"Design Paradigm"

A course on the Electronic System Design Imperatives

Background:

One of the critical components of the product realization process is the engineering design, which deserves a special attention in the engineering education to better prepare engineers to meet the demands of the industry.

The evolution of a design paradigm in Engineering curriculum is based on integration of a number of design experiences into theoretical courses and the design-specific courses. This approach is imperative to enhance the employability of Engineering Students in the industry by virtue of filling the vide gap between the Theoretical Aspects of Learning in the Indian Education System and the Practical Applications of the concepts learnt in college, which are essential for employment in the industry.

Objective:

The course is intended to address the vital gap in the fundamentals taught and their applications in Product/System Realization thru the understanding of the Design Paradigms. It leverages all the theoretical learnings and introduces the students to the vast applications of the concepts learnt thru the exposure to an approach to the Integration of comprehensive design experience with the Engineering Curriculum.

Course Summary:

The course intends to introduce and familiarize students with the design process and paradigms associated with Electronic System/Product Design in Analog, Digital, Embedded and Software domains. The course shall also introduce the students to the necessary design process & documentation skills that are an inevitable part of any design.

The course aims to strike a balance between design examples and associated theory, background & imperatives on design paradigms. Two approaches shall be adopted, interchangeably:

- Introduce the concepts of a particular paradigm and then go through a design realization example.
- Contemplate and discuss a design paradigm first, and then introduce the students to the relevant theory and their correlation.

The lectures conducted will be three hours long. In general, the first one & a half hour will contain more theoretical & instructional inputs, and the second half will be dedicated to interactive sessions with practical approach in problem solving with regards to product/system/solution designing.

The course shall conclude with the Crucial Design Imperatives like Safety, Security, Reliability, Standards, Compliances and Environmental Considerations.

Learning Objectives:

- Grasp fundamental concepts in product architecting like customer needs identification, requirements formulation, functional decomposition as well as function-form mapping during conceptual design.
- Understand the platform concept and be able to prioritize drivers of modularity and product platform design.
- Enumerate metrics for quantifying commonality within a product family.
- Synthesize and analyze existing architecting approaches to enhancing creativity while reducing ambiguity and complexity.
- Utilize out-of-the-box holistic system thinking in developing a system's conceptual model and architecture.
- Define system architecture, modeling, form, function, structure and behavior.
- Describe how a system's function emerges from its form and behavior.
- Distinguish between the notions of system, product, service, and project, and how each creates value and competitive advantage for any enterprise.
- Distinguish between incremental innovation and radical innovation when creating new solutions.
- Understand and apply a 10-Step Design Process.
- Build a knowledge base of the latest technological innovations.
- Develop new concepts and designs by participating in "Charrette" sessions that focus on a limited set of core issues connected to real-world implementation.
- Understand & practice the crucial Design Imperatives: Safety, Security, Reliability, Standards, Compliances and Environmental Considerations.
- Develop a holistic and system-level perspective on smart sustainable electronic designs.

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