

**BCA III Year V Semester**

**Network Security**

**Course Objectives:**

1. Understand Security: Attacks, Services & Mechanisms
2. Study of various security algorithm available for security and protection
3. Ciphering of plain text
4. Study of conventional encryption algorithm, key management issues
5. Cryptography and various encryption methods
6. Knowledge and implementation of hash function to messages
7. Digital signature and its importance in transaction processing
8. Concept of network security, directory authentication, e-mail
9. Viruses and their implication to business applications
10. Firewalls and network security principle

**UNIT – I**

**INTRODUCTION:**OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and Modes of Operation.

**UNIT - II**

**PUBLIC KEY CRYPTOGRAPHY:**Key Management - Diffie-Hellman key Exchange - Elliptic Curve Architecture and Cryptography - Introduction to Number Theory - Confidentiality using Symmetric Encryption - Public Key Cryptography and RSA.

**UNIT – III**

**AUTHENTICATION AND HASH FUNCTION :**Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - RIPEMD - HMAC Digital Signatures - Authentication Protocols - Digital Signature Standard

**UNIT - IV**

**NETWORK SECURITY :** Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security - PGP - S/MIME - IP Security - Web Security.

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**UNIT – V**

**SYSTEM LEVEL SECURITY:** Intrusion detection - password management - Viruses and related Threats - Virus Counter measures - Firewall Design Principles - Trusted Systems.

**REFERENCES**

1. William Stallings, "Cryptography And Network Security - Principles and Practices", Prentice Hall of India, Third Edition, 2003.
2. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.
3. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.
4. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003.

**Student Activity:**

1. Create password verification using images
2. Create password verification using multimedia

**BCA III Year V Semester  
Software Engineering**

**Course Objectives**

The Objective of the course is to assist the student in understanding the basic theory of software engineering, and to apply these basic theoretical principles to a group software development project.

**Course outcomes**

1. Ability to gather and specify requirements of the software projects.
2. Ability to analyze software requirements with existing tools
3. Able to differentiate different testing methodologies
4. Able to understand and apply the basic project management practices in real life projects
5. Ability to work in a team as well as independently on software projects

**UNIT I**

**INTRODUCTION:**Software Engineering Process paradigms - Project management - Process and Project Metrics – software estimation - Empirical estimation models - Planning - Risk analysis - Software project scheduling.

**UNIT II**

**REQUIREMENTS ANALYSIS :**Requirement Engineering Processes – Feasibility Study – Problem of Requirements – Software Requirement Analysis – Analysis Concepts and Principles – Analysis Process – Analysis Model

**UNIT III**

**SOFTWARE DESIGN:**Software design - Abstraction - Modularity - Software Architecture - Effective modular design - Cohesion and Coupling - Architectural design and Procedural design - Data flow oriented design.

**UNIT IV**

**USER INTERFACE DESIGN AND REAL TIME SYSTEMS :**User interface design - Human factors - Human computer interaction - Human - Computer Interface design - Interface design - Interface standards.

**UNIT V**

**SOFTWARE QUALITY AND TESTING :**Software Quality Assurance - Quality metrics - Software Reliability - Software testing - Path testing – Control Structures testing - Black Box testing - Integration, Validation and system testing - Reverse Engineering and Re-engineering. CASE tools –projects management, tools - analysis and design tools – programming tools - integration and testing tool - Case studies.

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**REFERENCE BOOKS:**

1. Roger Pressman S., “Software Engineering: A Practitioner's Approach”, 7th Edition, McGraw Hill, 2010.
2. Software Engineering Principles and Practice by Deepak Jain, Oxford University Press
3. Sommerville, “Software Engineering”, Eighth Edition, Pearson Education, 2007
4. Pfleger, “Software Engineering-Theory & Practice”, 3rd Edition, Pearson Education, 2009
5. Carlo Ghazi, Mehdi Jazayari, Dino Mandrioli, “Fundamentals of Software Engineering”, Pearson Education, 2003

**Student Activity:**

1. Develop requirement analysis report to develop software for any financial organization
2. Develop risk analysis report for any organization using software for its day to day transactions

**BCA III Year V Semester  
OOAD**

**Course Objective**

- To develop background knowledge as well as core expertise in object oriented system.
- To provide the importance of the software design process.
- To assess the unified process and Unified Modeling Language

**Course Outcome**

- To describe the three pillars of object-orientation methodologies and explain the benefits of each .
- To create use case documents that capture requirements for a software system.
- To create class diagrams that model both the domain model and design model of a software system.
- To design the interface between the classes and objects.
- To create interaction diagrams that model the dynamic aspects of a software system.
- To understand the facets of the Unified Process approach to designing and building a software system.
- To describe how design patterns facilitate development and list several of the most popular patterns.
- To design the Axioms and corollaries.
- To build a model for the user interface (UI) of a software application
- To measure the Level of User satisfaction and software quality assurance.

**UNIT I**

Introduction to OOAD – What is OOAD? – What is UML? What are the United process(UP) phases - Case study – the NextGen POS system, Inception -Use case Modeling - Relating Use cases – include, extend and generalization.

**UNIT II**

Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class hierarchies- Aggregation and Composition- UML activity diagrams and modeling

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### **UNIT III**

System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams - UML interaction diagrams

### **UNIT IV**

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling –Controller – High Cohesion – Designing for visibility - Applying GoF design patterns – adapter, singleton, factory and observer patterns.

### **UNIT V**

UML state diagrams and modeling - Operation contracts- Mapping design to code -UML deployment and component diagrams

#### **REFERENCE BOOKS:**

1. Object Oriented Analysis and Design By Grady Booch.
2. Craig Larman,"Applying UML and Patterns: An Introduction to object-oriented Analysis and Design and iterative development", Third Edition, Pearson Education, 2005
3. Mike O'Docherty, "Object-Oriented Analysis & Design: Understanding System Development with UML 2.0", John Wiley & Sons, 2005.
4. James W- Cooper, Addison-Wesley, "Java Design Patterns – A Tutorial", 2000.
5. Micheal Blaha, James Rambaugh, "Object-Oriented Modeling and Design with UML", Second Edition, Prentice Hall of India Private Limited, 2007
6. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides,"Design patterns: Elements of Reusable object-oriented software", Addison-Wesley, 1995.

#### **Student Activity:**

1. Develop a class diagram for the flight services available in your near by air port
  2. Develop a sequence diagram of activities of any automated device
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**BCA III Year V Semester**

**ELECTIVE 1: Data mining & Ware Housing**

**Course Objectives**

The Objective of this course is to understand data mining principles and techniques: Introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors. Develop and apply critical thinking, problem-solving, and decision-making skills

**Course Outcomes**

1. Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. Apply preprocessing statistical methods for any given raw data
3. Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems , make predictions of outcomes
4. Comprehend the roles that data mining plays in various fields and manipulate different data mining techniques
5. Select and apply proper data mining algorithms to build analytical applications.
6. Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate the knowledge discovery.

**Unit I**

Introduction to Data Mining, Fundamentals of data mining, data mining functionalities, data and attribute types, statistical description of data.

Data Preprocessing:

Data cleaning, data integration, data reduction, data transformation and data discretization.

**Unit II**

**Data Warehousing:** Basic concepts, data ware house modeling data cube and OLAP, data warehouse design and implementation.

**Unit III**

Mining Frequent Patterns and Associations: Basic methods, frequent Item set mining methods any two algorithms, pattern evaluation methods.

**Unit IV**

**Classification:** Basic concepts, decision tree induction, Bayes classification, any two advanced methods, model evaluation.

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## **Unit V**

**Cluster Analysis:** Basic concepts, clustering structures, major clustering approaches, partitioning methods, hierarchical methods, density based methods, the expectation maximization method, cluster based outlier detection Essential Reading.

### **References:**

1. 1.Data Mining by Vikram Pudi, P.Radha Krishna, Oxford Universith Press
2. Data Warehousing by Reema Thareja , Oxford University Press
3. 1.J. Han , M. Kamber and J. Pei , Data Mining: Concepts and Techniques , 3rd.edMorgan Kaufmann, 2011
4. Introduction to data mining –G.K.Gupta, PHI
5. 3.Data mining, Data warehouse & Olap-Berson, Tata McGraw Hill

### **Student Activity:**

- 1.Predict the course taken by a student based on his activities and way of learning
  2. Learn visual patterns of any real time data
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**Data Mining Lab**

1. Demonstration of preprocessing on dataset student.arff
  2. Demonstration of preprocessing on dataset labor.arff
  3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
  4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
  5. Demonstration of classification rule process on dataset student.arff using j48 algorithm
  6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
  7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
  8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
  9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
  10. Demonstration of clustering rule process on dataset student.arff using simple k-means.
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**BCA III Year V Semester**

**ELECTIVE 1: Computer Networks**

**Course Objectives**

1. To provide an introduction to the fundamental concepts on data communication and the design of computer networks.
2. To get familiarized with the basic protocols of computer networks.

**Course Outcomes**

After this course, the student will be able to

1. Identify the different components in a Communication System and their respective roles.
2. Describe the technical issues related to the local Area Networks
3. Identify the common technologies available in establishing LAN infrastructure.

**UNIT I**

Network architecture – layers – Physical links – Channel access on links – Hybrid multiple access techniques - Issues in the data link layer - Framing – Error correction and detection – Link-level Flow Control.

**UNIT II**

Medium access – CSMA – Ethernet – Token ring – FDDI - Wireless LAN – Bridges and switches

**UNIT III**

Circuit switching vs. packet switching / Packet switched networks – IP – ARP – RARP –DHCP – ICMP – Queueing discipline – Routing algorithms – RIP – OSPF – Subnetting – CIDR – Interdomain routing – BGP – Ipv6 – Multicasting – Congestion avoidance in network layer

**UNIT IV**

UDP – TCP – Adaptive Flow Control – Adaptive Retransmission - Congestion control – Congestion avoidance – QoS

**UNIT V**

Email (SMTP, MIME, IMAP, POP3) – HTTP – DNS- SNMP – Telnet – FTP – Security – PGP - SSH

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**REFERENCE BOOKS:**

1. Andrew S. Tanenbaum, “Computer Networks”, Fourth Edition, 2003
2. Computer Networks by Bhushan Trivedi, Oxford University Press
3. James F. Kuross, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, Third Edition, Addison Wesley, 2004.
4. Nader F. Mir, “Computer and Communication Networks”, Pearson Education, 2007
5. Comer, “Computer Networks and Internets with Internet Applications”, Fourth Edition, Pearson Education, 2003.
6. William Stallings, “Data and Computer Communication”, Sixth Edition, Pearson vi, 2000

**Student Activity:**

1. Learn the functioning of various network devices used in your college network
  2. Compare 2G, 3G, 4G and 5G networks
  3. Prepare LAN deployment diagram of your organization
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**Computer Networks lab**

- 1 Implementation of Stop and Wait Protocol and Sliding Window Protocol
  - 2 Study of Socket Programming and Client – Server model
  - 3 Write a code simulating ARP /RARP protocols.
  4. Write a code simulating PING and TRACEROUTE commands
  5. Create a socket for HTTP for web page upload and download.
  6. Write a program to implement RPC (Remote Procedure Call).
  7. Implementation of Subnetting.
  8. Applications using TCP Sockets like
    - a. Echo client and echo server
    - b. Chat
    - C. File Transfer
  9. Applications using TCP and UDP Sockets like DNS, SNMP and File Transfer.
  10. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
  11. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
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**BCA III Year V Semester**

**ELECTIVE 3: Computer Forensics**

**Course Objectives**

- Explain the responsibilities and liabilities of a computer forensic investigator
- Plan and prepare for an incident requiring computer forensic skills
- Seize a computer from a crime scene without damaging it or risking it becoming inadmissible in a court of law
- Explain where digital evidence resides on computer storage devices
- Hire experts to perform detailed forensic analysis and expert testimony

**Course Outcomes**

1. understand the role of computer forensics in the business and private world
2. identify some of the current techniques and tools for forensic examinations
3. describe and identify basic principles of good professional practice for a forensic computing practitioner
4. Apply forensic tools in different situations.

**Unit I**

**Introduction to Computer Forensics :** Computer forensics definitions ,Computers' roles in crimes ,Computer forensics tasks ,Prepare for an investigation, Collect evidence ,Preserve evidence ,Recover evidence, Document evidence Challenges associated with making "cybercrime" laws, Jurisdictional issues.

**Unit II**

**Computer Crimes :**Crimes ,Violent crimes where computers are used include terrorism, assault threat, stalking, child pornography ,Nonviolent crimes where computers are used include trespass, theft, fraud, vandalism , Where evidence often resides for different types of crimes ,Address books, chat logs, e-mail, images, movies, Internet browser history, etc.

**Unit III**

**Computer Criminals:** Using evidence to create a crime timeline , Modify Access Create (MAC) dates associated with files ,Problems with using these (they don't change in a logical fashion in some cases) ,Criminals and crime fighters ,Understanding "cyber criminals" and their victims ,Understanding "cyber investigators."

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#### **Unit IV**

**Building a Cybercrime Case:** Bodies of law ,Constitutional law ,Criminal law ,Civil law ,Administrative regulations ,Levels of law ,Local laws ,State laws ,Federal laws ,International laws ,Levels of culpability ,Intent ,Knowledge ,Recklessness ,Negligence , Level and burden of proof ,Criminal versus civil cases ,Vicarious liability ,Laws related to computers ,CFAA, DMCA, CAN Spam, etc.

#### **Unit V**

**Preserving and Recovering Digital Evidence:** Disk imaging ,Creating a message digest or hash code for a disk ,Where data hides; deleted and erased data ,File systems ,Files ,Modify Access Create (MAC) dates to establish time line ,File headers - info about file type

#### **References books**

1. Guide to Computer Forensics and Investigations ,By Bill Nelson, Amelia Phillips, christopher Steuart
2. Scene of the Cybercrime, by Debra Littlejohn Shinder.
3. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition, Charles River Media, 2005
4. Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, 2 nd Edition, Springer's, 2010
- 5 . Ali Jahangiri, Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers & IT Security Experts, Ali Jahangiri, 2009
6. Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics), 2010

#### **Student Activity:**

1. Collect calls made from a cell tower and analyze them
  2. Trace the IP address of the machine from which you received a email
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## **Computer Forensics lab**

### **The Sleuth Kit and Autopsy**

The Sleuth Kit (TSK) and the Autopsy Forensic Browser are open source Unix-based tools . TSK is a collection of over 20 command line tools that can analyze disk and file system images for evidence. To make the analysis easier, the Autopsy Forensic Browser can be used. Autopsy is a front end to the TSK tools and provides a point-and-click type of interface.

- 1) Use of disk tools to analyze the tool displays the total number of sectors and the user-accessible sectors.
  - 2) Use of volume system tools to analyze the disk volume and partitions , whether they are allocated properly or not
  - 3) File system tools to analyze the file system , its type and its description
  - 4) Content category tool to analyze the data in the directory
  - 5) Meta data category tool to analyze the data that describes a file
  - 6) File name category tool to analyze The file name category of data includes the data that associates a name with a metadata entry.
  - 7) Multiple category tool to analyze that combine the data from the various categories to produce the data sorted in a different order
  - 8) Experiment to use the searching tools
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**BCA III Year V Semester**

***Elective -2 :***

**Android Basics**

**Course Objectives:**

1. Describe the platforms upon which the Android operating system will run.
2. Create a simple application that runs under the Android operating system.
3. Access and work with the Android file system.
4. Create an application that uses multimedia under the Android operating system.
5. Access and work with databases under the Android operating system.

**Course Outcomes**

After completion of this course students should make Android apps for Android devices. Students will be able to write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.

**UNIT-I**

What is Android, Android Tools, Your First Android Application, Anatomy of Android Application, Workspaces, Editors in Eclipse, Eclipse Perspective, Refactoring

**UNIT-II**

Creating Android Emulator, Creating Snapshot, SD Card Emulation, Sending SMS Messages to the Emulator , Transferring Files into and out of the Emulator ,Resetting the Emulator

**UNIT-III**

Activity, Linking Activity using Intent, Fragments, Calling Build-In Application using Intent, Notifications

**UNIT-IV**

Components of a Screen, Display Orientation, Action Bar, Listening for User Inter

**UNIT-V**

Basic Views, Picker Views, List View, Specialized Fragment, Gallery and Image View, Image Switcher, Grid View, Options Menu, Context Menu, Clock View, Web view

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**Reference Books:**

1. Android Programming: The Big Nerd Ranch Guide (Big Nerd Ranch Guides) By: Bill Philips & Brian Hardy
2. Android Design Patterns: Interaction design solutions for developers by Greg Nudelman
3. Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps By: Ian G. Clifton
4. Android Recipes: A Problem-Solution Approach By: Dave Smith & Jeff Friesen
5. Hello, Android: Introducing Google's Mobile Development Platform (Pragmatic Programmers) By: Ed Burnette

**Student Activity:**

- 1. Create a mobile APP for your college**
- 2. Create a mobile APP for any rural application**

## **Android basics lab**

### **Exercise 1**

- *Developing Simple Applications for Android*

### **Exercise 2**

- *Creating Applications with Multiple Activities and a Simple Menu using ListView*

### **Exercise 3**

- *Creating Activities For Menu Items and Parsing XML Files*

### **Exercise 4**

- *Writing Multi-Threaded Applications*

### **Exercise 5**

- *Using WebView and Using the Network*

### **Exercise 6**

- *Using Audio Functions in Android*

### **Exercise 7**

- *Graphics Support in Android*

### **Exercise 8**

- *Preferences and Content Providers*

### **Exercise 9**

- *Location Services and Google Maps in Android*
- *Data Storage*

### **Exercise 10**

- *Simulating Sensors*
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**BCA III Year V Semester**  
**Elective -2 : Principles of Animation**

**Course Objectives**

Students can expect to learn basic principles and relevant techniques for comprehending the underlying

**Course Outcome**

- Understanding of the key principles of animation.
- Understanding of the concept of timing for animation and its application as a means of communication.
- Ability to creatively manipulate frame time as a means of emphasizing and actualizing action and expressing an idea.

**UNIT-I**

What is Animation: Its definition, early examples of Animation. History of Animation: Stop Motion Photo Animation, Zoetrope, Thaumatrope, Cell and Paper Animation, early Disney's Cell Animation Processes

**UNIT-II**

Types of Animation: Cell Animation, Stop Motion Animation, Computer Animation, 2-D Animation, 3-D Animation. Skills for an Animation Artist: Visual and creative development of an Artist , importance of observation with minute details, efficiency to draw gestures, facial expressions, good listener, hard work and patience, creative and innovative.

**UNIT-III**

Basic Principles of Animation: Illusion of Life, straight action and pose to pose Timing, Exaggeration, Drama and Psychological Effect, Fade in and Fade out, Squash and Stretch, Anticipation, staging, follow through and overlapping action, Arcs, Solid Drawing ,Appeal, slow in and slow out, Secondary Action.

**UNIT-IV**

Various Terms: Animation Drawings/Cels, Rough Drawings , Clean ups, Color reference drawings, Layout, Model Sheet, Key Drawings and in Betweens, Master Background, Concept Piece, Character drawing , Story Board.

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**References:**

- 1.The complete animation course by Chris Patmore -Baron's Educational Series.(New York)
2. Animation Unleashed by Ellen Bessen, Michael Weise Productions,2008(U.S.A)
- 3.The Animator's Survival Kit by Richard Williams, Arrar Straus & Giroux Pub.(U.S.A

**Student Activity:**

1. Develop a simple animated short film
2. Develop a simple animated short film with back ground music

## **Computer Animation lab**

### **ADVANCED 2D ANIMATION**

#### **1: Action scripting**

Using actions to control a timeline - Using frame labels - Creating button symbols - Creating animated buttons using movie clips – Movie Clip Controls – Browser / network.

#### **2: Advanced Animation Methods**

Creating movies playing within movies (movie clips and .swf) - Controlling multiple timelines (movies) through action scripting - Critique storyboards.

#### **3: Streamlining Files for Use on the Web, Publishing Files to the Internet & Pre loaders**

Pre loaders - Controlling sound with script - Exploring types of output - Work on final project in class - Importing video - Publishing demo (video) reels on web - Publishing and exporting files - Trouble shooting sites.

### **Suggested books for Reading:**

#### **Flash books**

- The Illusion of Life: Disney Animation by Frank Thomas, Ollie Johnston (Contributor), Collie Johnston.
- Adobe Flash CS3
- The Animator's Survival Kit: A Manual of Methods, Principles, and Formulas for Classical, Computer, Games, Stop Motion, and Internet Animators by Richard Williams

*BCA III Year V Semester*

**Elective -2 : SOFTWARE TESTING METHODOLOGIES**

**Course Objectives**

The Objective of this course is to enable a clear understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry. The course will prepare students to be leaders in software testing. Whether you are a developer or a tester, you must test software. We can learn strengths and weaknesses of a variety of software testing techniques.

**Course Outcomes**

After completion of this course the student will be able to plan, develop, and execute an automated test plan.

**UNIT-I**

**Introduction:** Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of Bugs.

**Flow Graphs and Path testing:** Basics concepts of path testing, predicates, path predicates and Achievable paths, path sensitizing, path instrumentation, application of path testing.

**UNIT-II**

**Transaction Flow Testing:** Transaction flow, transaction flow testing techniques.

**Dataflow testing:** Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

**UNIT-III**

**Domain Testing:** domains and paths, Nice & ugly domains, domain testing domains and interfaces Testing, domain and interface testing, domains and testability.

**UNIT-IV**

**Paths, Path products and Regular Expressions:** Path products & path expression, reduction procedure, Applications, regular expressions & flow anomaly detection.

**Logic Based Testing:** Overview, decision tables, path expressions kv charts, specifications.

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**UNIT-V**

**State, State Graphs and Transition testing:** State graphs, good & bad state graphs state testing, Testability tips.

**Graph Matrices and Application:** Motivational overview, matrix of graph, relations, power of a matrix, Node reduction algorithm, building tools. (Student should be given an exposure to a tool like J Meter or Win runner.)

**Reference Books**

1. Software Testing techniques –Baris Beizerm Dreamtech, Second edition.
2. Software Testing Tools – Dr. K.V.K.K. Prasad, Dreamtech.
3. Software Testing Principles and Practices by Naresh Chauhan, Oxford University Press
3. The craft of software testing – Brain Matrick, Pearson Education.
4. Software Testing Techniques – SPD (Oreille)
5. Software Testing in the Real World-Edward Kit, Pearson.
6. Effective methods of Software Testing, Peery, John Wiley.
7. Art of Software Testing – Meyers, John Wiley.

**Student Activity:**

1. Prepare a chart for guidelines for data security in your organization
2. Test the performance of any software that is used by your organization under maximum load

**Testing Tools Lab**

1. Introduction to win runner testing tool
2. Recording test in context sensitive & analog mode
3. Synchronizing test.
4. Checking gui objects
5. Checking bitmap objects.
6. Programming test with tsl
7. Creating data driven test
8. Maintaining test script
9. Batch test
10. Project (creating test report)