Introduction

• Detailed plan for what is to be done
• Mainly focuses on job scheduling
• Prioritized list of the orders indicating what should be done first, second, etc.
• Timetable for performing activities, utilizing resources or allocating facilities
• Basis for manufacturing execution system
Objectives of scheduling

• Meet due dates
• Minimize lead time
• Minimize setup time or cost
• Minimize WIP inventory
• Maximize machine or labor utilization
Scheduling in Work Centers

• Job arrives at a work center & enters a queue
• Scheduling determines sequence and assigns machine
• Scheduling system uses either infinite or finite loading
• System uses forward or backward scheduling
Infinite & Finite Loading

• Infinite loading
  – Job assigned to work center based only on what is needed
  – Capacity or sequence not considered
  – Resources checked only at an aggregate level

• Finite loading
  – Capacity and sequence considered
Forward & Backward

• Forward scheduling
  – Operations scheduled forward in time
  – Determines earliest date that an order can be completed

• Backward scheduling
  – Starts from date in the future i.e. due date
  – Schedules the required operation in reverse sequence
  – Tells when an order must be started
Scheduling and Control

• Allocate orders, equipment and personnel to work centers i.e. short-run capacity planning
• Determine sequence of order performance – that is establishing job priorities
• Initiate performance of the scheduled work; commonly termed dispatching of orders
• Shop-floor control or production activity control
Job Sequencing

- Use priority rules to determine job sequence
- Simple rules requiring that jobs be sequenced according to some data, i.e. processing time, due date, etc
Priority Rules

• First come, first served (FCFS)
• Shortest operating time (SOT)
• Earliest due date first (EDD)
• Slack time remaining (STR)
• Slack time remaining per operation (STR/OP)
• Critical ratio (CR) – No. of remaining days to due date/No. of working days
• Last come, first served (LCFS)
• Random order or whim
Evaluation of Priority Rules

- Meeting due dates of customers or downstream operations
- Minimizing the flow time i.e. time a job spends in the process
- Minimizing WIP inventory
- Minimizing idle time of machines and workers
Principles of scheduling

• There is direct equivalence between workflow and cash flow
• Effectiveness measured by speed of flow through the shop
• Once started, a job should not be interrupted
• Speed of flow is most efficiently achieved by focusing on bottleneck work centers and jobs
• Reschedule every day
• Obtain feedback each day on jobs that are not completed at each work center
• Match work-center input information to what the worker can actually do
• When seeking improvement in output, look for incompatibility between engineering design and process execution
Shop-Floor Control Analogy