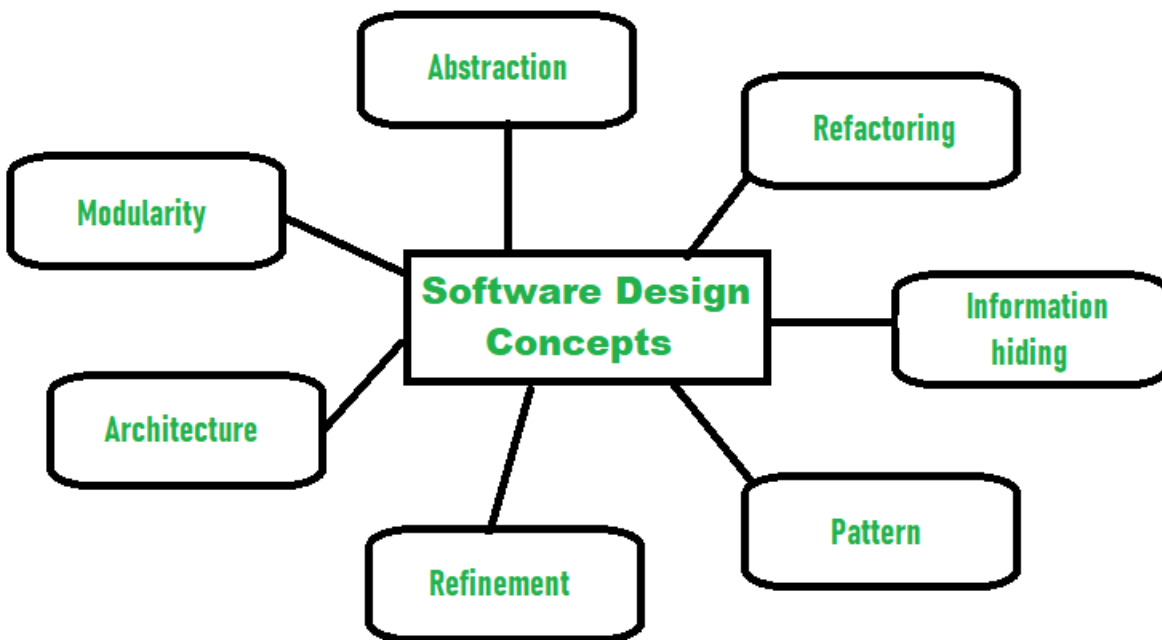


Unit: II
Lecture: 2
Software Design Concepts

The software design concept means the **principle behind the design**.

It describes how you plan to solve the problem of designing software. The software design concept provides a supporting and essential structure or model for developing the right software.

There are many concepts of software design:



- **Abstraction: (hide irrelevant data)**
 - Abstraction means to **hide the details to reduce complexity and increases efficiency or quality**.
 - Different levels of abstraction are necessary and must be applied at each stage of the design process so that any error that is present can be removed to increase the efficiency of the software solution and to refine the software solution.
 - The solution should be described in broad ways that cover a wide range of different things at a higher level of abstraction and a more detailed description of a solution of software should be given at the lower level of abstraction.

- **Refinement:**

- It is a top-down design strategy.
- Refinement is **a process of elaboration**. We begin with a statement of function (or description of information) that is defined at a high level of abstraction i.e. the statement describes function or information conceptually but provides no information about the internal workings of the function or the internal structure of the information.
- Refinement causes the designer to elaborate on the original statement, providing more and more detail as each successive refinement (elaboration) occurs.
 - Abstraction and refinement are complementary concepts.
 - Abstraction enables a designer to specify procedure and data and yet suppress low-level details.
 - Refinement helps the designer to reveal low-level details as design progresses.
 - Both concepts aid the designer in creating a complete design model as the design evolves.

- **Modularity: (subdivide the system)**

- Modularity means **dividing the system or project into smaller parts to reduce the complexity of the system** or project.
- Modularity in design means subdividing a system into smaller parts so that these parts can be created independently and then use these parts in different systems to perform different functions.
- Modularity is the single attribute of software that allows a program to be intellectually manageable.
- Monolithic Software → a large program composed of a single module, cannot be easily grasped by a reader. The number of control paths, span of reference, number of variables and over all complexity would make understanding close to impossible.
- So modularity in design reduces complexity, facilitates change and results in easier implementation by encouraging parallel development of different parts of a system.

- **Architecture/ Software Architecture:**
 - Architecture is the **hierarchical structure of program components**, the manner in which these components interact and the structure of data that are used by the components.
 - One goal of software design is to derive an architectural rendering of a system. This rendering serves as a framework from which more detailed design activities are conducted.
- **Control Hierarchy/ Program Structure:**
 - Program Structure represents **the organization of program components (modules) and implies a hierarchy of control**.
 - It does not represent procedural aspects of software such as sequence of processes, occurrence or order of decisions or repetition of operations nor is it necessarily applicable to all architectural styles.
- **Information Hiding:**
 - Information hiding is achieved by designing the modules in a manner that the **information gathered or contained in one module is hidden and can't be accessed by any other modules**.
 - The use of information hiding as a design criterion for modular systems provides the greatest benefits when modifications are required during testing and later, during software maintenance. Because most data and procedure are hidden from other parts of the software, inadvertent errors introduced during modification are less likely to propagate to other locations within the software.