

UNIVERSITY OF TWENTE.

# University of Twente

Industrial Engineering and Management

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Director of Education

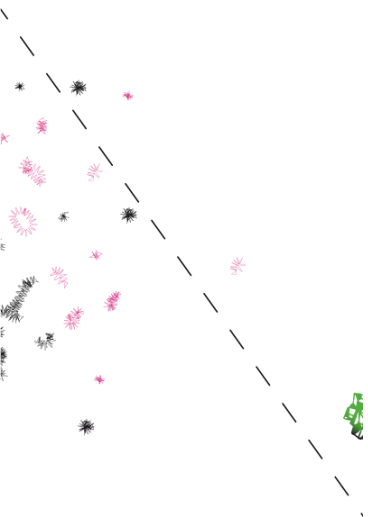
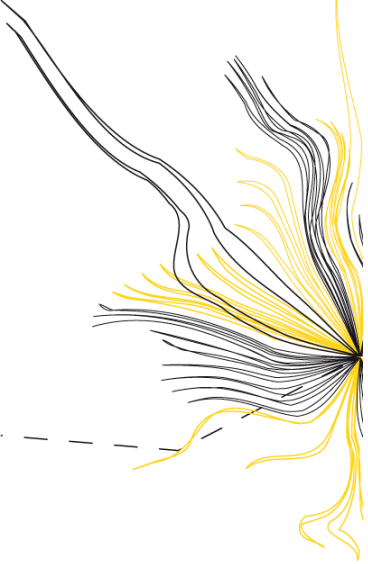




# Introduction, Outline

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- The field of Industrial Engineering & Management
- Master program IEM
- Admission WO students
- Related UT master programs
- More details on the specializations
- Admission HBO students
- Pre-master



You can't do today's job  
with yesterday's methods  
and expect to be in business tomorrow



# Industrial Engineering & Management (1/3)

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- Focus on processes inside and across organizations
- Aimed at improving the design and control of these processes, to enhance organizational performance (efficiency, profit, quality, service, safety, risks, etc.)
- Applied in diverse industries, such as manufacturing, logistics, finance, healthcare, etc.



## Industrial Engineering & Management (2/3)

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- Sufficiently broad ...
  - problems at intuitive, multi-disciplinary level
  - aware of human behavior (individual and social)
- ... yet sufficient depth
  - understanding technological context
  - quantitative analysis and modeling
  - knowledge and proper use of expert tools



## Industrial Engineering & Management (3/3)

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- With an open mind for conditions in the environment of the organization  
(for example: competitors, regulation, or government policies)
- Problem solvers, pragmatic
- Suitable for students with diverse backgrounds in engineering and science



# Industrial *Engineers*

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- Work on real-world problems (“high-tech human touch”)
- Math and quantitative skills
- Combine knowledge from different disciplines for designing solutions
- Project-management expertise
- Communication skills
- Creative, resourceful



## Master's Program IEM (1/3)

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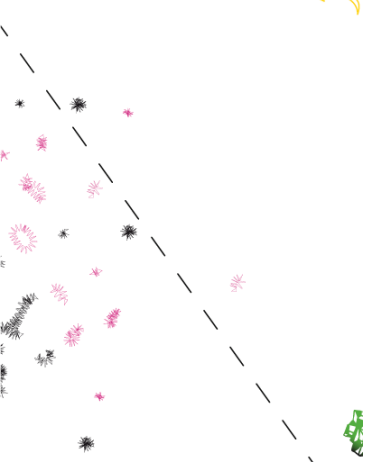
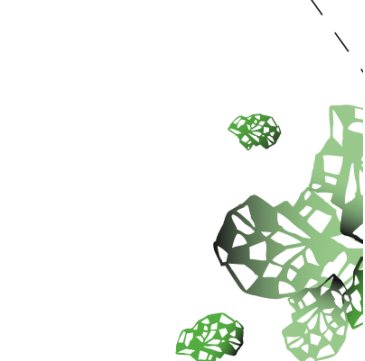
- Two-year program, 120 EC
- Courses: 90 EC
- Master thesis: 30 EC
- Specializations:
  - Production and Logistic Management (PLM)
  - Financial Engineering and Management (FEM)
  - Health Care Technology and Management (HCTM)
  - Information Technology and Management
    - **Business Information Technology** master program





## Master's Program IEM (2/3)

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- Equalization courses 10 EC (*to be discussed*)
  - Common courses 20 EC
  - Specialization courses 30 EC (*obligatory*)
  - Electives 30 EC (*to be discussed*)
  - Master thesis on specialization 30 EC (*obligatory*)
  
  - Much flexibility through elective courses: you can exchange up to 30 EC with courses from other technical Master programs (*more on this later*)
  - You may take courses at other universities
  - You can develop a proposal for studying a semester abroad
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## Master's Program IEM (3/3)

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- Equalization courses (early in the program) provide extra preparation for the track courses
  - For students who have a Dutch BSc in IEM: these are electives
  - For other students: individualized selection (to be discussed)
- HBO - and WO social Science students must follow a pre-master program (to be finished within one academic year)
- The MSc program starts in September and February



## IEM common courses (5 EC each)

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- Introduction to IEM
- Empirical research and data analysis
- Statistics and probability
- Preparation MSc thesis



# Elective courses

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You can choose:

- Extra courses in the specialization
- Courses from other IEM specializations and (almost) any master course offered by UT- EWI, -CTW, or -TNW (there may be constraints from their side (prior knowledge) or from our side (overlap))
- Examples of combinations:
  - Healthcare and logistics
  - Logistics/Finance and IT
  - Innovation and entrepreneurship
- (Inter)national courses on master level with technical orientation
  - National: e.g. LNMB / Dutch Network on the Mathematics of Operations Research ([www.lnmb.nl](http://www.lnmb.nl))



## IE&M relates to other master programs (1/2)

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- “Industrial Engineering” is a much broader field at University of Twente
- The university offers master programs across the various faculties that focus on *management – technology – engineering* interfaces
- Therefore, we offer much flexibility in the program for elective courses from other programs
- There is a graduate school Industrial Engineering, if you have PhD ambitions



## IE&M relates to other master programs (2/2)

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### **IEM specialization:**

- Financial Engineering & Management
- Production & Logistics Management
- Healthcare Technology & Management

### **Related to:**

- Applied Mathematics
- Applied Mathematics
- Mechanical Engineering
- Biomedical Engineering
- Health Sciences



### *Furthermore:*

Business Information Technology  
Civil Engineering & Management  
Industrial Design Management



# Master thesis

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- Last semester of the second year (30 EC)
- **Applied:** doing a project, conducting research, and writing a report in a real company, and about a real issue
- **Challenging:** a difficult project, where you can apply your knowledge and skills, in an environment with high professional standards
- **Scientific:** use scientific knowledge, and provide solid support for your solutions and recommendations. Involvement in UT's research.
- **Professional:** you work as a young colleague in the organization
- It is your responsibility to find such a project
  - MSc Thesis preparation course during master program (5 EC)
  - Thesis project at company/organization (30 EC)



# Admission of students with a research university degree

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- Dutch WO bachelor:
  - TBK: admitted
  - Others: Possibly some extra courses are required, see next slide
  - Who can apply: students who are at ease with modeling and quantitative analysis
  - Technical students
  - Physics, econometrics, mathematics
- International degree: [www.utwente.nl/master/](http://www.utwente.nl/master/)

*(We will talk about admission with HBO degree later in this presentation)*





# WO premaster

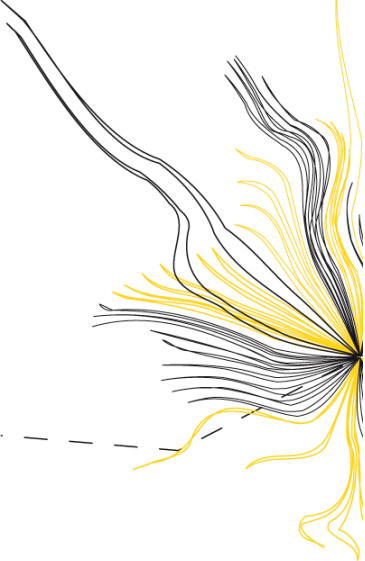
## Technical WO BSc

### PLM/HCTM

code	name	EC	kw
191530420	Statistics & probability for premaster IEM	5	1
201500012	OR modellen voor de premaster PLM	10	1
		<b>15</b>	

### FEM

code	name	EC	kw
191530420	Statistics & probability for premaster IEM	5	1
new	Financial Engineering for premaster IEM	10	1
		<b>15</b>	



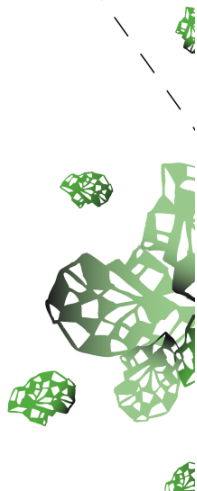
## Tuition fees 2014 – 2015

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- European Economic Area (EEA): €1,906 per year
- Non-EEA: € 13,226.- per year

*(EEA = EU + Iceland, Liechtenstein, Norway)*

See: [utwente.nl/en/education/master/financial/tuition-fees/](http://utwente.nl/en/education/master/financial/tuition-fees/)





## More details on the specializations

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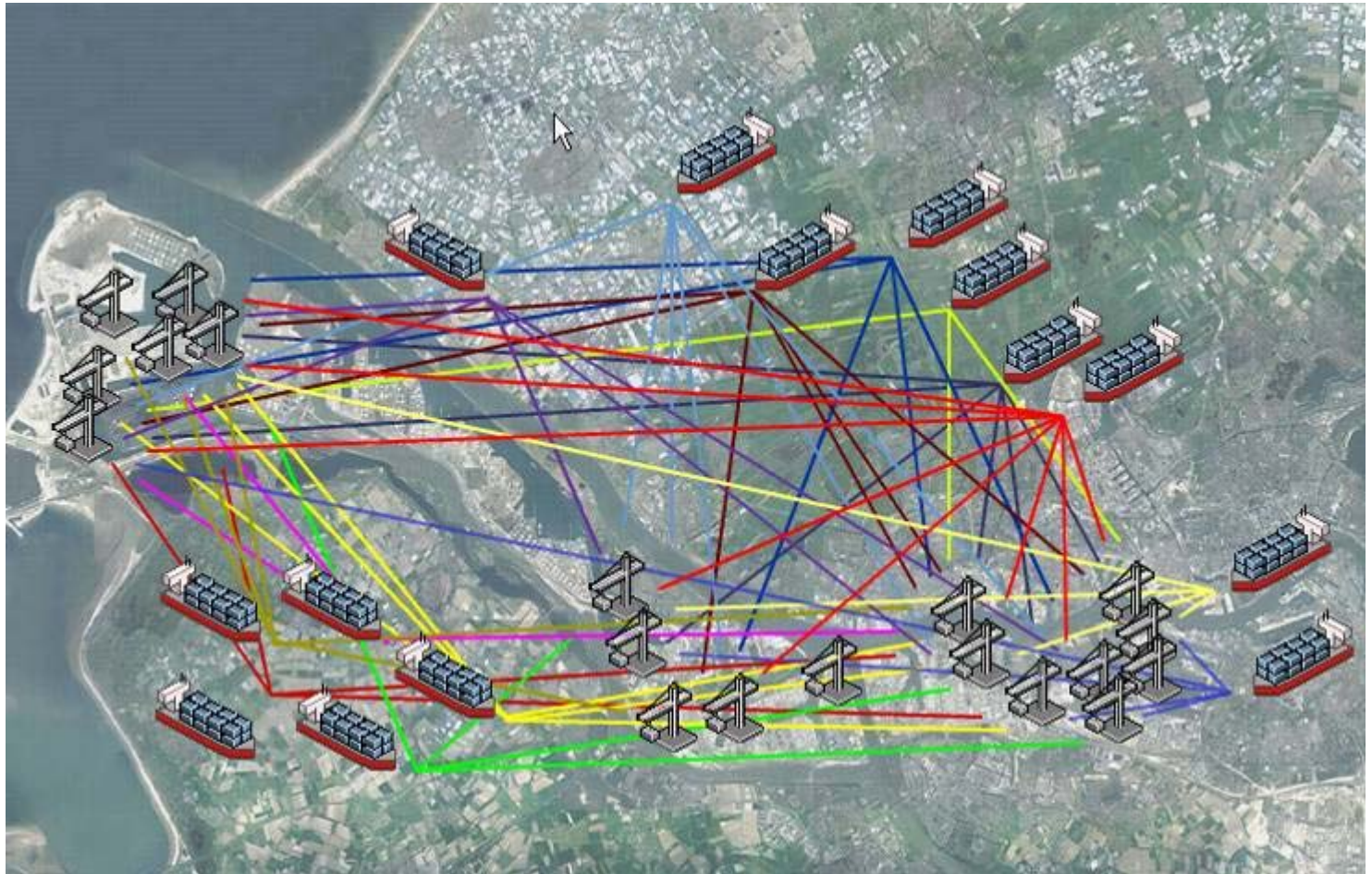
- Production and Logistic Management (PLM)
  - Track coordinator: Leo van der Wegen (BMS-IEBIS)
- Financial Engineering and Management (FEM)
  - Track coordinator: Berend Roorda (BMS-IEBIS)
- Healthcare Technology and Management (HCTM)
  - Track coordinator: Marjan Hummel (BMS-HTSR)



# Production & Logistics Management

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# How to plan logistics between multiple actors in an uncertain world?





# Hoe Hollands is de Hollandse fiets?

Meest verkochte fiets: Gazelle Orange f 1649,-







# Production & Logistics Management

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- Design and control of manufacturing processes and supply chains
  - location of production facilities
  - capacity of distribution centers
  - delivery agreements with suppliers (time, quality, reliability)
- Control
  - flow lines or job shops in manufacturing
  - engineer to order, assemble to order, make to stock
  - safety stock and inventory policy decisions
- Not only applicable to manufacturing, but also healthcare







# PLM: courses

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## Obligatory

- Discrete Optimization of Business Processes
- Simulation
- Supply Chain - & Transport Management
- Advanced Production Planning
- Warehousing
- Technology of Management for PLM

## Electives

- Reverse Logistics & re-manufacturing
- Optimization of Healthcare Processes
- Reliability engineering & Maintenance management
  - New Production Concepts
  - Purchasing

***Wrong valuation  
is a splendid basis  
for bad decisions***

# How to deal with financial risk and trading these?



# The fall of Bear Stearns Bank

BSC (NYSE)

\$5.72

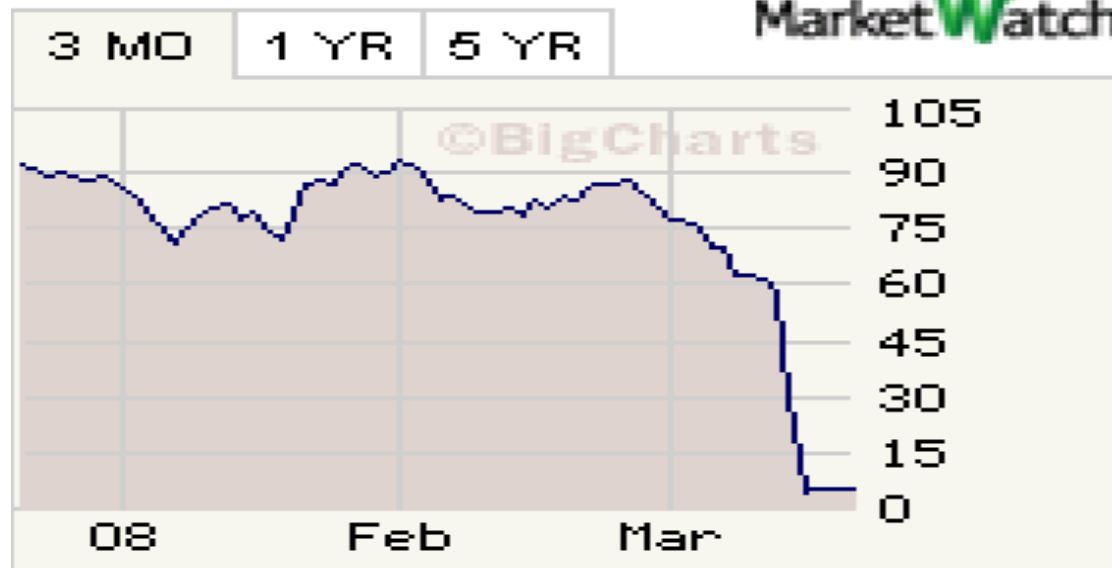


+0.39

+7.32%

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In partnership with  
MarketWatch

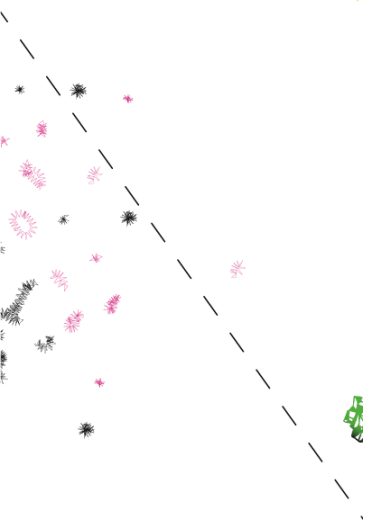


- 5th largest at Wall street
- sold to J.P. Morgan for 2\$/share



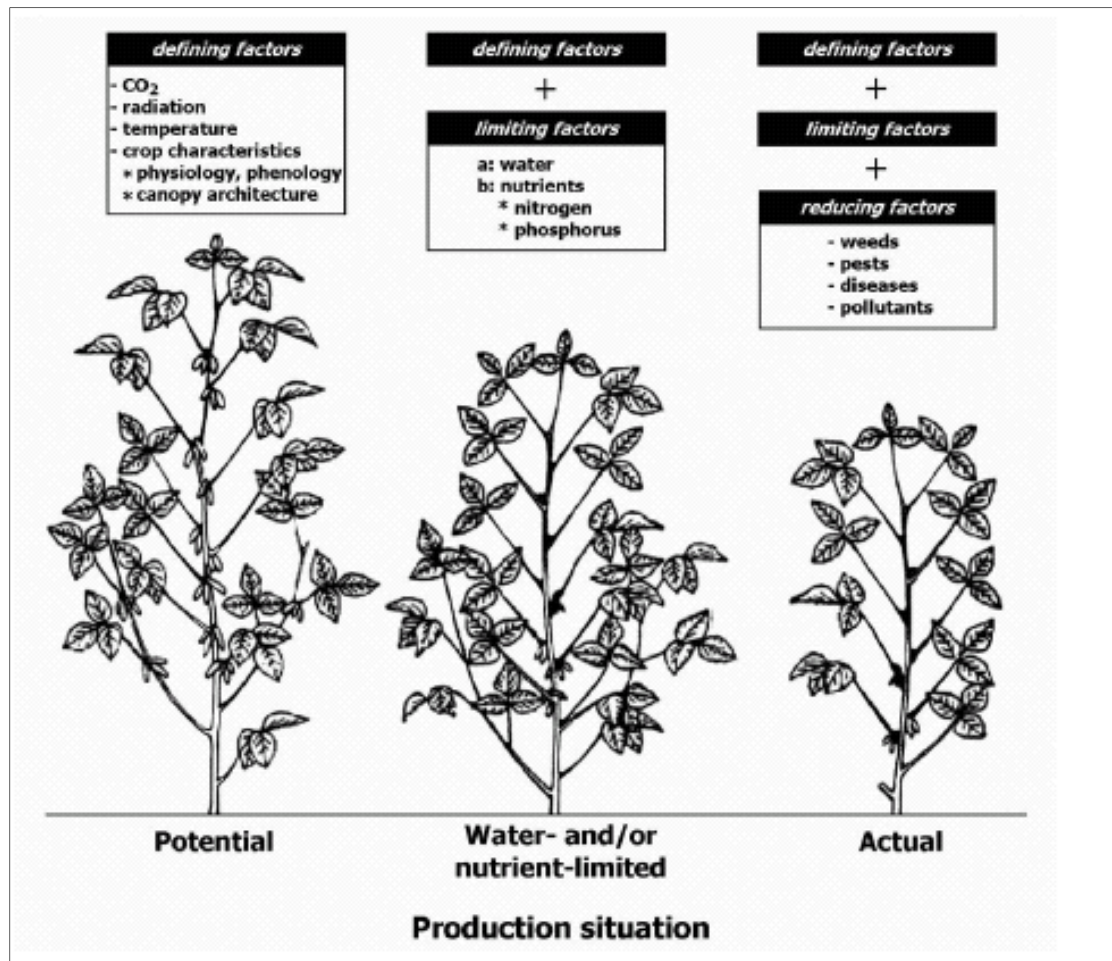
# Credit Derivatives and the Credit Crisis

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- Credit Derivatives are contracts with payoff depending on credit events (like bankruptcy)
  - Underlying value: \$45.000 billion
  - Also involving sub-prime mortgages
  - Complex constructions, risk is hard to model
  - Underestimation of risk by the entire financial industry is a factor in the current credit crisis
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# Revenue Hedging with Weather Derivatives





# Financial Engineering & Management

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- Identify and quantify risks:
  - Modeling and measurement of risk
  - Knowledge of company's products, processes, environment → understanding future scenarios (context)
- Control risk:
  - Use financial instruments to hedge risks (e.g. futures, options, insurance)
  - Change business processes (e.g. production location)?
- Design products with desired risk profile





# FEM: some courses

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## Obligatory

- Statistics and probability
- Micro Economics
- Mathematical Finance
- Risk management
- Structured Products
- Special topics in Financial Engineering

## Electives

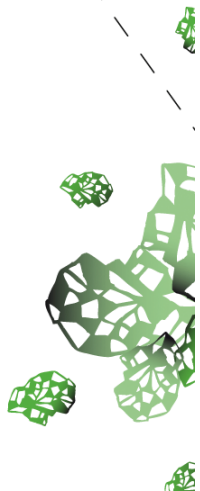
- Game Theory
- Management Control for Financial Institutions
  - Simulation
- Organization & Strategy

*Etc.*



# Healthcare Technology & Management

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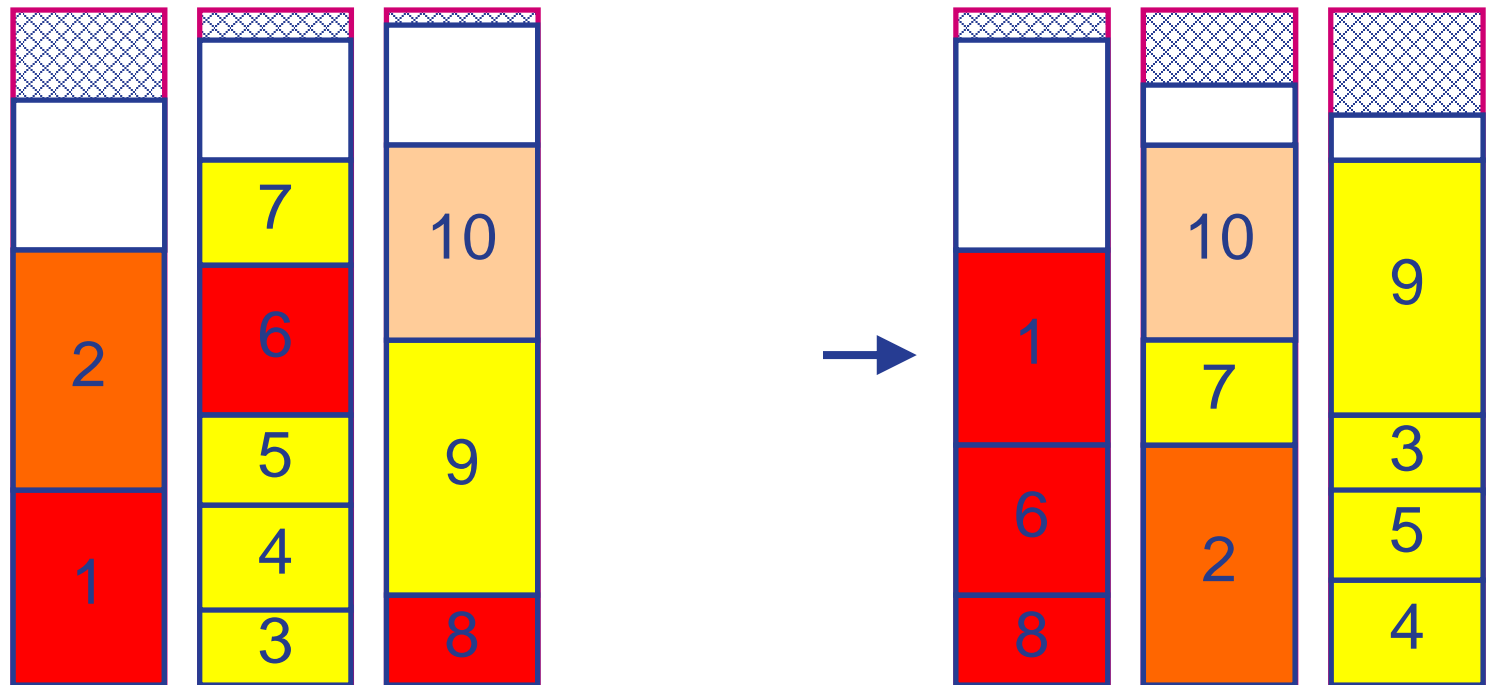
# Optimization of health care processes





# Portfolio effect-based optimization

The more red the surgery, the higher its duration variability:



Capacity gain 2.3%, increase in unused capacity: 40%



# Healthcare Technology & Management

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- Focused on hospitals (health organizations)
- Improving health care processes in hospitals (e.g. reducing waiting times)
- Development and implementation of biomedical technology (e.g. organizational aspects in introducing new technology; developers–user interaction for development)
- Market and technology development for biotech



# HCTM: some courses

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## Obligatory

- Discrete Optimization of Business Processes
- Simulation
- Optimization of Healthcare Processes
- Health & Health Systems
- Clinical Safety and Quality Assurance
- E-health strategies

## Electives

- Medical decision making
  - Clinical efficacy & MTA
- Quality and Safety in Health Care
  - Organization and Strategy





## Individual program

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- Students may also propose an individual program, combining courses from various master programs
- The program should meet the objectives of the IE&M master, but the emphasis can be adapted to the student's intellectual curiosity
- Application to program director, and official permission of the examination committee is required