

*IK Computational Optimization, summer term '14:*

## **PhD-AW: Deterministic Global Optimization**

by **Prof. Nick Sahinidis** (e-mail: [sahinidis@cmu.edu](mailto:sahinidis@cmu.edu); web: <http://archimedes.cheme.cmu.edu>)

Room: **Seminarraum 5**

LV-Nr. 390040, LV-Type: UK, SemStd. 2.0, ECTS 8.0, Language: Englisch

### **Schedule:**

|     |            |               |
|-----|------------|---------------|
| Mon | 24.03.2014 | 10.00 - 12.00 |
| Tue | 25.03.2014 | 13.00 - 15.00 |
| Wed | 26.03.2014 | 10.00 - 12.00 |
| Thu | 27.03.2014 | 10.00 - 12.00 |
| Fri | 28.03.2014 | 10.00 - 12.00 |
|     |            |               |
| Mon | 31.03.2014 | 10.00 - 12.00 |
| Tue | 01.04.2014 | 13.00 - 15.00 |
| Wed | 02.04.2014 | 10.00 - 12.00 |
| Thu | 03.04.2014 | 10.00 - 12.00 |
| Fri | 04.04.2014 | 09.00 - 11.00 |

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## DETERMINISTIC GLOBAL OPTIMIZATION

|                   |   |
|-------------------|---|
| <b>Instructor</b> | Prof. Nick Sahinidis<br>e-mail: <a href="mailto:sahinidis@cmu.edu">sahinidis@cmu.edu</a><br><a href="http://archimedes.cheme.cmu.edu">http://archimedes.cheme.cmu.edu</a> |
| <b>Lectures</b>   | <i>see schedule, page 1</i>   |
| <b>Goal</b>       | To offer an in depth study of the general theory and methods of deterministic global optimization. We will study applications, algorithms, and software.                  |

### Course Outline\*

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|-----------------|--|
| <b>Part I</b>   | <b>Introduction</b> (1 hour)<br>Introduction, applications, course Outline   |
| <b>Part II</b>  | <b>Foundations</b> (3 hours)<br>Convex/nonconvex sets and functions<br>Local and global optimality conditions<br>Algorithms, convergence and finiteness<br>Computational complexity of global optimization   |
| <b>Part III</b> | <b>General solution methods</b> (10 hours)<br>Cutting planes<br>Outer approximation and convexification<br>Decomposition<br>Branch-and-bound<br>Lower bounding methods<br>Branching techniques<br>D.C. and Lipschitzian programming<br>Range contraction |
| <b>Part IV</b>  | <b>Special structures</b> (2 hours):<br>Quadratic, multilinear and edge-concave functions  |
| <b>Part V</b>   | <b>Software and applications</b> (4 hours):<br>BARON<br>Global MINLP codes<br>Applications in analytics  |

\*: number of lectures for each part of the course is tentative and may change to satisfy the specific needs and interests of the class.