Project Management – Scheduling and Risk Management

Week 12

Announcement

- Midterm 2
  - Wednesday, April 27
  - Scope
    - Week 11 – Week 12
  - Short answer questions

Agenda (Lecture)

- Scheduling
- Risk managment

Agenda (Lab)

- Implement a software product based on your design documents
- Submit a weekly project progress report at the end of the Wednesday lab session

Project Scheduling

- Manager's responsibility
  - Planning, scheduling, and controlling projects
  - Often these projects are so large or complex that the manager cannot possibly remember all the information about the plan, schedule, and progress
- Critical Path Method (CPM)
  - Research and development of new products
  - Construction of plants, buildings, and highways
  - Maintenance of large and complex equipment
  - etc.

Project Scheduling Process

1. Develop a list of the activities (tasks) that make up the project.

2. Determine the immediate predecessor(s) (that must be completed immediately prior to the start of the activity) for each activity.

3. Estimate the completion time for each activity.

4. Draw a project network depicting the activities and immediate predecessors listed in steps 1 and 2.

5. Use the project network and the activity time estimates and determine the earliest start and the earliest finish time for each activity by making a forward pass through the network.

Project Scheduling Process

6. Use the project completion time identified in step 5 as the latest finish time for the last activity and make a backward pass through the network to identify the latest start and latest finish time for each activity.

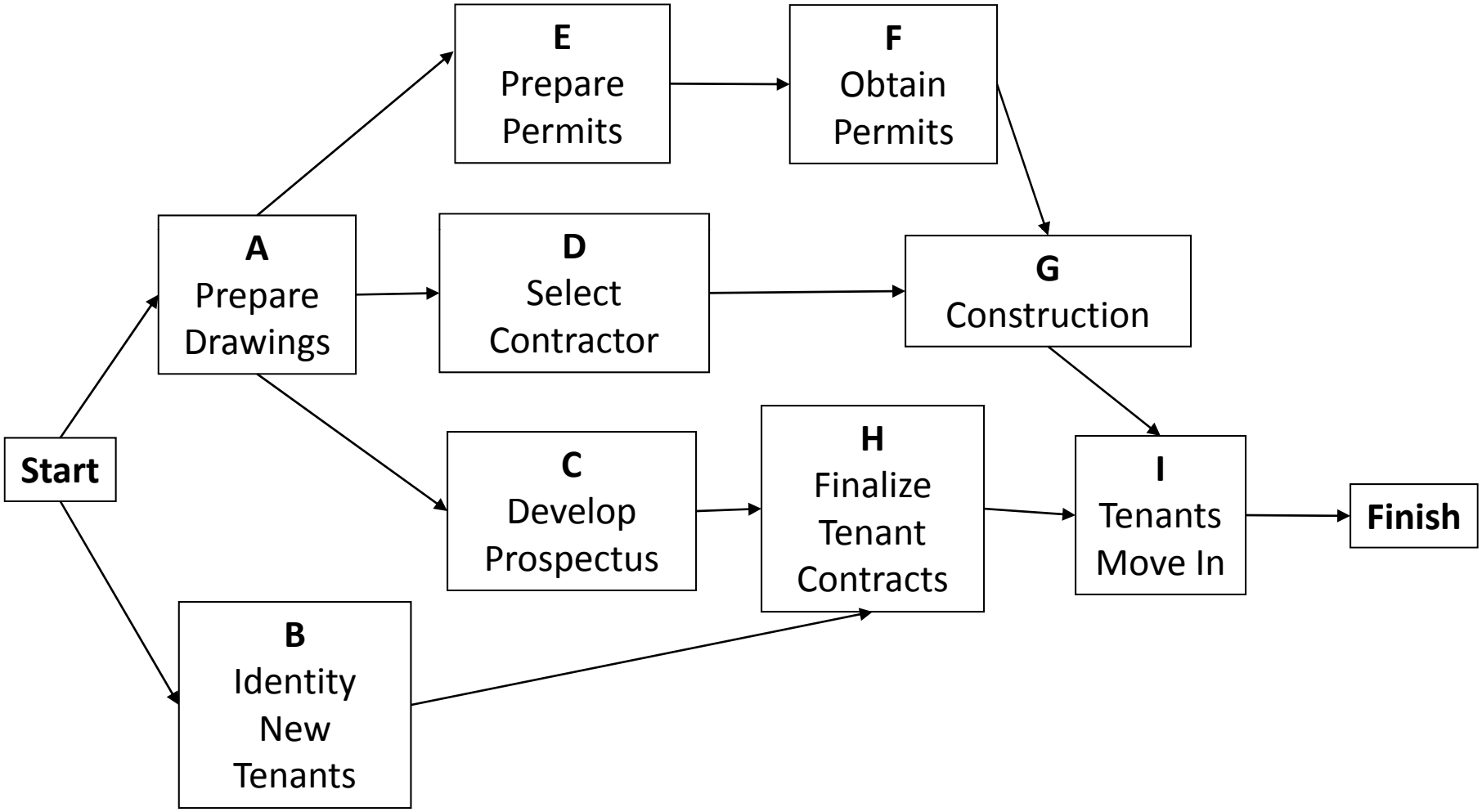
7. Use the difference between the latest start time and the earliest start time for each activity to determine the **slack** for each activity.

8. Find the activities with **zero slack**; these are the critical activities.

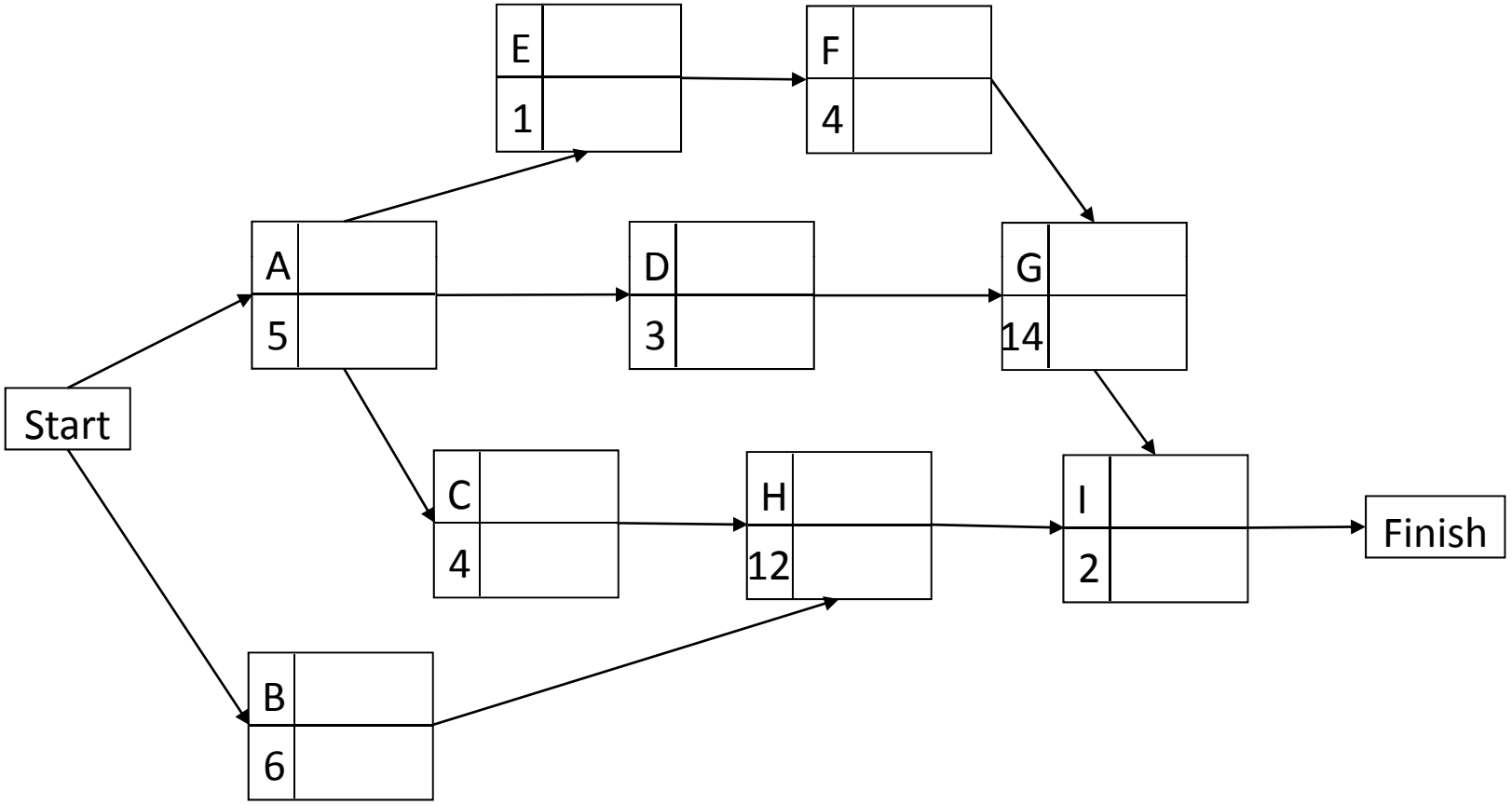
List of Activities for the CSUN Student Center Project

Activity	Activity Description	Immediate Predecessor(s)	Activity Time
A	Prepare architectural drawing		5
B	Identify potential new tenants		6
C	Develop prospectus for tenants	A	4
D	Select contractor	A	3
E	Prepare building permits	A	1
F	Obtain approval for building permits	E	4
G	Perform construction	D, F	14
H	Finalize contracts with tenants	B, C	12
I	Tenants move in	G, H	2
		total	**51**

Project Network for the CSUN Student Center



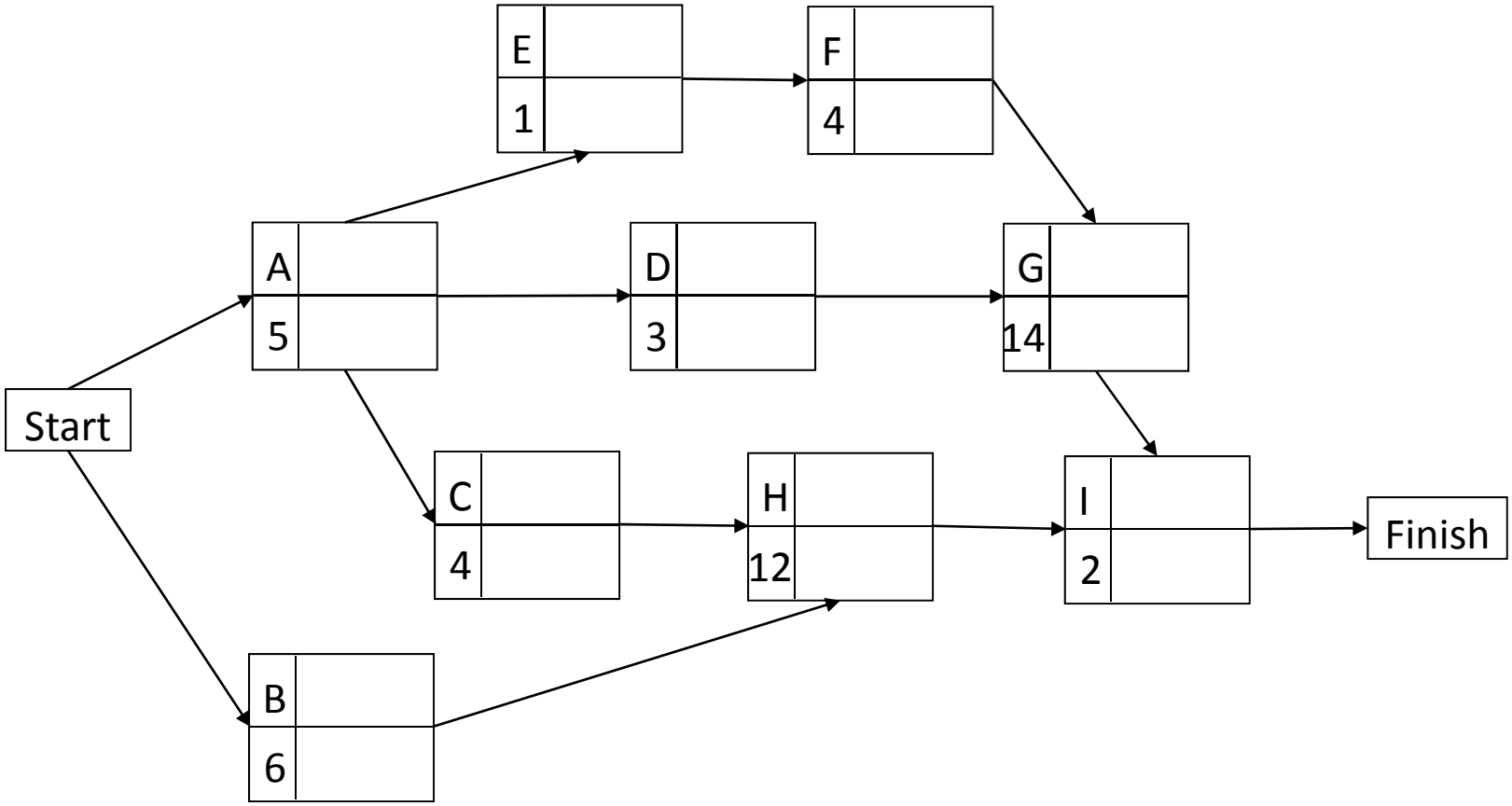
CSUN Student Center Project Network with Activity Times



Determining the Critical Path – Forward Pass

- **FORWARD PASS**
  - *ES* = Earliest start time for an activity
  - *EF* = Earliest finish time for an activity
  - *t* = activity time
  - $EF = ES + t$
  - The earliest time for an activity is equal to the largest of the earliest finish times for all its immediate predecessors

CSUN Student Center Project Network With Earliest Start and Earliest Finish Times for All Activities

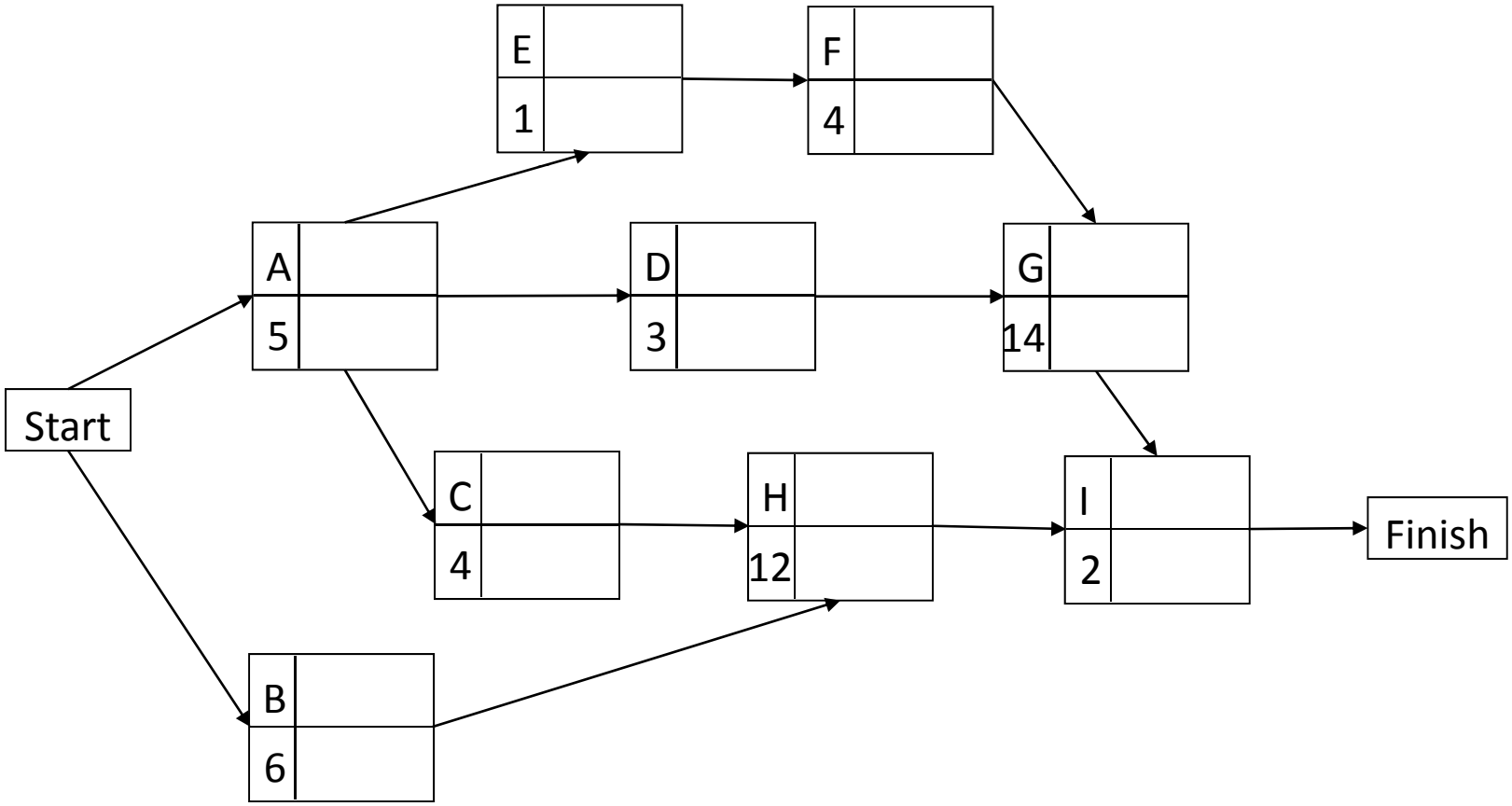


Determining the Critical Path – Backward Pass

- **BACKWARD PASS**
  - *LS* = Latest start time for an activity
  - *LF* = Latest finish time for an activity
  - *t* = activity time
  - *LS* = *LF* - *t*
  - The latest finish time for an activity is the smallest of the latest start times for all activities that immediately follow the activity

- **SLACK**
  - The length of time an activity can be delayed without increasing the project completion time
  - Slack = *LS* – *ES* = *LF* - *EF*

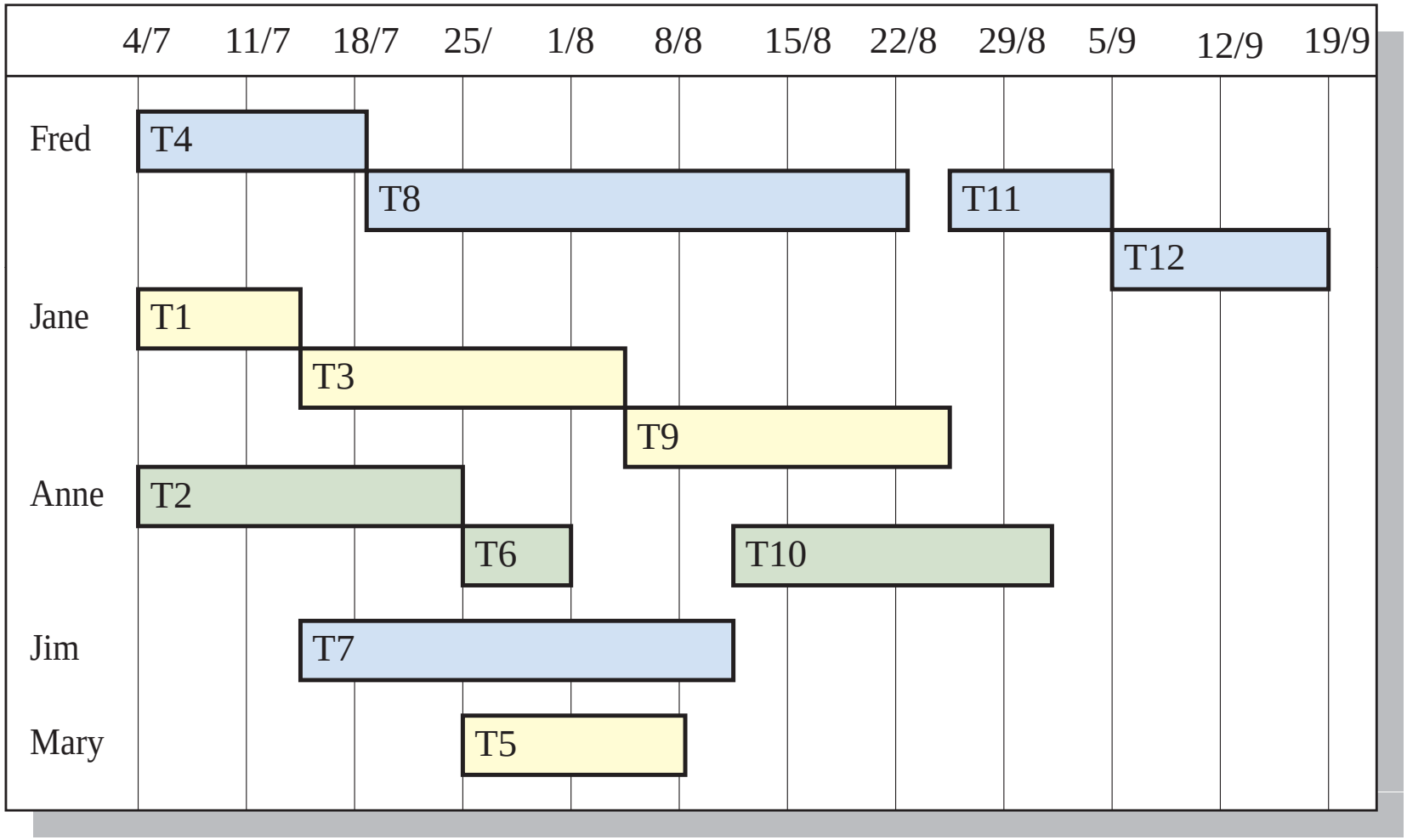
CSUN Student Center Project Network With Latest Start and Latest Finish Shown in Each Node



The Activity Schedule for the CSUN Student Center Report

Activity	Earliest Start	Latest Start	Earliest Finish	Latest Finish	Slack	Critical Activity
A	0	0	5	5	0	YES
B	0	6	6	12	6	
C	5	8	9	12	3	
D	5	7	8	10	2	
E	5	5	6	6	0	YES
F	6	6	10	10	0	YES
G	10	10	24	24	0	YES
H	9	12	21	24	3	
I	24	24	26	26	0	YES
						CRITICAL PATH: A-E-F-G-I
						PROJECT COMPLETION TIME = 26

Staff Allocation Timeline Chart



Exercise

Determine the critical path and estimate the project completion time.

Task	Duration (days)	Dependencies
T1	8	
T2	15	
T3	15	T1
T4	10	
T5	10	T2, T4
T6	5	T1, T2
T7	20	T1
T8	25	T4
T9	15	T3, T6
T10	15	T5, T7
T11	7	T9
T12	10	T11

Planning Tool

- Microsoft Project

Risk Management

- Risk management is concerned with identifying risks and drawing up plans to minimize their effect on a project
- The categories of risk
  - Project risks
    - affect schedule or resources
  - Product risks
    - affect the quality or performance of the software being developed
  - Business risks
    - affect the organization developing or procuring the software

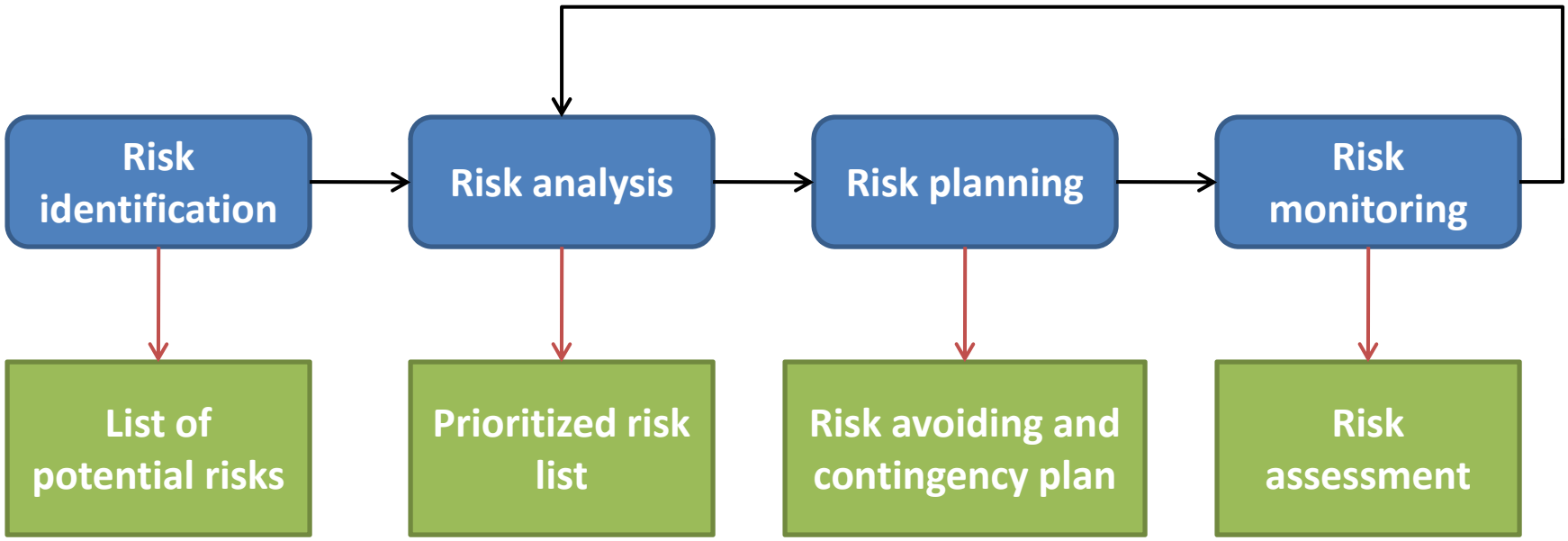
Reactive vs. Proactive Risk Strategies

- Reactive risk strategies
  - Indiana Jones school of risk management
  - "Don't worry, I'll think of something!"
    - Never worrying about problems until they happened, Indy would react in some heroic way
  - The average software manager is not Indiana Jones
- Proactive risk strategies
  - Intelligent strategy for risk management
  - A proactive strategy begins before technical work is initiated.
  - The primary objective is to avoid risk
  - Develop a contingency plan that will enable it to respond in a controlled and effective manner

Risk Management Process

- Risk identification
  - Identify project, product and business risks
- Risk analysis
  - Assess the likelihood and consequences of these risks
- Risk planning
  - Draw up plans to avoid or minimise the effects of the risk
- Risk monitoring
  - Monitor the risks throughout the project

Risk Management Process



Risk Identification

- Technology risk
- People risk
- Organizational risk
- Requirements risk
- Tools risk
- Estimation risk

Risk Types

Risk type	Potential indicators
Technology	Late delivery of hardware or support software, many reported technology problems
People	Poor staff morale, poor relationships amongst team member, job availability
Organisational	Organizational gossip, lack of action by senior management
Tools	Reluctance by team members to use tools, complaints about CASE tools, demands for higher-powered workstations
Requirements	Many requirements change requests, customer complaints
Estimation	Failure to meet agreed schedule, failure to clear reported defects

Risk Analysis

- Assess probability and seriousness of each risk
- Probability may be very low, low, moderate, high or very high
  - Very low (< 10%)
  - Low (10-25%)
  - Moderate (26-50%)
  - High (51-75%)
  - Very high (>75%)
- Risk effects might be catastrophic, serious, tolerable or insignificant

Risk Analysis

Risk	Probability	Effects
Organizational financial problems force reductions in the project budget.		
It is impossible to recruit staff with the skills required for the project.		
Key staff are ill at critical times in the project.		
Software components which should be reused contain defects which limit their functionality.		
Changes to requirements which require major design rework are proposed.		
The organisation is restructured so that different management are responsible for the project.		

Risk Analysis

Risk	Probability	Effects
The database used in the system cannot process as many transactions per second as expected.		
The time required to develop the software is underestimated.		
CASE tools cannot be integrated.		
Customers fail to understand the impact of requirements changes.		
Required training for staff is not available.		
The rate of defect repair is underestimated.		
The size of the software is underestimated.		
The code generated by CASE tools is inefficient.		

Risk Planning

- Consider each risk and develop a strategy to manage that risk
- Avoidance strategies
  - The probability that the risk will arise is reduced
- Minimization strategies
  - The impact of the risk on the project or product will be reduced
- Contingency plans
  - If the risk arises, contingency plans are to deal with that risk

Risk Planning

Risk	Strategy
Organizational financial problems	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business.
Recruitment problems	Alert customer of potential difficulties and the possibility of delays, investigate buying-in components.
Staff illness	Reorganise team so that there is more overlap of work and people therefore understand each other's jobs.
Defective components	Replace potentially defective components with bought-in components of known reliability.
Requirements changes	Derive traceability information to assess requirements change impact, maximise information hiding in the design.
Organizational restructuring	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business.
Database performance	Investigate the possibility of buying a higher-performance database.
Underestimated development time	Investigate buying in components, investigate use of a program generator.

Risk Monitoring

- Assess each identified risks regularly to decide whether or not it is becoming less or more probable
- Also assess whether the effects of the risk have changed
- Each key risk should be discussed at management progress meetings

Risk Exposure

- The expected value of the risk event
  - Expected value

    $E(x) = \Sigma x_i p_i$

    - *X is a the value of risk event*
    - *P is a risk probability*

- Consider a project that has 0.5 percent probability of an undetected fault that would cost the company $100,000 in fines. Calculate the risk exposure.

Exercise

- If there is a $100,000 bonus for being early with an aggressive schedule (only 20 percent chance of attainment), but a $250,000 penalty for being late with any schedule (being conservative gives a 90 percent chance of being on time or early), should we pursue an aggressive or conservative schedule?