BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
SECONDSEMESTER 2015-2015
Course Handout Part II

Date: 13th January, 2016

In addition to part-I (General Handout for all courses appended to the timetable), this portion gives further specific details regarding the course.

Course No.: SS G653
Course Title: Software Architectures
Instructor: **Dr. PANKAJ VYAS**(Email: pankajv@pilani.bits-pilani.ac.in)

1. Objective: to introduce the concept of architectural design of softwareand its practice **.**
2. **Scope**:The course will introduce basic concepts and themes of software design focusing on architectural design. The students will appreciate attribute driven architectural design by studying cases.
3. Text Book:
T1. Bass, Len & others. Software Architecture in Practice. Pearson Edu., 2nd Ed. 2003.
T2. Buschmann, F. Pattern Oriented Software Architecture. Vol I, WSE, 1996.
4. References:
R1. Mary Shaw, David Garlan. Software Architecture: Perspectives on an Emerging Discipline, Prentice Hall, 1996

5. Lecture Schedule:-

Learning Objective	Topics (Each Section Marks One Lecture, Unless Stated Otherwise)	Textbook Chapter Reference
1 Introduction: Envisioning Architecture And its Context	The Architecture Business Cycle: To Understand the Factors Influencing Architecture and the Factors Influenced by it (Sec 1.1) –with Emphasis on the Notion of Stakeholders and their Interests	T1 Ch 1
	Software Processes and ABC – Sec 1.2,T1	T1 Ch 2
	What is Software Architecture? Various Definitions of Software Architecture - Upto Sec 2.2,T1 5.Architectural Patterns, Reference Models and Reference Architectures as Intermediate Stages – their Importance as Sources of Architecture for Software Systems- Sec 2.3,T1	
	.Some Generic Qualities of "Good" Architecture – Sec1.3, T1-Recommended Good Practices for Architectural Process and Architectural Structures	
	Some Cases in Architectural Design Review of Design Principles from OOAD. Review of UML.	

2 Understanding the Various Structures that Constitute software Architecture	Importance of Architecture in Software Development : Vehicle for Stakeholder Communication, Manifestation of Early Design Decisions and a Transferrable, Re-usable Model , Sec 2.4,T1 Structures and Views – Sec 2.5,T1 Relative Importance of the Structures – Not all Structures are Equally Relevant in all Systems _____ The Various Structures present in a Case Study: Examples: Java API – with emphasis on Decomposition and Dependency (Uses) Structure, Class Structure, A Home Control System with a lot of Device Control Issues, leading to a Layered Structure, other examples of layered systems, systems with complex concurrency structures etc _____ Architectural Structures – the A-7E Avionics System Case Study – Chap 3, T1 – also to be used as an exercise in writing Performance and Modifiability Quality Scenarios, at a later point	T1 Ch 2 T1 Ch3
3 To Understand the role of Patterns in Understanding and Creating Architectures	Patterns: 1.What is a Pattern Pattern Description : The Context, Problem as a Set of Forces Arising in the Context, Solution along with Consequences – the benefits and liabilities Illustration of the above using an example (Layers), Chap1, T2 _____ 2.Patterns and Software Architecture – Role of Patterns in Creating, Understanding, and Communicating Architectures, Patterns as Conceptual Tools 3.The Various Categories of Patterns :The Various Categories – Giving Shape to Amorphous Systems, Handling Distributed Nature, Interactivity, Adaptability-Sec 2.1, T2 _____ 4.Mud to Structure Category of Architectural Patterns Layers Pattern : Pattern Description and Examples Forces: Setting the granularity of layers, recognizing the presence of horizontal components in layers, stability of interfaces, stepwise implementation of a layered architecture. Examples of layered structures, several design exercises where the students are asked to identify layers, assign responsibilities to the individual layers, name the services that will be offered by each layer	T2 Ch 1 T2 Ch 2

4 Patterns in Understanding and Creating Architectures	Architectural patterns Pipes and Filters : Description and Examples Blackboard : Description and Examples	T2 Ch.2
5 To Understand the Importance of Quality Attributes of a Software System	Understanding Quality Attributes Functionality and Architecture – Architecture not fully Governed by Functionality - Architecture and Quality Attributes as Orthogonal Scenarios as Quality-Attribute-Specification Generic Structure of a Quality Scenario _____ General Structure of Scenarios that Specify Availability ,Modifiability, Performance and other attributes – with attention to the various stimuli, response mechanisms and the various response measures _____ Quality Attribute scenarios in Practice – Exercises	T1 Ch 4
6. Techniques Used to Achieve Quality Attributes	Quality Attributes: System Qualities Attributes -Business Qualities Achieving Qualities: Introduction to Tactics _____ Availability Tactics Performance Tactics	T1 Ch 4 T1 Ch 5
7 Architectural Patterns	Architectural Patterns: Distributed Systems – Broker – Issues in a Distributed System – the Responsibilities of a Broker - Examples – the CORBA Reference Model, Web Services, Importance of Discovery and Registration Services, Need for a Standard Intermediate Representation – IDL _____ Adaptable Systems : Microkernel and Reflection The Meta-Class mechanism in Java	T2 Ch. 2.3 T2 Ch 2.5
8 Techniques for Achieving Quality Attributes	Quality Tactics:Modifiability, Security Tactics : Testability and Usability, Tactics and Patterns _____ Case Studies: Designing for High Availability and Performance- the WIKI architecture, architecture of large scale internet applications – load distribution and content caches, REST architecture Review of the Avionics Architecture in terms of the tactics employed J2EE :Component Based Architecture and Middle Ware Service Oriented Architecture – Introduction and Issues Peer to Peer Architecture – Introduction and Examples 3-4 lecs	**T1 Ch 5** **T1 Ch 6**

9 Understanding Attribute Driven Design	Designing the Architecture Architecture in the Life Cycle, Attribute Driven Design :Steps Forming the Team Structure The Garage Door Opener Case from the textbook,Other examples	T1 Ch.7
10 The Role of Documentation	Documenting Software Architectures Uses of Documentation, views, choosing the relevant views – stepwise process, tabulating stakeholder interest in various views Standard Organization for the Documents- primary presentation, element catalog, context diagram, variability guide, architecture background, glossary _____ Documenting behaviour – interface documentation, template for documenting interfaces Documentation across views UML – UML features focused on architecture, Sec 9.6, T1	T1 Ch 9.1 to 9.7
11Patterns	Patterns:Interactive Systems – MVC and PAC	T2 Ch 2.4
12Design Patterns	Design Patterns:Structural – Whole Part, Organization of Work-Master Slave _____ Access Control –Proxy Management – Command Processor _____ Communication – Forwarder-Receiver, Client-Dispatcher-Server, Publisher-Subscriber	T2 Ch 3
13Analyzing an Architecture	The ATAM: A Comprehensive Method for Architecture Evaluation Introduction, Participants,, Outputs, the four phases, the steps in phases 1 and 2 , Case Study – 2lecs	T1 Ch 11
14One System to Many	J2EE/EJB: A Case Study of an Industry Standard Computing Infrastructure The EJB Architectural Approach Examples of other Standard Computing Platforms – Android etc	T1 Ch. 14

6. Evaluation Scheme:

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Evaluation Component	Type	Duration	Weight	Date
MidSem Exam	Open Book	90 Minutes	**30%**	16/3 11:00 - 12:30 PM
Project Assignment	Open Book (Take Home)		**35%**	To be Announced in class
Comprehensive Exam	Partly Open Book	3 hours	**35%**	11/5 AN

7. Make up Policy:

- No Make-Up Without Prior Permission.

8.Notices: All notices will be displayed only on the notice board of Department of Computer Science.

9. Consultation Hour: Tuesday and Thursday 3:00 PM – 4:00 PM.
Students can contact instructor via mail also.

Instructor-in-Charge
Dr. Pankaj Vyas
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