**JNTUH COLLEGE OF ENGINEERING HYDERABAD**
**(AUTONOMOUS)**
**5 Year Integrated Double Degree Masters Program (IDDMP)**
**(B.Tech. + M.Tech + M.Sc)**

## COMPUTER SCIENCE

## COURSE STRUCTURE

**IV YEAR** **I SEMESTER**

| S.No. | Group | Subject | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | | UG Project | - | - | - | 8 |
| 2 | PGC-1 | Security in Computing | 4 | 0 | 1 | 4+1 |
| 3 | PGC-2 | Software Architecture & Design Patterns | 4 | 0 | 1 | 4+1 |
| 4 | PGE-3 | 1. Information Retrieval System.<br>2. Software Design and Engineering.<br>3. Parallel and Distributed Algorithms | 4 | 0 | 0 | 4 |
| 5 | PGC | Computing Lab | 0 | 0 | 6 | 4 |
| 6 | PGC | Comprehensive Viva voce | - | - | - | 2 |
| | | | | | | **28** |

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## SECURITY IN COMPUTING

**Unit I**

**Security Problem in Computing**

Computer Security, Threats, Attacks, Computer Criminals, Defense Methods,

**Cryptography**

Symmetric and Public-key Encryption, Uses of Encryption.

**Unit II**

**Program Security**

Secure Programs, Viruses and other Malicious Code, Control against Program Threats

**Protection in General-Purpose OS**

Protected Objects and Methods of Protection, Memory and Address Protection, Control of Access to General Objects, File Protection Mechanism, User Authentication.

**Unit III**

**Designing Trusted OS**

What is Trusted System?, Security Policies, Models of Security, Trusted Operating System Design

**Database and Data Mining Security**

Security Requirements, Reliability and Integrity, Sensitive Data, Inference, Multilevel Databases, Proposals for Multilevel Security, Data Mining

**Unit IV**

**Security in Networks**

Threats in Networks, Network Security Controls, Firewalls, Intrusion Detection System, Secure E-Mail

**Administering Security**

Security Planning, Organizational Security Policies, Physical Security

**Economics of Cybersecurity**

Quantifying Security, Modeling Cybersecurity, Current Research and Future directions

**Unit V**

**Privacy in Computing**

Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Privacy on the Web

**Legal and Ethical Issues in Computer Security**

Protecting Programs and Data, Computer Crime, Ethical Issues in Computer Security, Case Studies of Ethics

**Security in Service-Oriented Architecture (SOA)**

Web Services, XML Firewalls

***Prescribed Text Book***

1. C. P. Fleeger and S. L. Fleeger, Security in Computing, Pearson Education.

**References:**


1. M.Bishop and S. S. Venkatramanaya, Introduction to Computer Security, Pearson Education Asia, 2005.
2. Atul Khate, Cryptography and Network Security, Tata McGraw-Hill.
3. Stallings W., Cryptography and Network Security Principles and Practice, 3/e, Pearson Education Asia, 2003.
4. C K Shyamala, N Harini, Dr T R Padmanabham, Cryptography and Network Security, Wiley India

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# SOFTWARE ARCHITECTURE & DESIGN PATTERNS

**UNIT I**

**Envisioning Architecture**

The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

**Creating an Architecture**

Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

**UNIT II**

**Analyzing Architectures**

Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

**UNIT III**

**Moving from one system to many**

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

**UNIT IV**

**Patterns**

Pattern Description, Organizing catalogs, role in solving design problems ,Selection and usage.

**Creational and Structural patterns**

Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight, Proxy.

**UNIT V**

**Behavioral patterns**

Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

**Case Studies**

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development

**Text Books:**


1. Software Architecture in Practice, second edition, Len Bass,Pau Clements&Rick Kazman, Pearson Education,2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

**Reference Books:**


1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.

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## PG Elective- 3
## INFORMATION RETRIEVAL SYSTEMS

**UNIT-I**
Definition ,objectives, functional overview , Relationship to DBMS, Digital libraries, Datawarehouses. Information Retrieval System
Capabilities: Search , browse, Miscellaneous[1]

**Unit –II:**
Retrieval strategies: vector space model, probabilistic retrieval strategies, extended Boolean retrieval, LSI, fuzzy set Retrieval,[2]
Cross language information retrieval: Introduction, cross language barrier, Cross –language Retrieval strategies, Cross language utilities,[2]

**Unit -III:**
Efficiency: Inverted Index, Query processing, Signature files, Duplicate document Detection[2]
Integrted structured data and text: IR as a relational application, semi structured search using a relational scheme, multi-dimensional data model, mediators[2]

**Unit IV:**
Text Search Algorithms: Introduction, software Text search algorithms, Hardware Text search algorithms[1]

**Unit V:**
Multi-media information retrieval:Spoken language audio retrieval, Non-speech audio retrieval, graph retrieval, image retrieval, video retrieval [1]
Parallel information retrieval: Text Scanning, indexing, clustering and classification, [2]
Distributed information retrieval: A theoretical model of Distributed retrieval, Result fusion , [2]

**Text books:**

[1] Information storage and retrieval systems: Theory and implementation IInd edition: springer publishers,Gerald J.Kowalski mark T.Maybury
[2] `Information Retrieval : algorithms and heuristics IInd edition, springer publishers. David A . Grossman ,Ophir frieder.


**References:**

[1] Information Retrieval systems: Yates personed education
[2] Modern information retrieval ; frakes pearsoned education.

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**PG Elective- 3**

**SOFTWARE DESIGN AND ENGINEERING**

**UNIT I**

**Introduction to Software Engineering:** The evolving role of software, Changing Nature of Software, legacy software, Software myths.

**A Generic view of process:** Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

**Process models:** The waterfall model, Incremental process models, Evolutionary process models, Specialized process models, The Unified process.

**Software Requirements:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

**UNIT II**

**Software Design**

The nature of the design process, transferring design knowledge, constraints upon the design process and product, recording design decisions, designing with others, context for design, economic factors, assessing design qualities, quality attributes of the design product, assessing the design process. Representing abstract ideas, design view points, the architecture concept, design methods, design patterns, design representations, rationale for design methods.

**Design Processes and Strategies :** The role of strategy in design methods, describing the design process – The D – Matrix, design by top-down decomposition, design by composition, organizational influences upon design.

**UNIT III**

**Designing with objects and components**

Designing with objects : Design practices for object-oriented paradigm, Object-oriented paradigm, Object-oriented frame works, Hierarchical object oriented design process and heuristics, the fusion method, the unified process.

**Component - based design:**

The component concept, designing with components, designing components, COTS.

**User Interface design**

The Golden rules, Interface analysis and design models, user and task analysis, analysis of display content and work environment, applying interface design issues, design evaluation.

**UNIT IV**

**Concepts Of Software Projects**

**Project Management :** The management spectrum: people, product, process and project, W5HH principle, Critical practices

**Metrics for Process and Projects :** Process metrics, project metrics, size-oriented metrics, function-oriented metrics, Object-oriented and use-case metrics, metrics for software quality, integrating metrics with in software process.

**UNIT V**

**Project Scheduling and Management**

**Project Scheduling:** Basic concepts, project scheduling , defining a task set and task network, timeline charts, trackimg the schedule, tracking the progress for an OO project, Earned value analysis.

**Risk Management:** Reactive Vs. Proactive risk strategies, software risks, risk identification, risk projection,risk refinement, risk mitigation and monitoring, the RMMM plan.

**Text Books:**


1. Software design, David Budgen, second edition, Pearson education,2003
2. Software Engineering:A practitioner's Approach, Roger S Pressman, sixth edition. McGrawHill International Edition, 2005


**Reference Books:**


1. Applying domain- driven design and patterns, jimmy Nilsson, Pearson education,2006
2. Software Engineering Foundations, Ian Sommerville, seventh edition, Pearson education,2004.
3. Software Project Managenent , Bob Hughes & Mike Cotterell, Fourth edition, Tata Mc Gr aw Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
4. The Art of Project Management, Scott Berkun, O'Reilly, 2005.
5. Software Engineering, Project Management , Richard H. Thayer & Edward Yourdon, second edition, Wiley india, 2004.
6. Software Engineering foundations,Yingxu Wang Auerbach publications, 2008.
7. Applied Software Project Management , Andrew Stellman & Jennifer Greene, O'Reilly, 2006.

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**PG Elective- 3**

## PARALLEL & DISTRIBUTED ALGORITHMS

**UNIT-I**
Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing

**UNIT-II**
Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples

**UNIT-III**
Pipelining- Techniques computing platform, pipeline programs examples

**UNIT-IV**
Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallelist sharing data parallel programming languages and constructs, open MP

**UNIT-V**
Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

**Text Books:**

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2nd Edition.

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# COMPUTING LABORATAORY – I
## (Security and Software Testing)

**Security:**

1 a. Write a program to send a message (for example: "Mid exams are from next Monday") to your friend.
b. Write a program for the above one to show that the message has been modified (attack). (ex: "Mid exams are postponed").
2 a. Write a program so that sender and receiver are sharing the same key (Symmetric Encryption).
b. Write a program so that sender sends the message and receiver decrypts the message with the above key.
3 a. Write a program which shows the public-key cryptography technique. Note: generate two keys, public and private and encrypt with one key and decrypt with the other key.
4 a. Write a program to compute the sum of integers from 1 to 10.
b. Modify the above program to show that the above program can be sabotaged so that during execution it computes a different sum from 3 to 20. (Program security)
5. Write a program so that two mutually suspicious parties can authenticate each other.
6. Write a program to display the student's database (roll number, name, and attendance), but not the students confidential information (such as marks). (Database security)
7. Write a program to demonstrate man-in-middle attack. (Security in Networks)
8. Write a program, to demonstrate the denial-of-service to the authorized user in the Lab. (Administrative Security)

**Software Testing**: WinRunner – Case Tool(Testing Tool)

**Introduction to Case Tool WinRunner**

1. Recording in Context Sensitive Mode and Analog Mode
2. A) Gui Checkpoint for Single property
   B) Gui Checkpoint for single object/window.
   C) Gui Checkpoint for Multiple Objects
3. A) Bitmap Check point for object/window
   B) Bitmap Check Point for Screen Area.
4. A) Database checkpoint for Default check
   B) Database checkpoint for custom check.
   C) Database checkpoint for Runtime Record.
5. User Defined Functions (Given Number is Prime or not in WinRunner) & Executing a Prepared Query
6. A) Synchronization for Object/window property
   B) Synchronization for object/window bitmap.
   C) Synchronization Point for Screen Area Bitmap.
7. Per Test Mode & Pre Learning
8. A) Test Case for Calculator in Windows Application.
   B) Test Case for Flight Application.