

## Sequencing and Scheduling (2P450)

Lecturer Cor Hurkens, Technische Universiteit Eindhoven

room: MF.4.099

tel.: 040 247 4771

e-mail: c.a.j.hurkens@tue.nl

Location Potentiaal 6.23

MF15

Time Tuesday 10:45-12:30

Wednesday 13:45-15:30

---

November 11, 2014

November 12, 2014

November 18, 2014

November 19, 2014

November 25, 2014

November 26, 2014

December 2, 2014

December 3, 2014

December 9, 2014

December 10, 2014

December 16, 2014

December 17, 2014

January 6, 2015

January 7, 2015

January 13, 2015

January 14, 2015

## Information on the web:

<http://www.win.tue.nl/~wscor/0W/2P450/>

- references
- pdf- and ps-files of the slides of the lectures
- subjects of the course
- news
- ...

also on OASE – please register if not yet done

## Goals

main goals of the course 'Scheduling':

1. get knowledge on basic models in scheduling
2. get knowledge on basic solution techniques for scheduling models
3. learn about applications of scheduling models

## Material

- Pinedo, Michael L:  
Planning and Scheduling in Manufacturing and Services;  
Springer Series in Operations Research and Financial Engineering,  
2005, With CD-ROM., Hardcover, ISBN: 0-387-22198-0
- Brucker, Peter: Scheduling Algorithms  
4th ed., 2004, Springer Verlag Berlin, ISBN: 3-540-20524-1
- Pinedo, Michael L: Scheduling: Theory, Algorithms, and Systems;  
2nd ed., 2002, Prentice Hall, ISBN 0-13-028138-7
- handouts

## Planning of the subjects (temp.)

Lecture	Date	Subject
Lecture 1a	11.11.2014	Introduction, example, classification
Lecture 1b	12.11.2014	Parallel machine model, algorithm, quality
Lecture 2a	18.11.2014	Single machine models
Lecture 2b	19.11.2014	Single machine models
Lecture 3a	25.11.2014	Parallel machine models
Lecture 3b	26.11.2014	Parallel machine models
Lecture 4a	02.12.2014	Shop scheduling models
Lecture 4b	03.12.2014	Shop scheduling models
Lecture 5a	09.12.2014	On-line scheduling
Lecture 5b	10.12.2014	On-line scheduling
Lecture 6a	16.12.2014	...
Lecture 6b	17.12.2014	...
Lecture 7a	06.01.2015	...
Lecture 7b	07.01.2015	...
Lecture 8a	13.01.2015	...
Lecture 8b	14.01.2015	...

## Structure

- Lectures
  - models
  - methods and algorithms
  - examples
  - applications
- Examination: written examination
  - 23 January 2015, 1330-1630
  - 08 April 2015, 1330-1630

## **What is Scheduling?**

- decision making in manufacturing and service industries
- allocation of scarce resources to tasks over time

## **Two main areas of application**

- manufacturing models
- service models

Remark: we only consider deterministic models, in off-line and in on-line context.

## Example: Plywood Factory

- 1 -

- factory producing plywood boards of different types
- raw material: wood, birch tree logs
- intermediate material: sheets, different thickness, quality
- each customer order is set of production orders specified by
  - quantity and type of plywood board
  - 'committed' delivery date
- 4-stage production process
  - producing sheets, switching from one thickness to another
  - collecting and glueing sheets composing plywood boards
  - pressing a full load of boards
  - shipping complete customer order



## Example(cont'd): Plywood Factory

- 2 -

### Limitations:

- veneer processing times proportional to the quantities
- plywood board production depends on veneer availability
- limited stock for intermediate and final products
- late delivery leads to a penalty, magnitude depends on
  - importance of the client
  - tardiness of the delivery
- switching on a machine from production of one plywood-type to another, may lead to setup time or lost production time
- shipping should ideally be spread over the week
- plan is updated each week, shipments of next week are announced to customers

## **Example(cont'd): Plywood Factory**

- 3 -

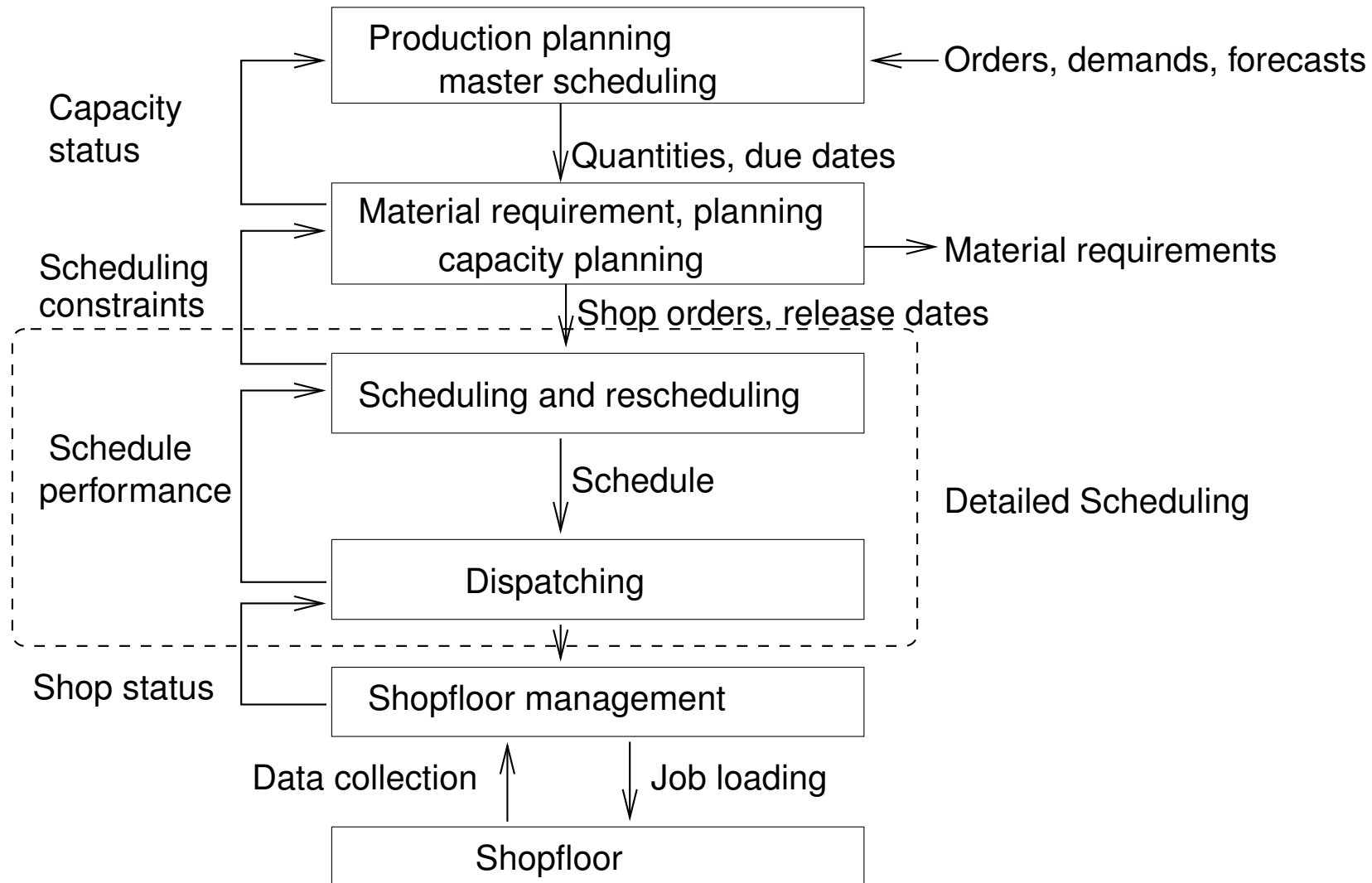
Objectives:

- minimize total penalty costs
- minimize variability on shipment volumes per day
- minimize total idle time in early weeks
- make everyone happy

## Scheduling Function in an Enterprise

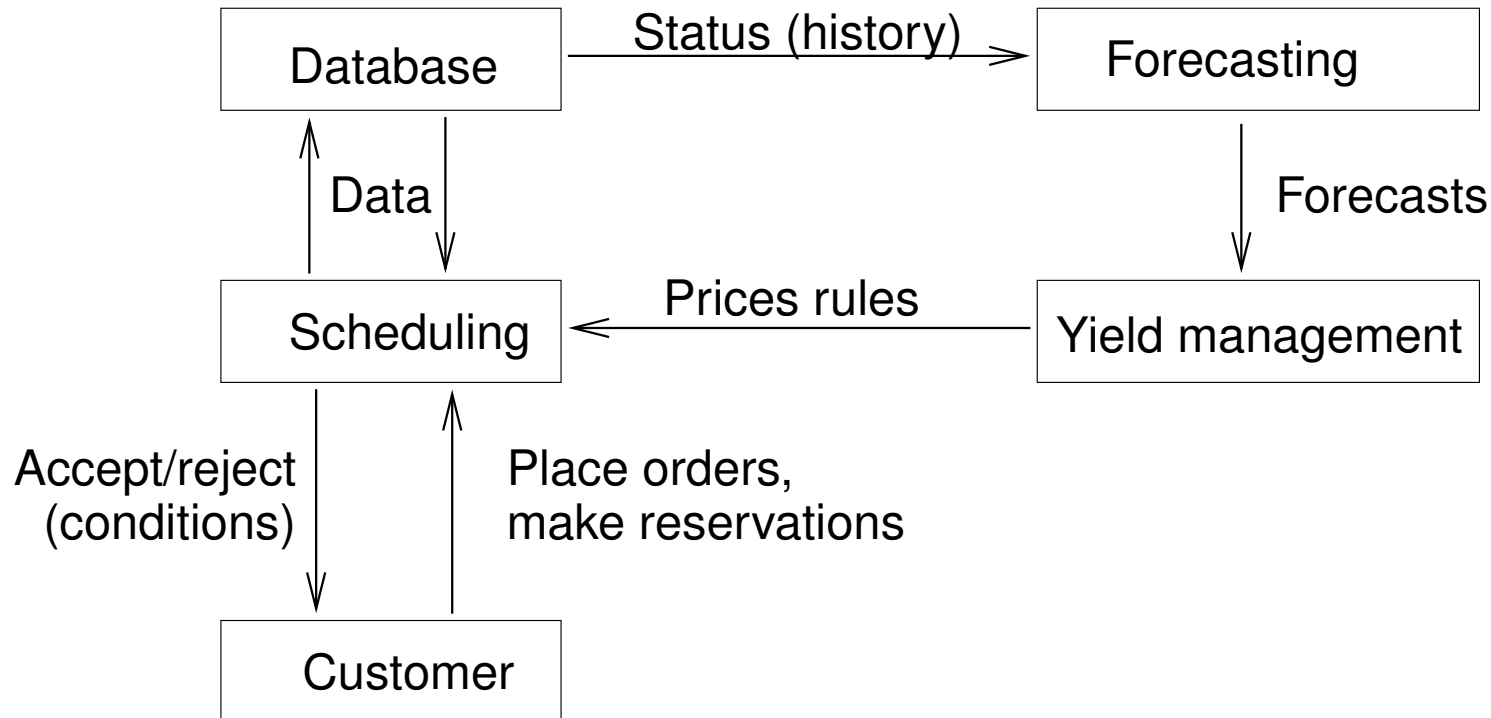
- the scheduling function interacts with many other functions
- interactions are system-dependent
- often take place in an enterprise-wide information system; enterprise resource planning (ERP) system
- often scheduling is done interactively with a decision support system linked to the ERP system
- several time scales: monthly, weekly, daily

# Scheduling in Manufacturing



## Scheduling in Services

Remark: scheduling function in service organization is much more diverse than in manufacturing



## Scheduling models (manufacturing)

- scheduling concerns optimal allocation or assignment of resources, over time, to a set of tasks or activities
  - $m$  machines  $M_1, \dots, M_m$
  - $n$  jobs  $J_1, \dots, J_n$
- schedule may be represented by Gantt charts

