# PROJECT PLANNING & CONTROL
## Lesson 3: Project Scheduling

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# Chapter Description

- Aims
  - The aim of this chapter to expose and understanding students to apply basic project scheduling, tool and techniques in relation to project management

- Expected Outcomes

  At the conclusion of this chapter, the students should be able to:
  - Understand the project scheduling and the phases.
  - Apply basic scheduling tool and techniques for project management
  - Demonstrate SMART principles to a project

- References
  - Erik W. Larson & Clifford F. (2014). Project Management: The Managerial Process (6th Ed.). McGraw-Hill Education, New York.
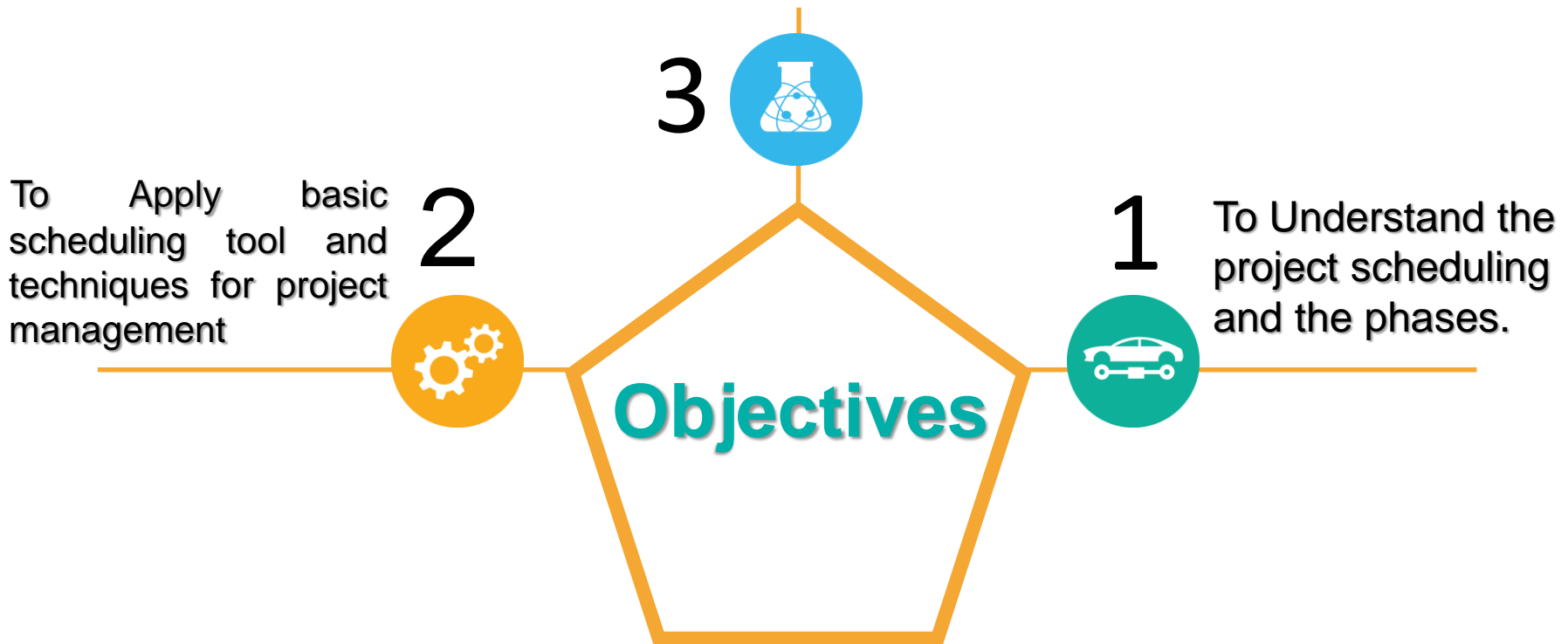
# LEARNING OUTCOME

To Demonstrate SMART principles to a project

**3**

To Apply basic scheduling tool and techniques for project management
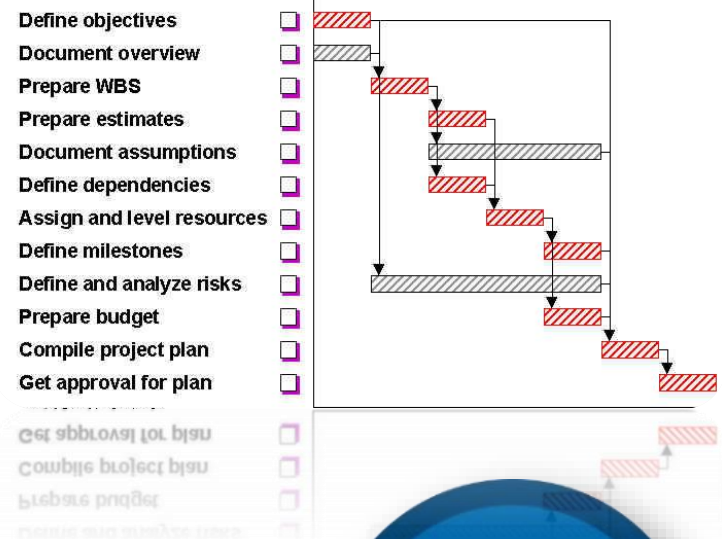
**2**

**1**

To Understand the project scheduling and the phases.

**Objectives**

- Overview of Project Scheduling
- Phases and Milestones
- Techniques for Scheduling
- Scheduling Tools
- Scheduling Software

## Project Planning Chart

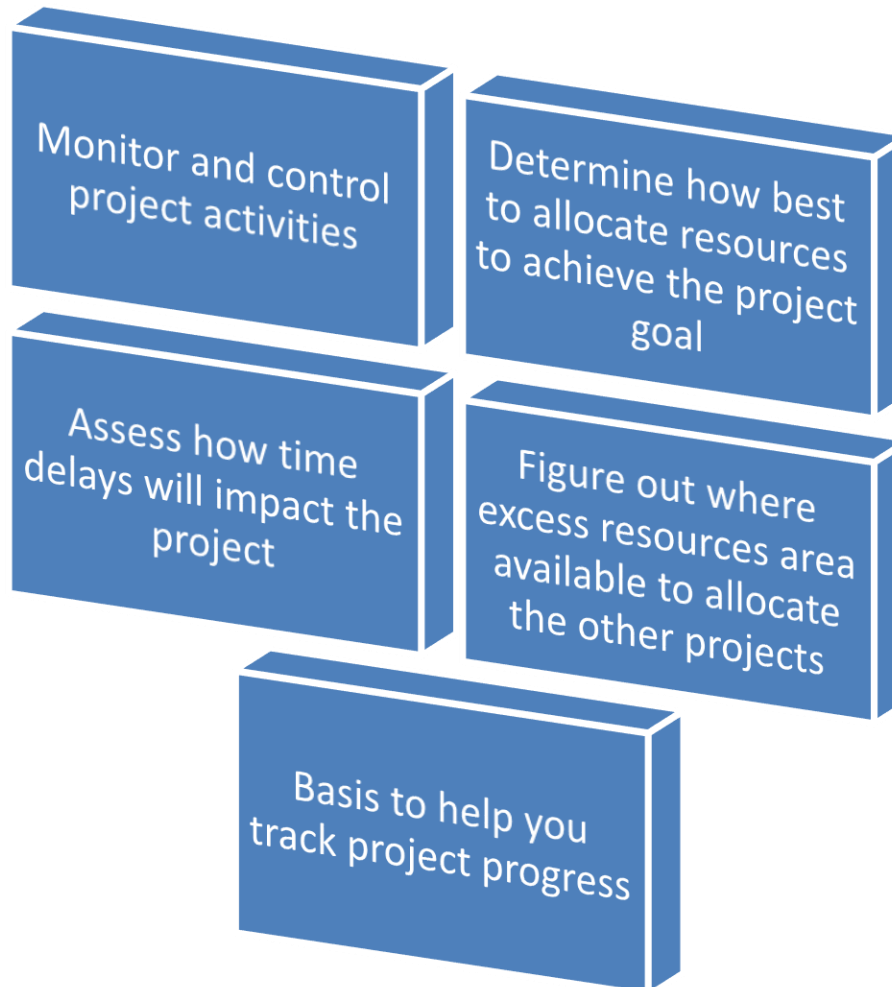| | |
|---|---|
| Define objectives | |
| Document overview | |
| Prepare WBS | |
| Prepare estimates | |
| Document assumptions | |
| Define dependencies | |
| Assign and level resources | |
| Define milestones | |
| Define and analyze risks | |
| Prepare budget | |
| Compile project plan | |
| Get approval for plan | |

# Overview of Project Scheduling Definition
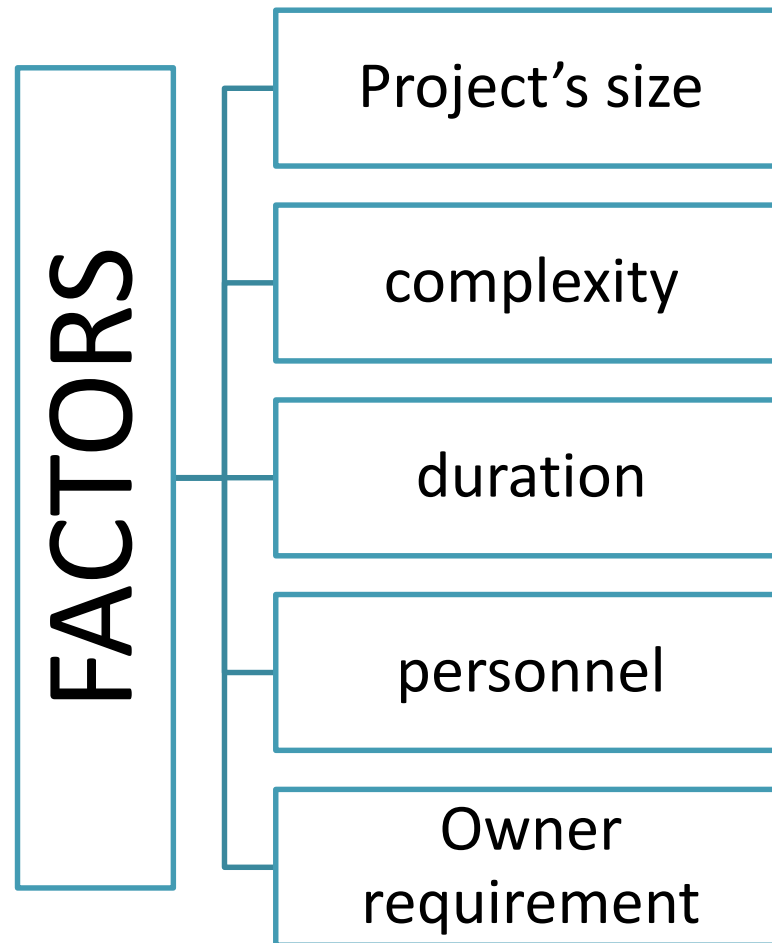
## Project Scheduling

- Is the process of determining the sequential order of the planned activities, assigning realistic durations to each activity and determining the start and finish dates for each activity.

# Objectives of Project Scheduling

Monitor and control project activities

Determine how best to allocate resources to achieve the project goal

Assess how time delays will impact the project

Figure out where excess resources area available to allocate the other projects

Basis to help you track project progress

# Factors to be Determined Techniques for Scheduling

**FACTORS**

- Project's size
- complexity
- duration
- personnel
- Owner requirement

# Importance of Project Scheduling

1. • To calculate the project **completion date**.

2. • To calculate the start or end of a specific activity.

3. • To expose and adjust conflicts between trades or sub-contractors

4. • To predict and calculate the cash flow

5. • To evaluate the effect of changes.

6. • To improve work efficiency
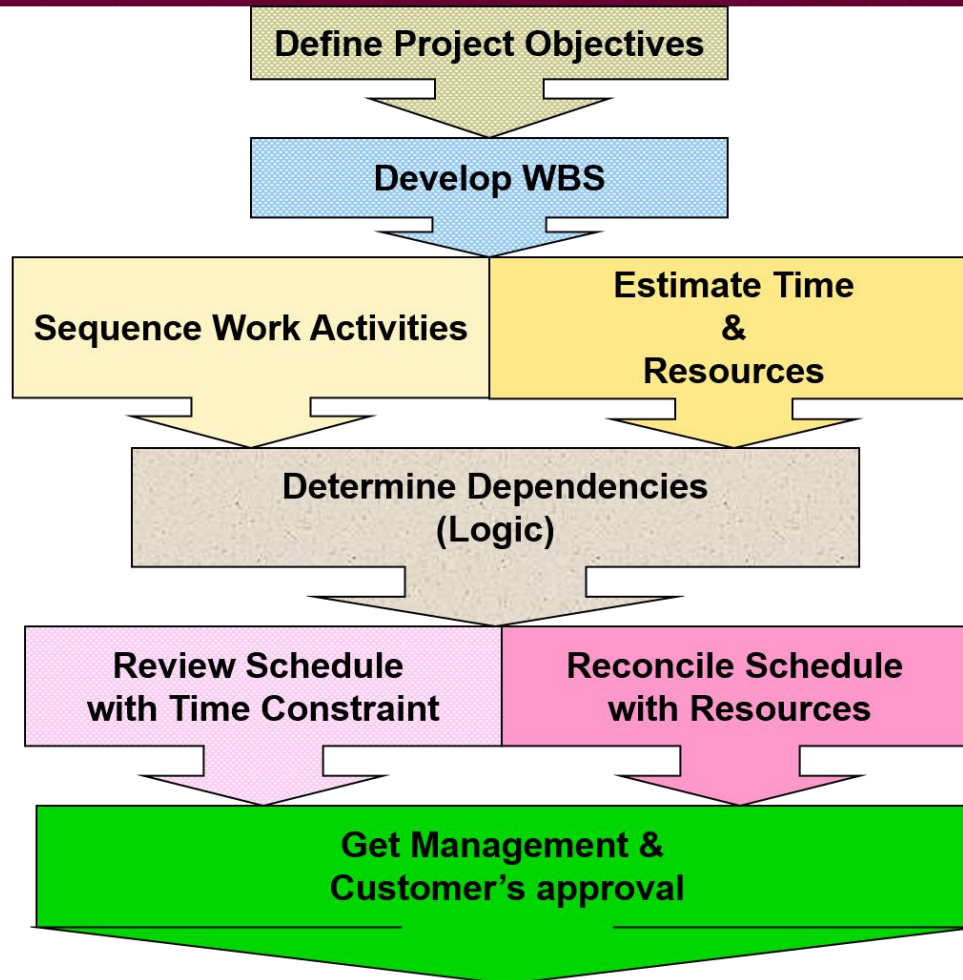
7. • To resolve delay claims

8. • To serve as an effective project control tool.
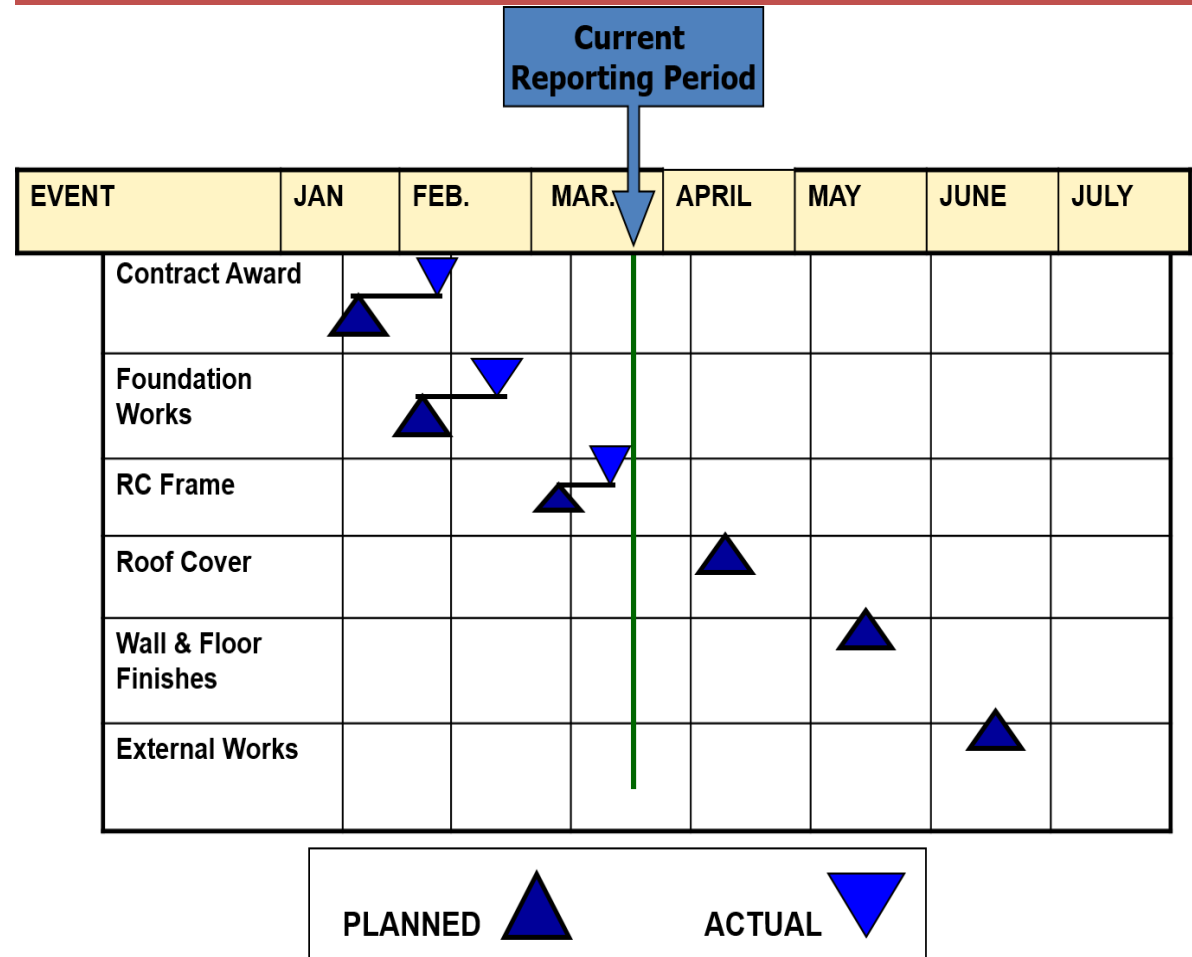
# Phases of Project Scheduling

**STEPS REQUIRED TO DEVELOP THE SCHEDULE:**

Define Project Objectives

Develop WBS

Sequence Work Activities

Estimate Time & Resources

Determine Dependencies (Logic)

Review Schedule with Time Constraint

Reconcile Schedule with Resources

Get Management & Customer's approval

# Set the Milestones

- Every project has milestone:
  - **Start date**
  - **Finish date**
  - Using the WBS, you can decide the key stages and assign their completion milestone status



**MILESTONE CHART**

Current Reporting Period

| EVENT | JAN | FEB. | MAR. | APRIL | MAY | JUNE | JULY |
|---|---|---|---|---|---|---|---|
| Contract Award | | | | | | | |
| Foundation Works | | | | | | | |
| RC Frame | | | | | | | |
| Roof Cover | | | | | | | |
| Wall & Floor Finishes | | | | | | | |
| External Works | | | | | | | |

PLANNED ▲     ACTUAL ▼

# Sources of Information

- **Personal and project calendars** – Understanding working days, shifts, and resource availability is critical to completing a project schedule.

- **Description of project scope** – From this, you can determine key start and end dates, major assumptions behind the plan, and key constraints and restrictions. You can also include stakeholder expectations, which will often determine project milestones.

- **Project risks** – You need to understand these to make sure there's enough extra time to deal with identified risks – and with unidentified risks (risks are identified with thorough Risk Analysis).

- **Lists of activities and resource requirements** – Again, it's important to determine if there are other constraints to consider when developing the schedule. Understanding the resource capabilities and experience you have available – as well as company holidays and staff vacations – will affect the schedule.

A project manager should be aware of deadlines and resource availability issues that may make the schedule less flexible.

# Scheduling Tools and Techniques

1. **Schedule Network Analysis** –Project management software is typically used to create these analyses – **Gantt charts** and **PERT Charts** are common formats.

2. **Critical Path Analysis** – This is the process of looking at all of the activities that must be completed, and calculating the 'best line' – or critical path – to take so that you'll complete the project in the minimum amount of time.

3. **Schedule Compression** – This tool helps shorten the total duration of a project by decreasing the time allotted for certain activities. You can use two methods here:

    I. **Crashing** – This is where you assign more resources to an activity, thus decreasing the time it takes to complete it. This is based on the assumption that the time you save will offset the added resource costs.

    II. **Fast-Tracking** – This involves rearranging activities to allow more parallel work. This means that things you would normally do one after another are now done at the same time. However, do bear in mind that this approach increases the risk that you'll miss things, or fail to address changes.

# Scheduling Techniques: BAR Charts

- **Most common & widely used.**
- **Used for relative simple project.**
- **For short term & weekly programming.**
- **For communication purpose.**
- **Provide graphic medium on which milestones can be entered.**
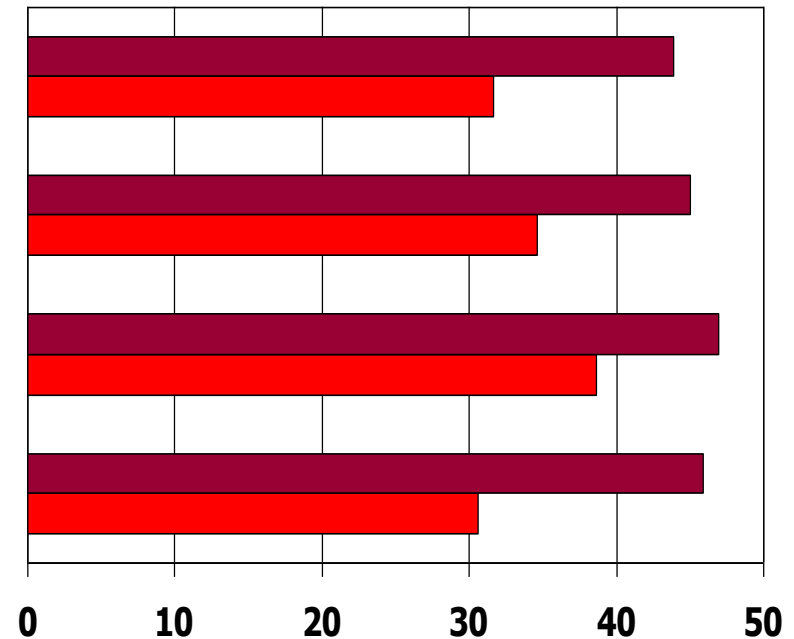
# Scheduling Techniques: Network Analysis
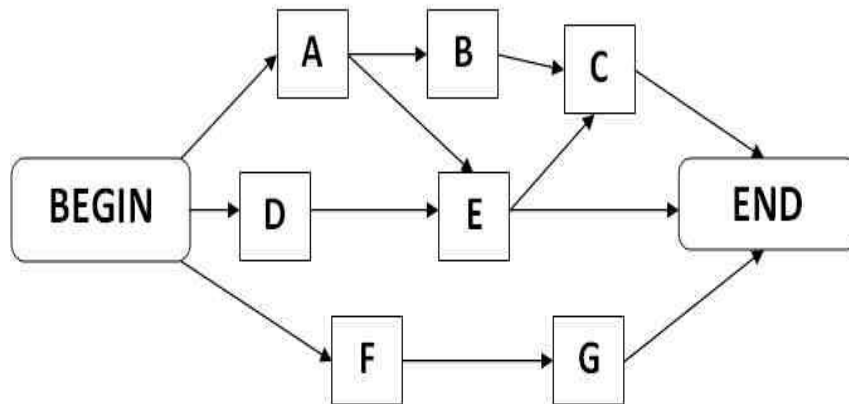


**Network shows a project as a system of activities**

## NETWORK MODELS

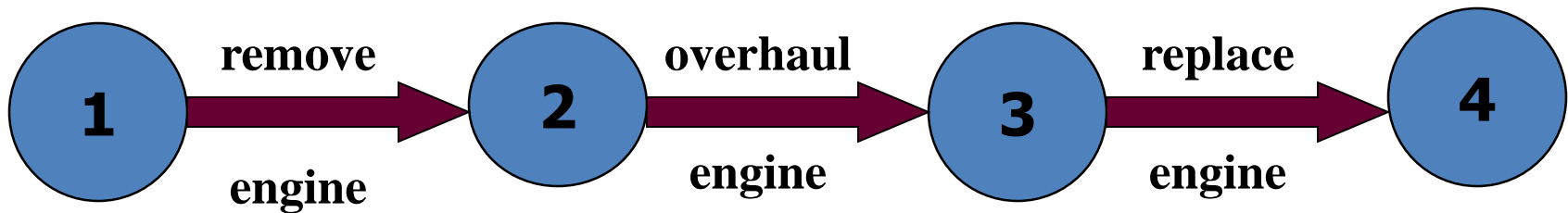Activity on Arrow (AOA)

Activity on Node (AON)
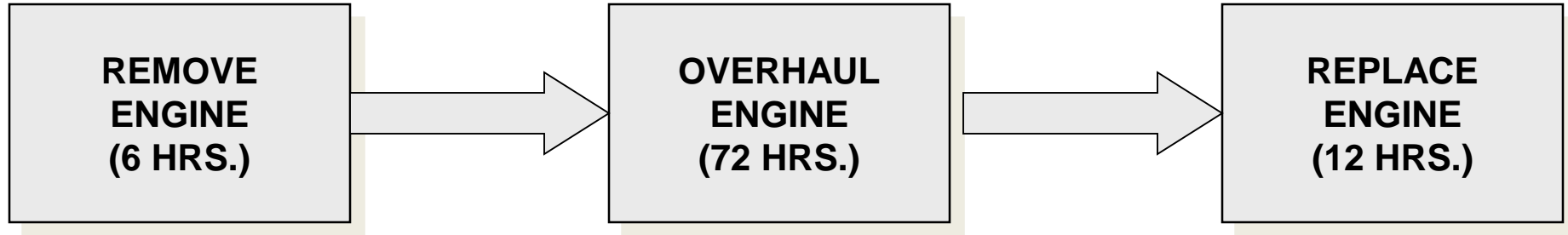
Precedence Diagram Method (PDM)

# Network Analysis
# Activity on Arrow (AOA)

Examples:



```
   (1) ── remove engine ──▶ (2) ── overhaul engine ──▶ (3) ── replace engine ──▶ (4)
```

# Network Analysis
## Activity on Network (AON)

Examples:

| REMOVE ENGINE (6 HRS.) | → | OVERHAUL ENGINE (72 HRS.) | → | REPLACE ENGINE (12 HRS.) |

# Forward & Backward Pass

| Forward Pass | Backward Pass |
|---|---|
| A Forward Pass is perform to find the earliest event time (Activity-on-Arrow network), or the earliest start and finish time of activities (PDM Network) | A Backward Pass is performed to find the latest event time or latest finish and start time. |
| Minimum overall duration of the project | Minimum overall duration of the project |

# Total and Free Float

- **Total Float** is the amount of time an activity may be delayed without delaying the project and date

$$\text{Starting Float = Late Start – Early Start}$$

$$\text{Finish Float = Late Finish – Early Finish}$$

- **Free Float** is the amount of time an activity may be delayed without delaying the start date of another activity

$$\text{Task Float = Late Finish – Early Start - Duration}$$

# Project Planning & Scheduling Software



Ms Project

Primavera

- Conclusions
  - The project network is the tools used for planning, scheduling and monitoring project progress.
  - The network diagram outlines the logic or sequences of work
  - Activities with zero float are on the critical path
  - The project network provides other invaluable information and insight. It provides the basis for scheduling labour and equipment.

# Thanks You for Your Attention