

25HCST403	SOFTWARE ARCHITECTURE BASICS	Category	L	T	P	R	Credit	Year of Introduction
		VAC	4	0	0	0	4	2025

Preamble: Software Architecture provides the fundamental structure of a software system and defines how system components interact to achieve quality, performance, and maintainability goals. This course introduces the core concepts, models, architectural styles, and design principles used in modern software development.

Pre-Requisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain fundamentals of software architecture, methodologies, components, connectors, and patterns.	K2 Understanding
CO2	Apply architectural models and styles, including modern approaches, in designing software systems.	K3 Apply
CO3	Apply ADLs, UML, middleware, and technologies to implement architectures.	K3 Apply
CO4	Implement architecture design and evaluation methods to create software architectures and document them.	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	1	1	-	-	-	-	-	-	-	1	2	1
CO2	2	2	3	-	2	-	-	-	-	-	1	-	3
CO3	2	2	3	1	3	-	-	-	-	-	1	-	3
CO4	2	3	3	2	2	-	-	-	1	-	1	-	3
Avg	2	2	2.5	1.5	2.33	-	-	-	1	-	1	2	2.5

Mapping of course outcomes with Knowledge and Attitude Profile (WK)

	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*	*		*	
CO3	*	*	*	*	*	*		*	
CO4	*	*	*	*	*	*		*	

Wks Mapped with the course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*		*	

Mark Distribution:

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern:

Attendance	: 5 marks
Continuous Assessment Test	: 20 marks
Assignment	:15 marks

SYLLABUS**Module 1 (12 hrs)**

Overview of Software development methodology and software quality model, different models of software development and their issues. Introduction to software architecture, evolution of software architecture, software components and connectors, common software architecture frameworks, Architecture business cycle – architectural patterns – reference model.

Module 2 (14 hrs)

Software architecture models: structural models, framework models, dynamic models, process models. Architectures styles: dataflow architecture, pipes and filters architecture, call-and return architecture, data-centered architecture, layered architecture, agent based architecture, Micro-services architecture, Reactive Architecture, Representational state transfer architecture.

Module 3 (14 hrs)

Software architecture implementation technologies: Software Architecture Description Languages (ADLs), Struts, Hibernate, Node JS, Angular JS, J2EE – JSP, Servlets, EJBs; middleware: JDBC, JNDI, JMS, RMI and CORBA. Role of UML in software architecture.

Module 4 (16 hrs)

Software Architecture analysis and design: requirements for architecture and the life-cycle view of architecture design and analysis methods, architecture-based economic analysis: Cost Benefit Analysis Method (CBAM), Architecture Tradeoff Analysis Method (ATAM). Active Reviews for Intermediate Design (ARID), Attribute Driven Design method (ADD), architecture reuse, Domain specific Software architecture. principles of sound documentation-context diagrams, variability-Documenting interfaces and behavior

Text Books:

1. Bass, L., Clements, P., & Kazman, R. (2003). *Software architecture in practice* (2nd ed.). Prentice Hall.
2. Keogh, J. (2002). *J2EE: The complete reference*. Tata McGraw-Hill.
3. Dikel, D., Kane, D., & Wilson, J. (2001). *Software architecture: Organizational principles and practices*. Prentice Hall.

Reference Books:

1. Bennett, D. (1997). *Designing hard software: The essential tasks*. Prentice Hall.
2. Clements, P., Kazman, R., & Klein, M. (2001). *Evaluating software architectures: Methods and case studies*. Addison-Wesley.
3. Albin, S. (2003). *The art of software architecture*. Wiley.
4. Mee, R., & Stafford, R. (2002). *Patterns of enterprise application architecture*. Addison-Wesley.

END SEMESTER EXAMINATION -MODEL QUESTION PAPER

Course Code	25HCST403
Course Name	SOFTWARE ARCHITECTURE BASICS
Max. Marks: 60	Duration: 2.5 Hours

Part A

(Answer all questions. Each question carries 3 marks)

Qn No.	Question	Marks	CO	BL
1	Explain the relationship between software quality attributes and software architecture.	3	1	L2
2	Describe the characteristics of a reference model.	3	1	L2
3	A travel booking application must expose services to mobile and web clients through standard interfaces. Apply REST Architecture to design the system	3	2	L3
4	A university uses a centralized database to manage student records, faculty information, course registrations, and examination results. Apply the concept of a data-centered architecture to this system and explain how data flows between	3	2	L3

	the central repository and the various subsystems.			
5	A software architect needs to communicate the structure and behavior of an ATM system to developers. Demonstrate how UML diagrams can be used.	3	3	L3
6	An e-commerce application consists of separate Order Processing, Inventory, and Payment services running on different servers. Apply Java Message Service (JMS) to enable message-based communication among these services and explain how messages are exchanged to complete an order transaction.	3	3	L3
7	During development of an airline reservation system, stakeholders need to review the architecture before implementation. Illustrate how ARID can be used in this system.	3	4	L3
8	Apply the ATAM method to evaluate the architecture of an online banking system.	3	4	L3
Part B				
<i>(Answer any one full question from each Module. Each carry 9 marks)</i>				
Module I				
Qn No.	Question	Marks	CO	BL
9	Explain software components and connectors with suitable diagrams.	9	1	L2
OR				
10	Describe the Architecture Business Cycle (ABC) and its stakeholders.	9	1	L2
Module II				
Qn No.	Question	Marks	CO	BL
11	An online banking application requires secure customer authentication, transaction processing, account management, and database services. Apply the Layered Architecture pattern to design the system and explain the role of each layer in supporting these functionalities.	9	2	L3
OR				
12	A payroll management system is developed using a structured software design approach. Apply the Call-and-Return Architecture to organize the system into modules and explain how control is transferred among the modules during payroll processing.	9	2	L3
Module III				
Qn No.	Question	Marks	CO	BL
13	An online shopping application requires secure order processing, payment handling, and transaction management.	9	3	L3

	Apply Enterprise Java Beans (EJBs) to implement the business logic and explain how EJB services can be used to manage transactions and business operations.			
OR				
14	A multinational organization is developing a distributed enterprise application consisting of multiple interacting components. Apply a Software Architecture Description Language (ADL) to represent the system architecture and illustrate the interactions among the components.	9	3	L3
Module IV				
Qn No.	Question	Marks	CO	BL
15.a	An organization must choose between two architectural alternatives for an enterprise application. Demonstrate the use of CBAM in selecting the appropriate architecture.	5	4	L3
15.b	A software company develops multiple versions of an e-commerce platform for different clients with varying requirements. Apply the concepts of architecture reuse and variability management to support software evolution and explain how they help in accommodating new features efficiently.	4	4	L3
OR				
16.a	A university management system requires proper interaction with external entities. Demonstrate the use of a context diagram for documenting system boundaries.	5	4	L3
16.b	A software company is developing multiple healthcare applications such as patient management, appointment scheduling, and medical record systems. Apply Domain-Specific Software Architecture (DSSA) principles to develop these applications and explain how DSSA supports reuse of common architectural components within the healthcare domain.	4	4	L3
