

School of Mechanical Engineering

Course Code : MCDM5004

Course Name: Product Design and Life cycle Management

UNIT I

INTRODUCTION

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Program Name: M.Tech (CAD/CAM)

INTRODUCTION

The logo of Galgotias University is a stylized, circular emblem. It features a central blue swirl that curves upwards and to the right, set against a background of yellow and orange gradients. The entire emblem is enclosed within a larger, light-colored circular border.

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PROGRAM ORGANIZATION

- ❖ Process of **allocating the resources** needed to develop a product and the organizational leadership to successfully manage the program, organize the team by **establishing roles, encouraging risks, and rewarding innovation**.
- ❖ A primary goal is to facilitate **communication** between people whose work is interrelated.
- ❖ The best companies **proactively focus on the customer** and consider life cycle performance in determining how the product is designed and how it will be delivered and serviced.
- ❖ A **design policy** is a management's statement of its overall goals for the design process and includes proven product development methods and guidelines.
- ❖ Design policies should include a mechanism for **setting schedules that are realistic** and allow adequate time for design, analysis, and development testing.

TECHNIQUES USED IN PROGRAM ORGANIZATION

❖ WORK BREAKDOWN STRUCTURE (WBS)

- Management develops a structure that defines responsibilities, resources, goals, and milestones.
- Hierarchical family tree that identifies and defines all task elements required for the program.
- A unique identification number is assigned to each task element. An effective structure identifies all reporting-level task elements of the program and provides a baseline for measuring financial, technical, and schedule progress on each individual element.
- The WBS provides a framework for detailed resource and financial planning of the program. Staffing requirements are then determined and the proper personnel are organized.

❖ NETWORK DIAGRAM

- Design activities usually involve a **multitude of smaller tasks** that must be done to complete the project. Each of the smaller tasks requires specific time and resources.
- Network diagram aids in **visualizing the various connections between these work elements** and the sequence in which they are required to be performed.
- The **Program Evaluation and Review Technique (PERT)** is one type of network diagram approach used on many programs, in which start and completion events are shown as blocks with interconnecting lines showing the dependency relationship and present activity times allowed. The amount of time required for each activity is estimated and entered on the dependency relationship line and represents activity time.

❖ SCHEDULE DIAGRAMS

- Prepared by **listing task activities** in a column on the left and a calendar-related time scale on a row across the top of the chart.
- A **start-and-stop time** span line (or bar) is placed in the row corresponding to each task activity to indicate the calendar relationship.
- Very **useful planning and control tools** but provide limited visibility of task interrelationships.

❖ TASK RESOURCE BUDGETS AND SCHEDULES

- Carefully prepared **task estimates** are necessary to establish project or program budgets.
- **Several cycles of adjustment and review** by program management are usually required to establish a realistic budget for production of a customer acceptable product at a management-acceptable profit margin.
- **Progress and performance are expected to stay within the budget** and schedule constraints and produce a product that meets requirements.

❖ TECHNICAL CONTROLS

- A major method of technical control is **documentation**.
- Technical documentation includes **specifications, block and interface diagrams, design guidelines, drawings, process capabilities, purchased part information, and technical files**.
- Specifications are usually required for the system and address the performance, environmental, reliability, producibility, and quality requirements.
- No design activity should proceed without **written task definitions and specifications**.
- The **system block diagram** depicts in block form the functional and physical partitioning of the elements of the system and indicates the major I/O flow. A well-prepared block diagram is a very useful working document for communicating essential interface information and functional operations.
- **Design guidelines** and rules are prepared to encourage the use of proven design practices and promote consistency of design for the specific development program.

❖ COST AND SCHEDULE CONTROLS AND ASSESSMENT

- Budgets and schedules are established at the start of the program for each element of the WBS. A forecast of resource expenditures are prepared by labour category, time frame, and entered into a cost and schedule status-reporting system.
- **Periodic updates** are made available for review of trends and corrective action.
- **Gantt charts** can then be used effectively to indicate the progress of each activity against a time scale. The end points of the task are clearly defined, but judgment is required to measure progress between the end points.
- In setting up the lower level activities, the task scope and time span should be **broken into small enough units of time** to provide good visibility of progress.
- Schedule control is then aided by **weekly informal reviews and periodic formal reviews**.
- **Computer software programs** are commercially available to help in these tasks.

❖ DESIGN REVIEWS AND AUDITS

- Design reviews are a crucial communication link between the designer and specialists from all the applicable disciplines.
- The purpose of design reviews is to evaluate technical progress, identify potential problems, and to provide suggestions for design improvements.
- It also provides an opportunity for the support areas, such as manufacturing, maintenance, test, and logistics to communicate with the project.
- The intention should be to evaluate and criticize the design, not the designer!
- It is not design by committee, but rather a systematic method to ensure that all aspects of the design are thoroughly evaluated prior to production.
- Best in class companies use weekly meetings with a strategic planning team made up of upper management from various areas. This leads to better design and better acceptance of the final design.

❖ PRODUCTION READINESS AND DESIGN RELEASE

- At some point in product development, creative design must cease so that the product can be released to production. This point in the developmental phase is called **design release**.
- **Scheduling a design release** is closely related to the status of other design activities, such as design reviews, production design, test results, and configuration control. Care must be taken to prevent the release of a design that is incomplete, inaccurate, or premature.
- **Deviating** from standard procedures allows **inferior-quality products** to reach users. By using uniform practices and procedures concerning technical requirements and by evaluating current manufacturing capability, more realistic design release dates can be established.
- The **design should be validated in stages**, using experienced personnel from technical and production disciplines to ensure that the design is producible, documentation is complete, and released on schedule.

TECHNICAL RISK MANAGEMENT

- **Technical risk** is a measure of the **level of uncertainty** for all of the technical aspects of the development process.
- Technical risk management **identifies and tries to control this uncertainty** found in product development. It is essential for identifying and resolving potential problems to ensure that the proposed system will work as intended and be reliable when it reaches the user.
- The **steps** in technical risk management are to:
 - Systematically identify **areas** of potential technical risk
 - Determine the **level** of risk for each area
 - Identify and **incorporate solutions** that eliminate or reduce the risk
 - Continue to **monitor and measure** progress
- **Technical risk assessment** is a managerial planning and control system for **quantifying design and technical progress** during program development.

- Technical risk assessment can be performed to decide whether to start new designs, to evaluate alternative technologies, or to make or buy a particular technology. This systematic approach allows management to regularly evaluate program status and assign additional resources as problems are identified.
- Technical risk management requires a considerable amount of effort and cost to be properly incorporated into the program. The up-front cost, however, is well spent and should provide a superior product with reduced risk in the production phases.

References

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