授業科目名	計算困難性：NP 完全性，整数計画法，及びスケジューリング問題への応用						
英語名	Computational Intractability: NP-completeness and Integer Programming, with Scheduling Applications						
担当教員名	David Avis						
配当学年		単位数	2	開講期	前期	曜時限	
授業種別・授業形態	専攻専門科目 講義			授業言語	英語		

【授業の概要・目的】

英語版参照

【授業計画と内容】

英語版参照

【履修要件】

英語版参照

【成績評価の方法・基準】

英語版参照

【教科書】

英語版参照

【参考書等】

英語版参照

【その他（授業外学習の指示・オフィスアワー等）】

英語版参照

Course Title	Computational Intractability: NP-completeness and Integer Programming, with Scheduling Applications						
Instructor(s)	David Avis						
Assigned Grade		Units	2	Semester	Spring	Time	
Course Category & Course Type	Specialized subject Lecture			Language	English		

Course Description (overview, purpose)

Most practical problems in discrete optimization, such as scheduling problems, fall into the NP-hard class of computationally intractable problems. While this means that we cannot normally expect efficient algorithms for these problems, they must nevertheless be solved. Scheduling problems, for example, must routinely be solved by transportation companies, sports schedulers, computer hardware, etc. Approaches to solving intractable problems often involve approximation, heuristics, and/or the use of exponential algorithms such as integer programming.

In this course we focus on the latter approach, which has recently shown impressive success in solving rather large-scale problems.

This course begins with a concise review of NP-completeness and an introduction to linear and integer programming, including cutting plane algorithms.

In the second part of the course, we apply these tools to a wide variety of problems related to scheduling.

Students will develop their own models for various applied problems and attempt to solve them using state-of-the-art software.

Course Schedule

The following topics are covered, each in two to four lectures.

1. The class of NP-complete problems. Cook's theorem and problem reductions. NP-hard problems.
2. Some NP-hard problems arising in scheduling.
3. Introduction to linear and integer programming.
4. Integer programming formulations of some scheduling problems.
5. Solution of integer programs and related software.

Prerequisites and Course Requirements

A basic knowledge of algorithms is assumed.

Grading Methods and Evaluation Criteria

Students are required to submit reports on subjects that will be given during lectures. Some reports will involve using course software.
Textbooks
N/A
References
N/A
Miscellaneous (homework assignment, office hours etc.)
Course materials can be downloaded from the course web page that will be announced during the first lecture