Adaptive Differential Pulse Code Modulation (ADPCM)
  - GIF File Format
  - Techniques of Lossy Compression

- JPEG(Joint Photographer Expert Group)
- MPEG(Motion Picture Expert Group)

Standards of MPEG

- Working Exposure on MM Tools

The following tools will be studied:

- Adobe Photoshop
- Dream Weaver
- FLASH
- Corel Draw

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit II Section II Q18,19, 30
2 Refer to Unit II Section III Q2,3,5,6,7,8, 15
3 Refer to Unit III Section III Q 11, 13
4 Refer to Unit IV Section III Q 13

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 403-404
2 ibid 2, Page No. 39-41, 52-123

REFERENCE BOOKS:

1 ibid 3, Page No. 383-435
2 ibid 5, Page No. 138-190

ARTICLES:

1 V.Uma, K.Vanishree,"Dwt Based Reversible Watermarking For Lossless Recovery", National Journal of System and technology, Volume 5, No 1,June 2012, ISSN- 0974-3308 Page No. 25-33.
2 SatyendraNathMandal,"An Innovative idea to represent tree in huffman Data Compression Algorithm", The IUP Journal of Computer Sciences, Volume 7, No 2, April 2013, ISSN- 0973-9904, Page No. 25-38.
3 PinakiMitra, A Comparative Analysis of Huffman Coding with Uniform Coding, The IUP Journal of Computer Science, Vol. 6, No. 1, Jan 2012

UNIT – III

LECTURE 31

MULTIMEDIA AND INTERNET

OBJECTIVE:

The objective of this lecture is to focus on Internet related concepts in MM.

CONTENTS:

- Multimedia and the Internet
    - History Internet working

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit III Section II Q29
2 Refer to Unit III Section III Q1, 7

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 359-367
2 ibid 2, Page No. 513-523

REFERENCE BOOKS:

1 ibid 3, Page No. 513,515
2 ibid 4, Page No. 358-363
3 ibid 5, Page No. 23-33, 564-667

LECTURES 32-33

CONNECTIONS, INTERNET SERVICES

OBJECTIVE:

The objective of these lectures is to give an idea about the concepts of Internet like the connections used and the services provided by Internet.

CONTENTS:

- Connections-
    - Dial up
    - Leased Line
    - DSL
    - Point to Point
- Internet Services-
    - MIME-Types
    - Email
    - FTP(File Transfer Protocol)
    - Telnet
    - Usenet

ASSIGNMENT FROM QUESTION BANK:

1 Refer to Unit III Section III Q2,4

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 367-371

REFERENCE BOOKS:

1 ibid 3, Page No. 526-527
2 ibid 5, Page No. 53-78, 668-727, 791-848, 896-945

LECTURES 34-37

WORLD WIDE WEB, HTML, VRML

OBJECTIVE:

The objective of these lectures is to discuss the tools used for WWW and the concept of WWW (World Wide Web) and also the concept of HTML and VRML.

CONTENTS:

- World Wide Web
- Tools for WWW-
    - Web Servers-
        - Types of Web Servers
        - Examples of web servers
    - Web Browsers-
        - Definition
        - Features
        - Functions
        - Examples
    - Web page makers and editors
    - Plug-Ins and Delivery Vehicles
    - HTML
        - Definition
        - designing of Page
        - Studying the basic tags
        - Navigational tags.
    - Beyond HTML
        - 3-D Worlds
    - VRML
        - Formats supported by VRML

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit III Section II Q3,5,6,7,8,9,10,11,12,13,14,15,16,17,20,21 Section III Q3

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 372-385,392-416

REFERENCE BOOKS:

1 ibid 3, Page No. 522-526,691
2 ibid 4, Page No. 345-346
3 ibid 5, Page No. 955-1009

ARTICLES:

1 M. Prensky, "The Role of Technology in teaching and the classroom," Educational Technology, Nov.-Dec. 2010.
2 M. Neo , Learning with Multimedia: Engaging Students in Constructivist Learning. International Journal of Instructional Media. vol. 34, no. 2, pp. 149-158, 2014.

LECTURE 38

DESIGNING FOR MULTIMEDIA APPLICATIONS

OBJECTIVE:

The objective of this lecture is to discuss the various MM applications like Media Communication, Media Consumption, Media Entertainment and games in MM.

CONTENTS:

- Designing for Multimedia Applications –
  - Media Communication
  - Media Consumption
  - Media Entertainment
  - Media games
- Designing for WWW

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit III Section II Q18, 19, 22 & Section III Q3, 2, 4, 5
2 Refer to Unit IV Section II Q 22-23 & Section III Q 7 & 11

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 294-312
2 ibid 2, Page No. 380-389

REFERENCE BOOKS:

1 ibid 3, Page No. 446-450
2 ibid 4, Page No. 401-405
3 ibid 5, Page No. 34-52

ARTICLE:

1 Fernando Garcia Calvo , Javier Lucendo de Gregorio, Fernando Soto de Toro, Jaoquin Munoz Lopez, Teo Mayo Muniz, Jose Maria Miranda, "Highlights of Computer Electronics Show (CES) 2013", An ACM SIGCOMM Computer Communication Review, Volume 43, No 2, April 2013,Page Nos. 74-78.

LECTURES 39-41

MULTIMEDIA LOOKING TOWARDS THE FUTURE

OBJECTIVE:

The objective of the following lectures is to emphasize on the concepts that deal with the final delivery of a multimedia project.

CONTENTS:

- Digital Communication and New Media
  - Physical transfer of data
  - Examples
    - Copper wires
    - Optical fibers
    - Wireless communication media
    - Storage media
  - Data representation
    - Electro-magnetic signal
    - A radio wave
    - Microwave signal
    - Infra-red signal.
- Interactive Television
  - Definition
  - Examples
- Digital Audio Broadcasting
  - Digital radio technology

- Application areas
- Digital Radio
  - Radio technologies
  - Wireless communication
  - Example
- Multimedia Conferencing
  - Building blocks of collaborative multimedia computing
  - Integration of multiple media formats
  - Application Areas
- Project Planning and Costing

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit IV Section III Q1, 3, 4, 5
2 Refer to Unit IV Section II Q2

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 392-401
2 ibid 2, Page No. 26-32

REFERENCE BOOK:

1 ibid 5, Page No. 731-784

WEBSITE:

1 http://encyclopedia.jrank.org/articles/pages/6809/Multimedia-Conferencing.html

ARTICLE:

1 Patel Sumit, "Business Purpose Multimedia Network", National Journal of System and technology, Volume 5, No 1,June 2012, ISSN- 0974-3308 Page No. 54-65.

LECTURE 42

DESIGNING AND PRODUCING

OBJECTIVE:

The objective of this lecture is to discuss in detail the Designing and producing stage of Project development.

CONTENTS:

- Designing and Producing
  - Strategies for creating interactive multimedia

- Types of multimedia structures
- Concepts affecting user interface
- Principles for successful project management

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit IV Section II Q12
2 Refer to Unit IV Section III Q2, 12

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 294-313, 314-323

REFERENCE BOOK:

1 ibid 3, Page No. 624-626

LECTURE 43

CONTENTS AND TALENT

OBJECTIVE:

The objective of this lecture is to discuss in detail the concept of Content and Talent in MM.

CONTENTS:

- Content and talent
  - Definition of Content
  - Description of Production Values
  - Benefits
  - Drawback
  - Identifying talent for production

ASSIGNMENT FROM QUESTION BANK:

1 Refer to Unit IV Section II Q9

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 331-351

REFERENCE BOOK:

1 ibid 3, Page No. 634-636

LECTURE 44

DELIVERING

OBJECTIVE:

The objective of this lecture is to discuss in detail the Delivery stage of Project development.

CONTENTS:

- Delivering
  - Steps for project delivery
  - Establishment of a protocol
  - Advantages
  - Disadvantages
  - Methods for archiving of project files

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit IV Section II Q1, 5
2 Refer to Unit IV Section III Q2

SUGGESTED READING:

REFERENCE BOOKS:

1 ibid 1, Page No. 442-438
2 ibid 3, Page No. 669-672

LECTURE 45

CD-ROM TECHNOLOGY

OBJECTIVE:

The objective of this lecture is to discuss the technology behind CD-ROM.

CONTENTS:

- CD-ROM Technology
  - Meaning
  - Features

- Storage Capacity in technical terms
- Working Principle behind CD-ROM

ASSIGNMENTS FROM QUESTION BANK:

1 Refer to Unit IV Section II Q3, 4,6,15, Section III Q4

SUGGESTED READINGS:

TEXT BOOKS:

1 ibid 1, Page No. 436-439, 446-449
2 ibid 2, Page No. 289-306

REFERENCE BOOK:

1 ibid 3, Page No. 446-450

WEBSITE:

1 http://tldp.org/HOWTO/CDROM-HOWTO/x76.html

LECTURE PLAN

SOFTWARE QUALITY MANAGEMENT

MCA-333

COURSE OUTLINE
MCA –V SEMESTER
SOFTWARE QUALITY MANAGEMENT- MS 333

L – 03 T - 01 Credit - 04

OBJECTIVE:

The purpose of this course is to enable the students know about the concepts, techniques and issues related to implementation of Software Quality Management. Worldwide software development organizations are becoming much more concerned with the process of developing quality software. This course will be helpful to the students to get acquaint with the industry perspective towards software quality.

INTERNAL ASSESSMENT AND ASSIGNMENT **40 marks**

1. Class Test-I – (Written Test) 15 marks
2. Class Test-II - (Written Test) 15 marks
3. Class Assessment + Attendance 10 marks

COURSE CONTENTS:

A. CONCEPTS AND OVERVIEW OF SOFTWARE QUALITY AND SOFTWARE QUALITY ASSURANCE (10 Hours)

- Concepts of Software Quality
- Quality Attributes
- Software Quality Control and Software Quality Assurance
- Evolution of SQA
- Major SQA activities
- Major SQA issues
- Zero defect Software
- Elements of a complete Software Quality System
- The Philosophy of Assurance
- The Meaning of Quality
- The Relationship of Assurance to the Software Life-cycle
- SQA Techniques

B. TAILORING THE SOFTWARE QUALITY ASSURANCE PROGRAM

(12 Hours)

- Reviews, Walkthrough, Inspection and configuration Audits
- Evaluation: Software Requirements, Preliminary design, Detailed design, coding and Unit Test, Integration Testing, System Testing , Types of Evaluations
- Testing: Types of testing, Test planning and conduct , Who does the testing

C. CONFIGURATION MANAGEMENTAND ERROR REPORTING

(10 Hours)

- Configuration Management Components
- Maintaining product integrity
- Change Management
- Version Control
- Metrics
- Configuration Management Planning
- Identification of defect
- Analysis of defect
- Correction of defect
- Implementation of Correction
- Regression testing
- Categorization of defect
- Relationship of Development Phases

D. DEFECT ANALYSIS AND CORRECTIVE ACTION AS TO CAUSE

(08 Hours)

- Analyzing concepts
- Locating data
- Defect Repair and closure
- Selecting Metrics
- Collecting measurements
- Quality tools
- Implementing defect analysis
- Program unit complexity
- Identifying the Requirement for Corrective Action
- Determining the Action to be taken
- Implementing the corrective action
- Periodic reviews of action taken
- Traceability
- Records
- Software Quality Program Planning
- Software Quality System Plan
- Software Documentation

STUDY MATERIAL FOR THE SUBJECT

Following will be the study material for topics of Software Quality Management. Students are advised to go through the material for thorough understanding of the subject:

- **TEXT BOOK:**

1. **Author's Name(s) :**Alan C Gillies
   Title: Software Quality Theory and Management
   Edition: II (Fourteenth Reprint) **Year:** 2013
   Publisher: Cengage Learning (ibid 1)

- **REFERENCE BOOKS:**

1. **Author's Name(s):** S.A. Kelkar
   Title:Software Project Management
   Edition:III**Year:** 2013
   Publisher: PHI (ibid 2)

2. **Author's Name(s):** Mordechai Ben-Menachem& Garry S. Marliss
   Title: Software Quality
   Edition: Fifth Indian Reprint **Year:** 2014
   Publisher: Cengage Learning (ibid 3)

3. **Author's Name(s):** K.K. Aggarwal&Yogesh Singh
   Title: Software Engineering
   Edition: III **Year:** 2012
   Publisher: New Age International (ibid 4)

LECTURES 1-6

ELEMENTS OF A COMPLETE SOFTWARE QUALITY SYSTEM

OBJECTIVE:

Quality Management as applied to software in an organization implies establishing a framework, within which standards are defined and a system is in place to manage the key processes and activities, so that products & services which the Organization produces / provides can meet customer expectations and thereby achieve customer satisfaction, which is of paramount importance The objective of this lecture is to introduce the basics of software quality management.

CONTENTS:

- Basic Definitions
  - Activity
  - Anamoly
  - Arithmetic defect

- Audit
- Component
- Control defect
- Error
- Failure
- Fault
- Inspection
- Peer Review
- Quality
- Quality Assurance
- Quality control
- Quality Groups
- Quality Management
- Quality systems
- Total quality System

- Elements of a Software Quality System
  - Standards
  - Reviewing
  - Testing
  - Defect Analysis
  - Configuration Management
  - Security
  - Education
  - Vendor Management
  - Safety
  - Risk Management
- Software Quality Attributes
  - Portability
  - Testability
  - Understandability
  - Modifiability
  - Efficiency
  - Reliability
  - Usability
- Software Quality Models
  - Boehm
  - McCall
  - FURPS
  - ISO 9126
  - Dromey
  - CMM
- Comparison of ISO and CMM

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q1, 2, 3, 8, 11, 12, 13, 14, 15
2 Unit I, Section III Q2, 3, 5, 6, 7, 8, 9,11,12,13, 19,26

SUGGESTED READINGS:

TEXT BOOK:

1 ibid 1, Page No. 3-14

REFERENCE BOOKS:

1 ibid 2, Page No. 161-185
2 ibid 3, Page No. 12-34

WEBSITES:

1 www.csbdu.in/.../Software%20Quality%20and%20Testing/UNIT%20I.pdf
2 www.swenet.org/Materials/80/QUA1%20Presentation.ppt
3 http://www.cs.ru.nl/~marko/onderwijs/masterscripties/GregorPanovskiThesis.pdf
4 https://ifs.host.cs.st-andrews.ac.uk/Research/Publications/Papers-PDF/2005-09/TKDE-Ponpit-2009.pdf

ARTICLES:

1 Simrandeep Singh Thapar,ParamjeetSingh,Shaveta Rani, "Challenges to the Development of Standard Software Quality Model",International Journal of Computer Applications,Vol. 49, No.10, July 2012,http://research.ijcaonline.org/volume49/number10/pxc3880765.pdf
2 Ashwin B. Tomar, Vilas. M. Thakare, "A Systematic Study of Software Quality Models", International Journal of Software Engineering & Applications (IJSEA), Vol.2, No.4, October 2011, http://airccse.org/journal/ijsea/papers/1011ijsea06.pdf
3 Ronan Fitzpatrick, Peter Smith, Brendan O'Shea, "Software Quality Challenges**",** arrow.dit.ie/cgi/viewcontent.cgi?article=1008&conTEXT BOOK
4 Joseph P. Cavano, James A. McCall, "A FRAMEWORK FOR THE MEASUREMENT OF SOFTWARE QUALITY" http://www-public.int-evry.fr/~gibson/Teaching/CSC7302/ReadingMaterial/CavanoMcCall78.pdf
5 Rasneet Kaur Chauhan and Iqbal Singh ," Latest Research and Development on Software Testing Techniques and Tools , Internaional Journal of Current Engineering and Technology ,E-ISSN-2277-4106,Vol.4,No.4,August2014, http://inpressco.com/wpcontent/ uploads/ 2014 /07 /Paper122368 -2372.pdf
6 Divya Bindal , Jyoti Tamak , " Enhancing Software Quality Using Quality Assurance Practices in the Project Life Cycle ",International Journal of Advanced Research in Computer Science and Software Engineering , ISSN:2277 128X , Vol . 3, Issue 10 , October 2013 , http://www.ijarcsse.com/docs/papers/Volume_3/10_October2013/V3I10-0468.pdf

LECTURES 7-12

SOFTWARE QUALITY ASSURANCE (SQA)

OBJECTIVE:

SQA processes provide assurance that the software products and processes in the project life cycle conform to their specified requirements by planning, enacting, and performing a set of activities to provide adequate confidence that quality is being built into the software. The objective of these lectures is to understand the term software quality assurance and its activities.

CONTENTS:

- Meaning of Software Quality Assurance
- Evolution of Software Quality Assurance
- Relationship of assurance to the software life cycle
- Zero defect software
- Software Quality Assurance Techniques
- Software Quality Assurance Activities
    - Application of technical methods
    - Conduct of Formal Technical Reviews(FTR)
    - Software Testing
    - Enforcement of standards
    - Control of change
    - Measurement
    - Record keeping and reporting
    -

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q 4, 6,9,10,19
2 Unit I, Section III Q1, 4, 14, 15, 16, 17, 18, 20,27

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 3, Page No. 45-54
2 ibid 2, Page No. 23-45

WEBSITES:

1 http://www.hss.energy.gov/publications/esh_bulletins/BULL0042.html
2 http://www.gamedev.net/page/resources/_/technical/general-programming/zero-defect-software-development-r1050
3 http://www.cs.utoronto.ca/~sme/papers/2007/SelectingEmpiricalMethods.pdf

ARTICLES:

1 Nelly Maneva, Software Quality Assurance and Maintenance for Outsourced Software Development", http://delab.csd.auth.gr/bci1/Balkan/644maneva.pdf

2 Ali Javed , MuazzamMaqsood,KhurramAshfaqQazi , Khurram Ali Shah , "How to Improve Software Quality Assurance In Developing Countries"Advanced Computing: An International Journal (ACIJ), Vol.3, No.2, March 2012

3 Dr. Emmanuel Ichu, Dr. RaoNemani, "The Role of Quality Assurance in Software Development Projects: Project Failures and Business Performance", Dr.RaoNemani et al, Int. J. Comp. Tech. Appl., Vol 2 (4), 716-725

4 Ali Javed, Muazzam Maqsood , "How to Improve Software Quality Assurance in Developing Countries", Advanced Computing : An International Journal (ACIJ), Vol. 3 , No. 2 , March 2012,http://airccse.org/journal/acij/papers/0312acij03.pdf

LECTURE 13

SOFTWARE QUALITY CONTROL

OBJECTIVE:

The objective of this lecture is to understand the concepts of software quality control.Software Quality Control is the set of procedures used by organizations to ensure that a software product will meet its quality goals at the best value to the customer, and to continually improve the organization's ability to produce software products in the future.

CONTENTS:

- Software Quality Control(SQC)
- Activities of SQC
- Reviews
    - Requirement Review
    - Design Review
    - Code Review
    - Deployment Plan Review
    - Test Plan Review
    - Test Cases Review
- Testing
    - Unit Testing
    - Integration Testing
    - System Testing
    - Acceptance Testing
- Difference between Software Quality Assurance and Software Quality Control

ASSIGNMENTS FROM QUESTION BANK:

1 Unit I, Section II Q 5
2 Unit I, Section III Q10

SUGGESTED READINGS:

WEBSITES:

1 **http://www.sqa.net/softwarequalitycontrol.html**
2 brettarthur.hubpages.com/.../Quality-Assurance-versus-Quality-Control
3 http://softwaretestingfundamentals.com/software-quality-control/
4 http://www.nickjenkins.net/prose/testingPrimer.pdf

ARTICLES:

1 ManeelaTuteja, GauravDubey, "A Research Study on importance of Testing and Quality Assurance in Software Development Life Cycle (SDLC) Models", International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-3, July 2012.
2 Emad Kh. El-Rayyes , Ibrahim M. Abu –Zaid , "New Model to Achieve Software Quality Assurance (SQA) in Web Application", International Journal of Science and Technology ISSN 2224-3577,Vol.2,No. 7, July 2012, http://ejournalofsciences.org/archive/vol2no7/ vol2no7_3.pdf

LECTURE 14

TAILORING THE SOFTWARE QUALITY ASSURANCE PROGRAM

OBJECTIVE:

This lecture consists of a comprehensive examination of the review process in the software development life cycle. Formal review methodologies are analyzed in detail from the perspective of the review participants, project management and software quality assurance.

CONTENTS:

- Meaning of Reviews
- Types of Reviews
    - Management Review
    - Technical Review
    - Walkthrough
    - Inspection
    - Audit

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q 11, 12, 21,24
2 Unit II, Section III Q13

SUGGESTED READINGS:

REFERENCE BOOK:

1 ibid 3, Page No. 97-132

WEBSITES:

1 courses.utep.edu/portals/870/Lecture-16a-Walkthroughs.ppt
2 http://istqbexamcertification.com/what-is-inspection-in-software-testing/
3 http://www.mastercontrol.com/quality-management-software/quality-assurance/inspection.html
4 http://www.softwarecertifications.org/cste/

LECTURE 15

CONFIGURATION AUDIT

OBJECTIVE:

Configuration audits verify that the configuration identification for a configured item is accurate, complete, and will meet specified program needs. The objective of this lecture is to discuss types of configuration audit.

CONTENTS:

- Meaning of Configuration Audit
  - Functional Configuration Audit
  - Physical Configuration Audit

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q 10
2 Unit II, Section III Q14,18

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 2, Page No. 214-215
2 ibid 1, Page No. 23-54

WEBSITES:

1 http://nawctsd.navair.navy.mil/Resources/Library/Acqguide/ch4cm.htm
2 http://istqbexamcertification.com/what-is-formal-review/
3 http://www.aptest.com/resources.html

LECTURES 16-17

EVALUATION IN THE SOFTWARE LIFE CYCLE

OBJECTIVE:

The objective of these lectures is to discuss the role of evaluation in software development lifecycle and its various types.

CONTENTS:

- Meaning of Evaluation
- Role of Evaluation in Software Life cycle
- Types of evaluation
    - Quantitative Evaluation Methods
    - Case Studies
    - Formal Experiments
    - Surveys
    - Qualitative Methods

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q 8,9,13, 15, 16
2 Unit II, Section III Q11, 12,19

SUGGESTED READING:

WEBSITES:

1 http://www.issco.unige.ch/en/research/projects/ewg95//node24.html
2 http://www.osel.co.uk/desmet.pdf
3 http://www.sei.cmu.edu/library/abstracts/reports/96tr036.cfm
4 https://saucelabs.com/resources/white-papers/sauce-labs-state-of-testing-report-2016.pdf

LECTURES 18-24

TESTING

OBJECTIVE:

Software Testing and Quality Management is becoming complex and sophisticated. Software is becoming ubiquitous and critical for quality of life. Hence ensuring a good product quality is vital and needs dedicated attention. These lectures arm the students with all tools, techniques and management capabilities to have in depth knowledge in this thriving area of software testing and quality management.

CONTENTS:

- Types of Testing
  - Black Box testing
    - Boundary Value Analysis
    - Equivalence class testing
    - Decision table testing
    - Cause effect graphing
  - White Box testing
    - Path testing
    - Data flow testing
    - Mutation testing
  - Test Planning and conduct
  - Who does the testing

ASSIGNMENTS FROM QUESTION BANK:

1 Unit II, Section II Q 1-7,14-20
2 Unit II, Section III Q1-10

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 4, Page No. 365-450
2 ibid2, Page No. 60-94

WEBSITES:

1 http://www.guru99.com/software-testing-life-cycle.html
2 http://www.cs.st-andrews.ac.uk/~ifs/Books/SE9/Web/Testing/Planning.html
3 http://www.cs.swan.ac.uk/~csmarkus/CS339/presentations/20061202_Oladimeji_Levels_of_Testing.pdf
4 http://www.diku.dk/forskning/performance-engineering/Courses/Software-development 2008 /Slides /testing.pdf

ARTICLES:

1 Hosam F. El-Sofany, Islam A. Taj-Eddin, Hassan El-Hoimal,Tourki Al-Tourki, Amjad Al-Sadoon, "Enhancing Software Quality by an SPL Testing based Software Testing", International Journal of Computer Applications, Vol. 69, No.6, May 2013, http://research.ijcaonline.org/volume69/number6/pxc3887574.pdf
2 Mohd. Ehmer Khan, "Different Forms of Software Testing Techniques for Finding Errors", IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 3, No 1, May 2011, http://www.ijcsi.org/papers/7-3-1-11-16.pdf
3 ShivkumarHasmukhraiTrivedi, "Software Testing Techniques", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 10, October 2012

http://www.ijarcsse.com /docs/papers/10_October2012/Volume _2_issue_10_October2012/V2I10-0047.pdf
4 W.Eric Wong , "Special Section on Software Quality Assurance : Research and Practice ",IEEE Transactions on Reliability , Vol. 65 , No.1 , March 2016, http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7422892

LECTURES 25-28

SOFTWARE CONFIGURATION MANAGEMENT (SCM)

OBJECTIVE:

Change is inherent and ongoing in any software project. The lectures focus on handling changes in software through configuration management.

CONTENTS:

- Meaning of SCM
- SCM Process
  - Identification of software configuration items
  - Change management control
  - Product status recording and management
- SCM Components
  - Software Configuration Identification
  - Software Configuration Control
  - Software Configuration Auditing
  - Software Configuration Status
- SCM Planning
- Version Control
  - Identifying New Versions
  - Numbering Schemes
  - Visibility
  - Tracking
- Metrics for SCM

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q1, 7,8, 9,10,11,12,22
2 Unit III, Section III Q1, 2,3,6,7,9,10,16

SUGGESTED READINGS:

REFERENCE BOOKS:

1 ibid 2, Page No. 199-216
2 ibid 3, Page No. 112-135

WEBSITES:

1 http://www.computer.org/portal/web/swebok/html/ch7
2 http://www.google.co.in/url?sa=t&rct=j&q=components%20of%20software%20configuration%20management&source=web&cd=17&ved=0CF0QFjAGOAo&url=http%3A%2F%2Fwww.eecs.ucf.edu%2F~turgut%2FCOURSES%2FEEL6883_SEII_Spr07%2FPaperPresentations%2FBersoffp9.ppt&ei=gYgbUMzQFMWGrAfUiIC4BA&usg=AFQjCNGfU6X9WVLCHjqxw76AOZ5phoJ_IA
3 http://www.softwaretestinghelp.com/

LECTURES 29-32

ERROR REPORTING

OBJECTIVE:

Organizations face many problems that impede rapid development of software systems critical to their operations and growth. The challenge in any software product development lies in minimizing the number of defects. Occurrence of defects is the greatest contributor to significant increases in product costs due to correction and rework time. Identifying and correcting process defects will prevent many product defects from recurring. The objective of these lectures is to explain the defect identification and correction process.

CONTENTS:

- What are software defects
- Identification of defect
- Analysis of defect
- Correction of defect
- Implementation of correction
- Regression testing
- Categorization of defect
- Lifecycle of defects

ASSIGNMENTS FROM QUESTION BANK:

1 Unit III, Section II Q2, 3,4,5,6,23
2 Unit III, Section III Q4, 5,8,11, 14, 15,17,18,19

SUGGESTED READINGS:

WEBSITES:

1 http://software-testing-zone.blogspot.in/2008/01/software-quality-testing-defects-debate.html
2 http://www.softwaretestingstuff.com/2008/05/classification-of-defects-bugs.html

ARTICLE:

1 Seema Singh, Mandeep Singh," Software Defect Prediction using Adaptive Neural Networks", International Journal of Applied Information Systems, Vol. 4, No.1, 2012, http://research.ijais.org/volume4/number1/ijais12-450612.pdf

2 Vaibhav E. Pawar , Amol K . Kadam , Dr S .D Joshi , "Analysis of Software Reliability Using Testing Time and Testing Coverage ", International Journal of Advance Research in Computer Science and Management Studies " , ISSN :2321-7782, Vo./ 3 , Issue 5 ,May 2015 , http://www.ijarcsms.com/docs/paper/volume3/issue5/V3I5-0029.pdf

LECTURES 33-38

DEFECT ANALYSIS

OBJECTIVE:

Defect analysis generally seeks to classify defects into categories and identify possible causes in order to direct process improvement efforts. The objective of these lectures is to make understand the concepts of defect analysis.

CONTENTS:

- Meaning of defect analysis
  - Analyzing concepts
  - Locating data
  - Defect Repair and closure
  - Selecting metrics
  - Collecting measurements
  - Quality tools
  - Implementing defect analysis
  - Program unit complexity
- Bug Life Cycle
- Six Sigma defect metrics

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q1, 2, 4, 5, 7, 8, 12, 13,19
2 Unit IV, Section III Q1, 2, 3, 6, 11, 13, 14, 15,16,17,18

SUGGESTED READINGS:

WEBSITES:

1 http://sqa.fyicenter.com/Introduction_to_Software_Testing/35_Root_Cause Analysis. html
2 http://sqa.fyicenter.com/Introduction_to_Software_Testing/34_Software_Defect_Reports.html
3 http:// sqa.fyicenter.com /Introduction_to_Software_Testing /33_ Elements_of_a_ Defect_ Report.html

4 http://www.iscn.at/select_newspaper/measurement/bruelkjaer.html
5 http://www.scitools.com/features/qualityReports.php
6 http://billharlan.com/pub/papers/Code_complexity.html
7 http://www.softwarecertifications.org/cste/

ARTICLES:

1 SakthiKumaresh, R Baskaran, "Defect Analysis and Prevention for Software Process Quality Improvement", International Journal of Computer Applications, Volume 8– No.7, October 2010, www.ijcaonline.org/volume8/number7/pxc3871759.pdf
2 PankajJalote,NareshAgrawal, "Using Defect Analysis Feedback for Improving Quality And Productivity in Iterative Software Development",http://www.cse.iitk.ac.in/users/jalote/papers/DefectPrevention.pdf
3 SakthiKumaresh,RBaskaran, "Defect Analysis and Prevention for Software Process Quality Improvement"International Journal of Computer Applications (0975 – 8887) Volume 8– No.7, October 2010
4 Nadia Bhuiyan , Habib A. Elsabbagh , "A Quality Assurance Model for Airborne Safety –Critical Software ", Journal of Software Engineering and Applications , Vol. 7 , ISSN -162-176 , June 2014 , http://file.scirp.org/pdf/JSEA_2014032713433911.pdf

LECTURES 38-41

CORRECTIVE ACTION

OBJECTIVE:

The objective of these lectures is to provide the overview of corrective actions to be taken after the identification of defects.

CONTENTS:

- What is CAPA
- Identifying the Requirement for Corrective Action
- Determining the Action to be taken
- Implementing the corrective action
- Periodic Review of Actions taken

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q 3, 10, 20 Section III Q 9, 10,19

SUGGESTED READING:

WEBSITES:

1 www.lm.doe.gov/Office_of.../050_DOE_G_414_1-5.aspx?__.
2 http://actoolkit.unprme.org/wp-content/resourcepdf/software_testing.pdf

LECTURES 42-45

SOFTWARE QUALITY PROGRAM

OBJECTIVE:

The software quality program is an overall approach to influence and determine the level of quality achieved in a software product. The objective of these lectures is to have an overview of software quality program.

CONTENTS:

- Software Quality Program Planning
- Software Quality System Plan
- Software Documentation
- Traceability
  - Traceability Matrix
  - Types of traceability matrix
  - Advantages of traceability matrix
  - Limitations of traceability matrix

ASSIGNMENTS FROM QUESTION BANK:

1 Unit IV, Section II Q6, 9,21
2 Unit IV, Section III Q4, 5, 7, 8, 12,20

SUGGESTED READING:

WEBSITES:

1 http://www.shellmethod.com/refs/SQAP.pdf
2 http://www.softwaretestingtimes.com/2010/04/traceability-matrix-from-software.html
3 http://kpa-group.com/en/our-customers/our-customers-1/part1TheSoftwareQualityProgramv2.pdf
4 http://home.btconnect.com/managingstandard/sqpp_1.htm