

# Constraint-Based Scheduling

**Helmut Simonis**

## Constraint Based Production Scheduling



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# Acknowledgments



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# Key Points



- Two Day Course
- In Person at UCC
- Based on Insight Research
- Using Open-Source Scheduling Tool
- Practical Use-case Studies

# The Lecturer



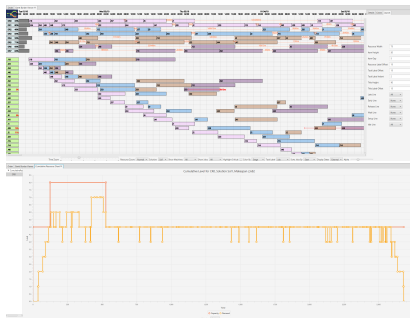
- Mathematics @ TH Darmstadt
- 1986-1990 ECRC GmbH, Munich
- 1990-2000, Technical Director, Cosytec SA, Orsay
- 2000-2005, Imperial College London, Parc Technologies Ltd
- 2013-2014, President, Association for Constraint Programming
- Best Application Paper Awards, CP 2009, CP 2013
- Program Chair, CP 2020, CPAIOR 2014
- Distinguished Service Award, ACP



# Top-Level Course Structure



- Background/Motivation
- Scheduling Concepts
- Machine Constraints
- Costs and Objectives
- Advanced Concepts
- Case Studies
- Literature Review

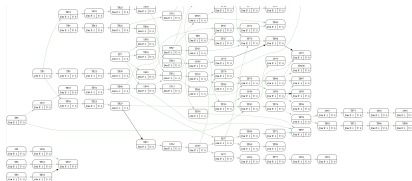


Examples from our scheduling tool

# Scheduling Concepts



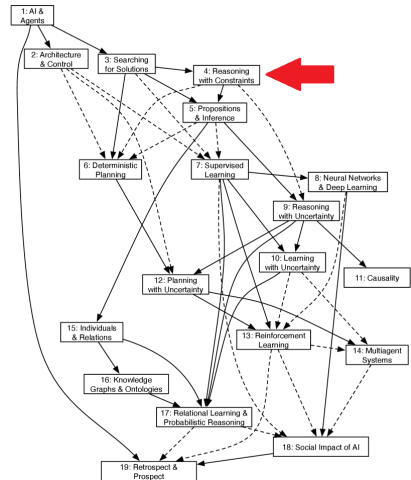
- Jobs, Tasks and Resources
- Orders, Products, Processes
- Temporal Relations
- Alternative Processes
- Bill of Material
- Problem Classification
- Key Visualisation Concepts



Example of complex temporal relations

# Method: Constraint Programming

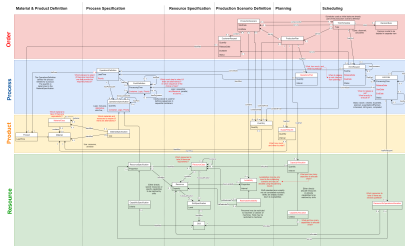
- Declarative modelling framework
- Combination of powerful solution methods
- Explainable results
- Good solutions found rapidly
- Recognised as preferred tool for solving scheduling problems



From: David Poole, Alan Mackworth. Artificial Intelligence,  
Cambridge University Press, 3rd Edition, 2023



- Production Planning
  - Using Scheduling as a module
- Oven Scheduling
  - Unconventional resource constraints
- Blades and Vanes Production Planning
  - Multi-year scheduling for capacity planning



Generic domain model for expressing scheduling problems