# Introduction to BLG 545E Discrete Optimization

Fall 2022
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## Outline

- Course Outline
- Evaluation
- Homework
- Rules

## Tentative Course Outline - 1

- W1. Introduction to course, introduction to optimization
- W2. Terminology, simple heuristics: nearest neighbor, hillclimbers, …
- W3. Heuristics, HW problems
- W4. Simulated annealing, tabu search, GRASP
- W5. MIDTERM 1
- W6. Introduction to linear programming
- W7. Solving LP: simplex method

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## Tentative Course Outline - 2

- W8. Simplex, duality, and sensitivity
- W9. Population based metaheuristics, evolutionary algorithms
- W10. Evolutionary algorithms, ant colony optimization
- W11. Transportation and assignment problems
- W12. Integer programming
- W13. MIDTERM 2
- W14. Integer programming
- TBA. Project presentations

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# Evaluation Criteria

- Evaluation
  - 2 Midterms 50%
  - 3 Homework Assignments 50%
- Attending at least 70% (at least 10 out of 14 lectures) of classes is mandatory. Failure to do so results in a grade of VF.

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# Homework - Scoring

- 3 problems: Traveling Salesman Problem (TSP), Graph Coloring Problem (GCP), Warehouse Location Problem (WLP)
- 5 instances per problem (total of 15 instances)
- Possible points per instance: 6, 14, 20
- Maximum points per problem: 100
- Scores:
  - 0 points for invalid, infeasible solutions
  - 6 points for low quality solutions
  - 14 points for good quality solutions
  - 20 points for high quality solutions

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## Homework – Test Data

- Several instances of each problem will be provided for your experiments.
- Five of these will be used to test your program. You will not be told which five instances are included in the test system.
- A "Report Form" will be available. For each instance of each problem, you will be required to fill out a report form.



## Homework – Submission System

- For each instance of each problem, you will make a final submission through the submission system.
- The following items will be included in your submission:
  - Objective value and the corresponding solution
  - Your source code files
  - Your report form
- You can make a submission for the same instance as many times as you want. Your last submission will be considered.

# Homework – Demo Sessions

- There will be a demo session (details to be announced later).
- During the demo, you will be asked to demonstrate and explain some of the programs and solutions you submitted to the submission system.
- You will be expected to answer detailed questions about your submissions. If you are not able to answer these questions, you will NOT receive any points.



# Homework – Demo Sessions

**Important notes:**

- Please make sure your results are reproducible (even if you use a stochastic algorithm).
- On the report form, for each program and solution submission, write down all the relevant parameter settings, including the random number generator seed you used (if you use a stochastic approach).
- If, during the demo, you cannot reproduce a result you submitted, you will NOT receive any points for that instance.

# Homework – Rules

- The aim is to achieve the highest possible score for each instance. Therefore, you can solve each instance of each problem with a different algorithm/tool. You can use the approaches explained in class or any other approach you want.
- The total score you obtain from homework will make up 50% of your final grade for this course.
- You can use any algorithm or general purpose optimization tool. These tools are not tailored to a specific problem. However, you cannot use solvers that are dedicated to solving a specific problem.
  - For example you CAN use "CPLEX" or "CPOPT",
  - but you are NOT allowed to use the "Concorde TSP Solver".
- For some of the optimization tools, you have to use a specific programming language. However, for your own programs, you can use any programming language.



# Homework – Collaboration

- The homework assignments are individual assignments. You should not discuss your solution approaches and solutions.
  - Your code and algorithms should be your own. You should not share your algorithms, source codes, programs, or solutions with others.
  - You should not use any publicly available source codes or program binaries.
- General-purpose optimization tools and programs are allowed. However, problem specific ones are not. When in doubt, please contact the course instructor.
- You can collaborate with your classmates and other people ONLY in the following cases:
  - get help for understanding the problem
  - get help for technical issues such as how the tester script works, how the submission system works, etc.
  - get help with problems about reading the provided input data files.
  - get help regarding how to install and use some optimization tools.

# Academic Honesty

- Cases of plagiarism and cheating **will not** be tolerated and disciplinary action will be taken
- Plagiarism includes
  - actions such as, but not limited to, submitting the works of others as one's own (even if in part and even with modifications)
  - any copy-paste from other resources, such as someone else's code, paper, thesis, web page, etc. (even if you give a reference)
- All work must be your own and expressed in your own words
- References must be given for everything that is not your own work/idea

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# Warning!

NOTICE ABOUT PLAGIARISM: Do not copy any sentences or paragraphs from any papers, books, or any online resources. Everything must be in your own words. It is NOT OKAY to copy-paste something EVEN IF you give a reference to it. Plagiarism will result in a grade of VF and failing the course.

The following types of excuses will NOT be accepted in cases of plagiarism or not turning in assignments on time:

1) "My baby/dog/vacuum cleaner ate my USB stick/laptop."

2) "I did not have time to write it in my own words."

3) "My English is not good enough to write it myself."

Consider yourselves warned!

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## Do not come to me at the end of the semester with these types of excuses!

1) “I am on a scholarship and I have to finish all my courses this semester.” => set realistic goals and put in the required effort

2) “I am having personal/family problems.” => take a leave of absence for the semester!

3) “I do not have the required background for this course.” => drop the course while you still can

4) “I did not know the rules; I did not come to the first lecture, I did not read the syllabus” => read the syllabus and be aware of rules!

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## Some Hints

- Come to lecture
- Do the homework
  - You will have a hard time with the exams without doing the homework

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# Some Hints

- Ask questions
  - In class, via e-mail, …
- Start assignments early