

**CS201: Discrete Math for Computer Science**  
**2022 Spring Semester Course Project (Optional)**  
**Due: Jun. 12th, 2022, please submit through Sakai**

The goal of this project is for you to have better understandings of interesting topics in discrete mathematics and its applications in various related areas. You are required to give a self-contained report, together with possible supplementary materials (demo, codes, etc.). The project is optional, and counts 5% additional overall marks.

You are assumed to work individually. The project report is due on Jun. 12th, 2022. Each student may submit your project directly to the homepage on Sakai. Please indicate clearly the references in your report. All your submissions will be evaluated individually based on your own project quality (work load, scope, clarity and organization of your report, etc.). The suggested list of topics includes but not limited to the following:

- Advanced topics in logic, implementation of logic, e.g., expert system, automated theorem proving. You are encouraged to present the details of these implementations and explain the details with the techniques learned in this course.
- Topics related to the applications of graph theory. Application scenarios may include social networks, transportation systems, and computer networks. You are encouraged to consider a research problem and solve the problem using the techniques learned in this course.
- Topics on the discrete mathematics techniques used in blockchain. This may include cryptography and graph theory (in particular, trees). You are encouraged to select on a specific direction and present the details on how the techniques are used in blockchain. You are also encourage to point out limitations of the existing approaches and suggest improvements.
- Implementation of pseudorandom number generators. You are required not only to give an implementation, e.g., using Java, but also to describe in detail what kind of the underlying method (linear congruential method) is exactly used. You are also encouraged to find possible applications. For instance, random groups generator, online "red envelope" generator, etc.
- Demo of certain interesting algorithms. This may include exact steps of how the algorithm runs with given parameters. For example, (extended) Euclidean algorithm, RSA algorithm, Chinese Remainder Theorem, Roy-Warshall algorithm, topological sorting, Dijkstra algorithm, DFS/BFS algorithm, Tree traversal, Minimum spanning tree, etc.
- Other interesting topics of discrete mathematics.