**Unit: II**
Lecture: 5
Architectural Design

Software Architecture:

The software architecture of a program or computing system is the structure or structures of the system, which comprises software components, the externally visible properties of those components and the relationships among them.

Architectural design is a process for indentifying the sub-systems making up a system and the framework for sub-system control and communication.

The output of this design process is a description of the software architecture.

- Architectural design is an early stage of the system design process.
- It represents the link between specification and design processes and is often carried out in parallel with some specification activities.
- It involves identifying major system components and their communications.

The analysis model   The design model
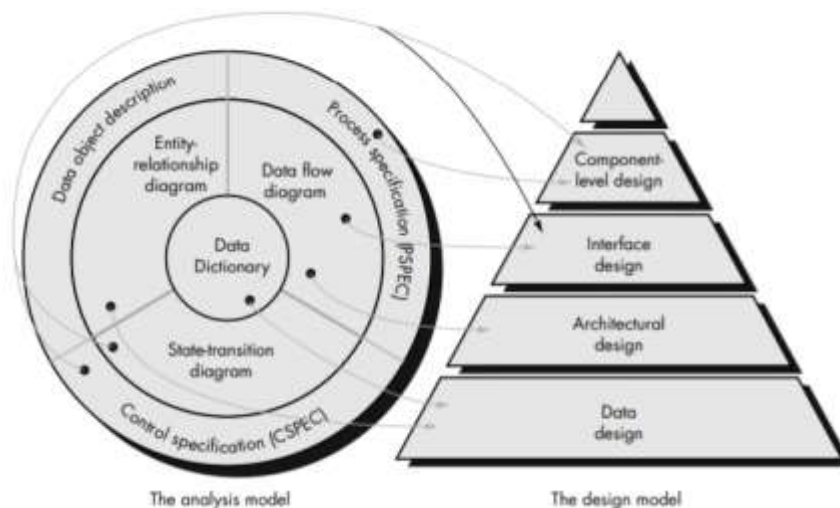
As shown in above diagram, software architecture considers two level of the design pyramid: data design and architectural design.

Data Design enables us to represent the data component of the architecture.

Architectural design focuses on the representation of the structure of software components, their properties and interactions.

The advantages of explicitly designing and documenting software architecture:

- Stakeholder communication: Architecture may be used as a focus of discussion by system stakeholders.

- System analysis: Well-documented architecture enables the analysis of whether the system can meet its non-functional requirements.
- Architecture constitutes a relatively small, intellectually graspable model of how the system is structured and how its components work together.

Data Design:

Data design is the first design activity, which results in less complex, modular and efficient program structure.

Data design creates a model of data and/or information that is represented at a high level of abstraction (user's view of data).

The data objects, attributes and relationships depicted in entity relationship diagrams and the information stored in data dictionary provide a base for data design activity.

During the data design process, data types are specified along with the integrity rules required for the data.

The structure of data can be viewed at three levels:

- **At the program component level,** the design of data structures and the algorithms required to manipulate them is necessary, if high-quality software is desired.
- **At the application level,** it is crucial to convert the data model into a database so that the specific business objectives of a system could be achieved.
- **At the business level,** the collection of information stored in different databases should be reorganized into data warehouse, which enables data mining that has an influential impact on the business.

Following principles for Data Design should be followed (by Wasserman) :

- The data structures needed for implementing the software as well-as the operations that can be applied on them should be identified.
- A data dictionary should be developed to depict how different data objects interact with each other and what constraints are to be imposed on the elements of data structure.
- Stepwise refinement should be used in data design process and detailed design decisions should be made later in the process.
- Only those modules that need to access data stored in a data structure directly should be aware of the representation of the data structure.
- A library containing the set of useful data structures along with the operations that can be performed on them should be maintained.
- Language used for developing the system should support abstract data types.