



University OF Hilla
Engineering Faculty
Medical Device Technology Engineering



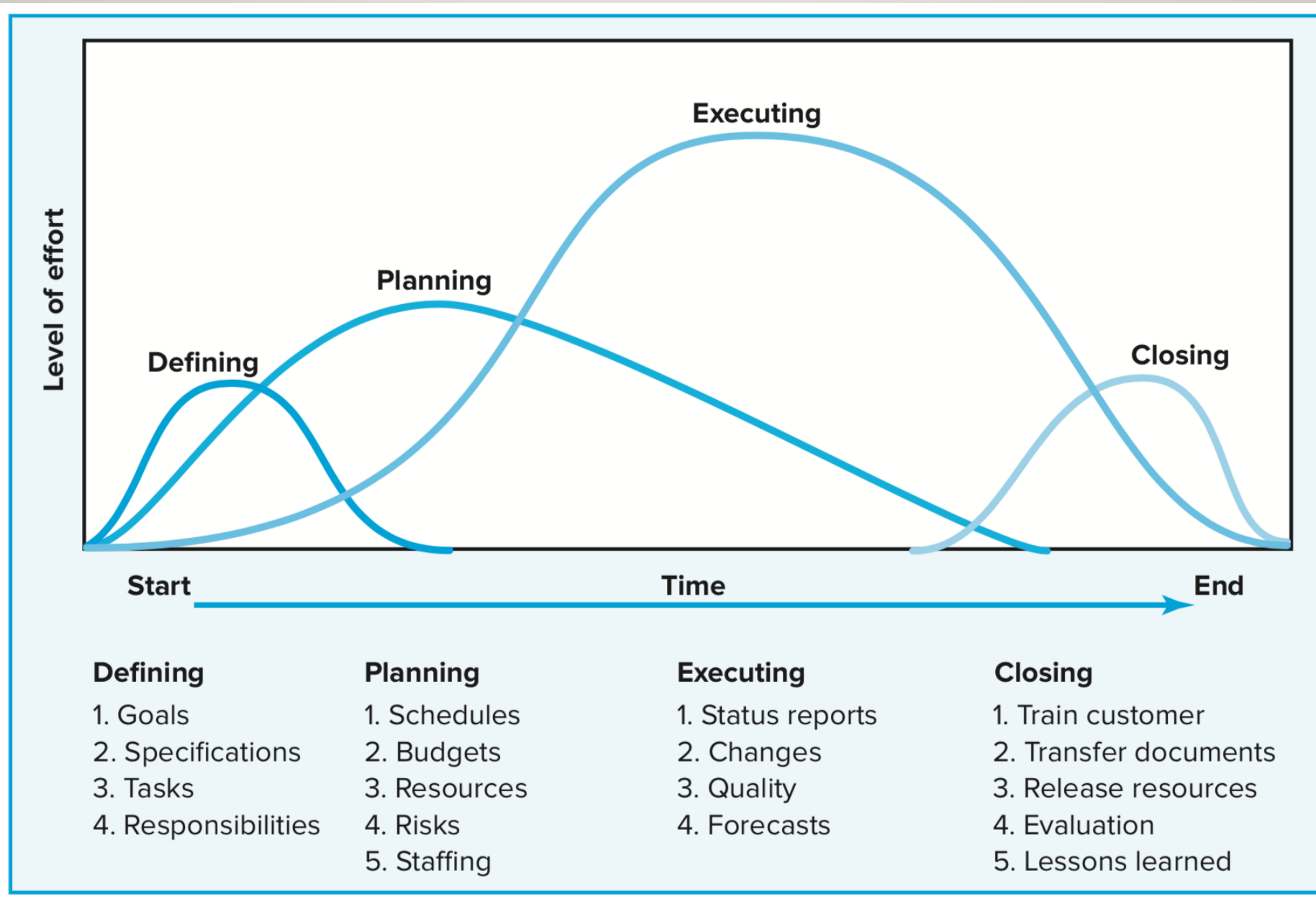
PROJECT MANAGEMENT

Lecture 3

ASST. LEC. MORTEZA ABBAS IMRAN



The project life cycle



- Defining stage: Specifications of the project are defined; project objectives are established; teams are formed; major responsibilities are assigned.
- Planning stage: The level of effort increases, and plans are developed to determine what the project will entail, when it will be scheduled, whom it will benefit, what quality level should be maintained, and what the budget will be.
- Executing stage: A major portion of the project work takes place both physical and mental. The physical product is produced (a bridge, a report, a software program). Time, cost, and specification measures are used for control. Is the project on schedule, on budget, and meeting specifications? What are the forecasts of each of these measures? What revisions/changes are necessary?
- Closing stage: Closing includes three activities: delivering the project product to the customer, redeploying project resources, and post-project review. Delivery of the project might include customer training and transferring documents. Redeployment usually involves releasing project equipment/materials to other projects and finding new assignments for team members. Post-project reviews include not only assessing performance but also capturing lessons learned.

Project life cycles

- Defining
- Planning
- Executing
- Closing

Product life cycles

- Research and development
- Market introduction
- Growth
- Maturity
- Deterioration
- Death



Project Scheduling

Project scheduling is the time-phased arrangement of project activities subject to precedence, time and resource constraints in order to accomplish project objective

The most widely used scheduling aids involve network techniques of which the critical path method

(CPM) was used to find the Total slack Time and Free slack time of the project activities

Project Network Analysis

Is the graphical representation of the plan of the carrying out project

The basic activity of the network analysis should be implemented in three phases

- Planning phase
- Scheduling phase
- Control phase

Planning Phase

Step 1: Activity planning

The activities making up the project are defined and their interdependency or precedence relationships are determined

Step 2: Activity Network Drawing

The activities defined in step 1 are represented in the form of network diagram

Scheduling Phase

Step 3: Basic Scheduling

The basic scheduling computations are performed through forward-pass and backward-pass rules. These computations give the earliest and latest allowable start and finish time for each activities

Step 4: Time/Cost Trade-offs

This step is performed if the project analyst is interested in determining the cost of reducing the project length

Step 5: Constrained Resource Allocation

Process of allocation limited resources to completing activities in the project. Which competing activities get resources first

Step 6: Resource Leveling

If desired, activity shifting or rearrangement may be performed to reduce period-to-period fluctuations in resources requirements.

Control Phase

Step 7: Monitoring and Analyzing

The project progress and performance are mentored by comparing the actual project status to the prevailing schedule. The monitoring permit frequent review and revisions of the project plan.

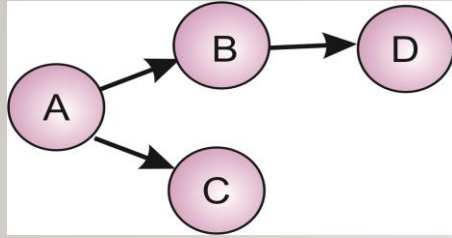
Some of the advantages of network analysis

1. Ease of application
2. Good visual communication tool
3. Detailed specification of operational characteristic
4. Starting point for further analysis of a system
5. Provision of a basis for managerial control
6. A measure of operational performance
7. A statement of project requirements

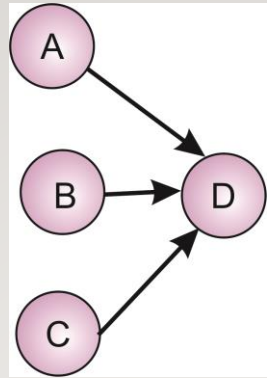
Network Analysis Procedure (Activity on node Method)

Terms and symbols

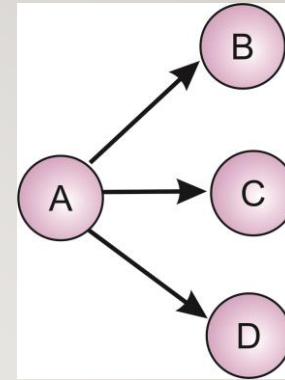
- **Node:** is a circular representation of activities
- **Arrow:** A line connecting two nodes and having an arrow head at one end
- **Activity :** Is a time –consuming effort required to perform a part of the overall project
- **Restrictions :** Precedence relationship that establishes the sequence of activities
- **Dummy :** activity with zero time duration
- **Predecessor Activity:** is the activity that immediately precedes the one being consideration
- **Successors Activity:** is the activity that immediately follows the one being consideration
- **Descendant Activity :** Any activity restricted by the one under consideration
- **Antecedent Activity :** Any activity that must be precede the one under consideration
- **Merge Point:** This point exists when two or more activities are predecessor of single activity
- **Burst Point :** This point exists when two or more activities have a common predecessor activity



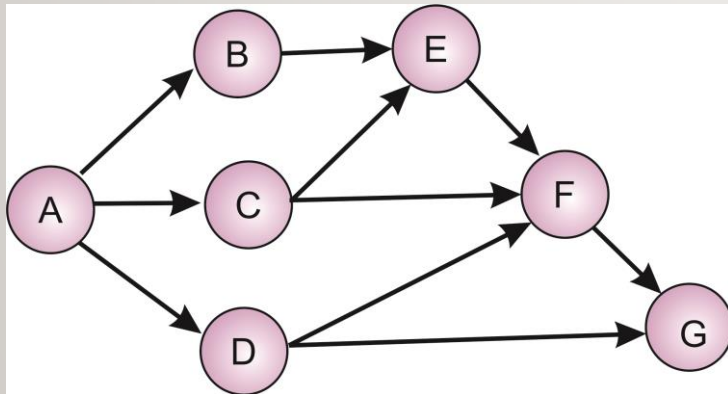
A is predecessor of B and C
 B and C are successor of A
 B,C,D Descendent of A
 A,B Antecedents of D
 A, Antecedents B



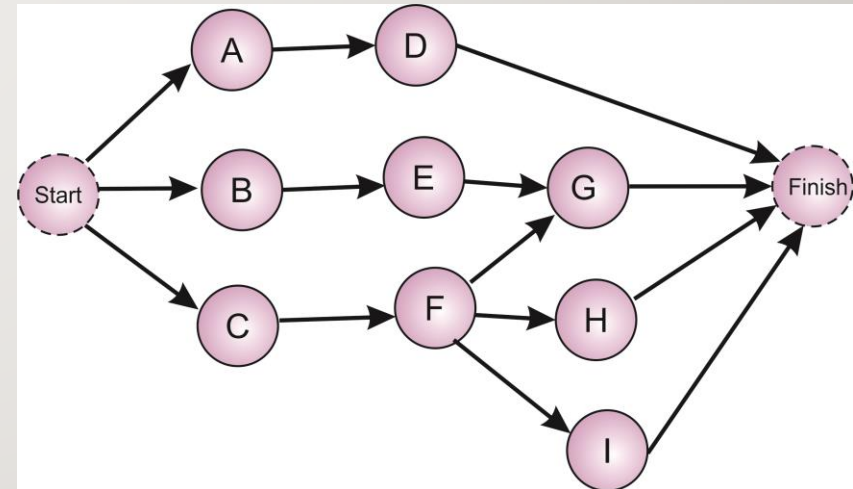
D, is a Merge point



A, is a Burst point



Precedence Diagram



Project
 Network

Kinds of Precedence Restriction

Technological constraints: Cannot be circumvented regardless of the level of resources applied

Procedural constraints: It may exist because of safety regulation, policies on working conditions, method design...etc.

Imposed constraints: Its imposed by the shortage of available resources

Rules helpful in developing more effective representation

1. All nodes, except the terminal node, must have at least one following node.
2. All nodes, except the first, must have at least one preceding node.
3. There must be only one initial node and one terminal node.
4. The length of the arrow has no correlation of the time duration of either of the activities it connects.
5. The compass direction of the arrow has no time meaning.
6. No arrow may be left dangling, every arrow must have starting node and ending node.
7. Avoid redundant precedence description.
8. Avoid closed- loop precedence relationship

Critical Path Method Analysis (CPM)

The primary goal of a CPM analysis of a project is the determination of the “critical path”, which is the sequence of project activities that determines the minimum completion time for the project. The computational procedure involves forward-pass and backward-pass rules

Forward Pass Rule : Determine the earliest start point and earliest completion point of each activity in the network. During the initial forward pass, it is assumed that each activity begins as soon as it possibly can. Any activity can begin as soon as the last of its predecessor activity is finished

Thus the earliest start (ES) time for any activity is equal to the maximum earliest completion (EC) time of all the activities immediately preceding the activity. The ES for initial activity in the network is assumed to be zero

$$ES = \text{Max} \{ \text{Preceding ECs} \}$$

$$EC = ES + (\text{Activity duration})$$

Backward Pass Rule: Determine the latest allowable start (LS) time and latest allowable completion (LC) time for each activity in the network, the backward pass is essentially the forward in reverse, beginning at expected project completion time and ending at the expected earliest start time.

$$LC = \text{Min} \{ \text{Succeeding LCs} \}$$

$$LS = LC - (\text{Activity duration})$$

Slack Time: Is the amount of time flexibility that an activity possesses

Total Slack (TS): The amount of time an activity may be delayed from its earliest start time without delaying the latest completion time of the project

Free Slack (FS): The amount of time an activity may be delayed from its earliest start time without delaying the latest completion time of at least one succeeding activity.

$$TS = LC - EC \text{ or } TS = LS - ES$$

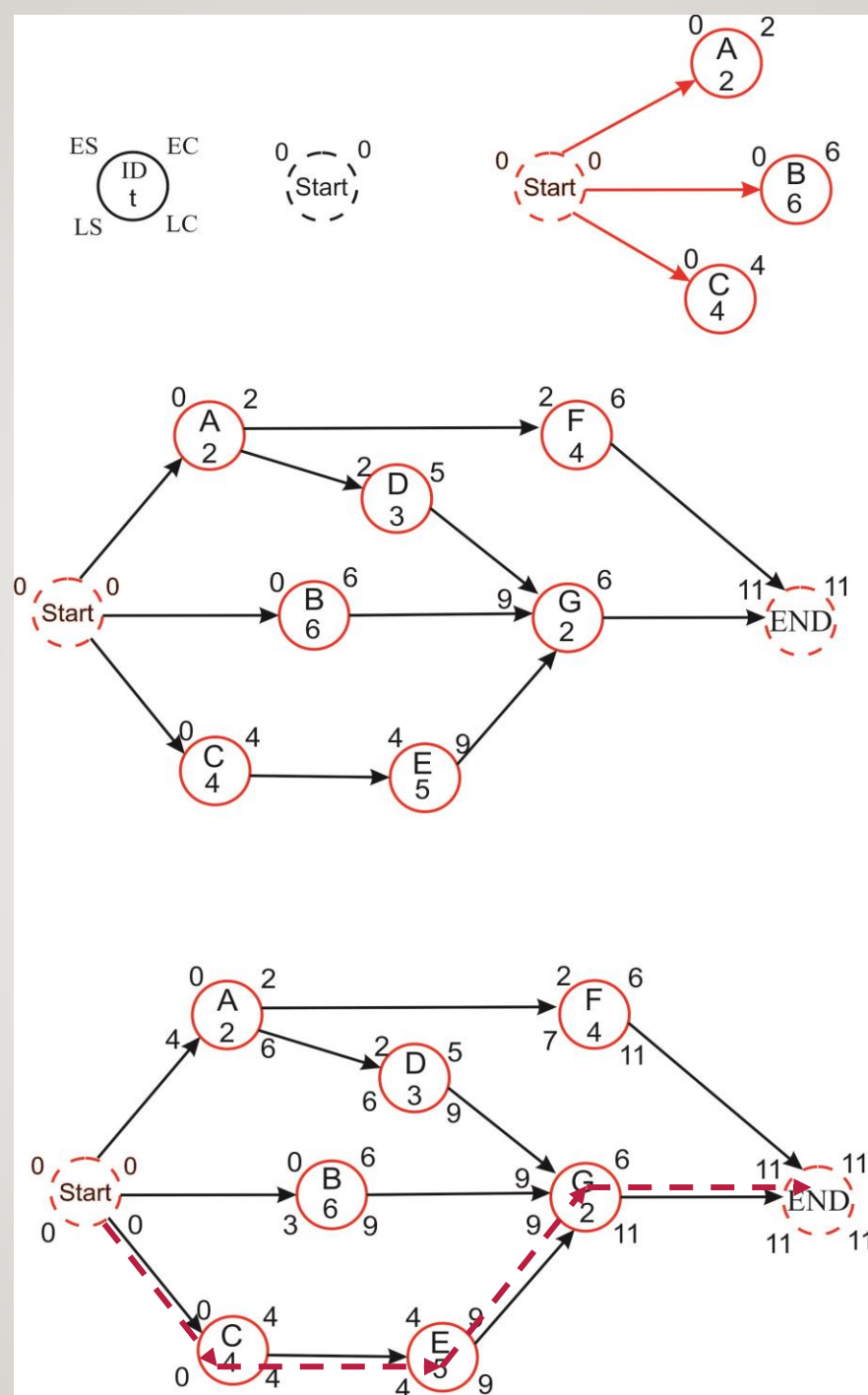
$$FS = \text{Min} \{ ESs \} - EC$$

Example

Draw the network analysis diagram for the project activities tabulated below and find the critical path, total slack time, free slack time for each task

Activity	Predecessor	Time Unit
A	-	2
B	-	6
C	-	4
D	A	3
E	C	5
F	A	4
G	B,D,E	2

Forward pass



THANK YOU