# IS2020 COMP 2540: Data Structures and Algorithms

## Lecture 00(I): Course Outline

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# Course Information

- COMP-2540 Data Structures and Algorithms
- Prerequisite: COMP-1000 and COMP-1410
- Commitment:
  - 3 hours lecture a week
  - 1.5 hours laboratory a week
  - 6-7 hours self study per week
- Course Web Page:
  - https://blackboard.uwindsor.ca
- Lectures:
  - Monday and Wednesday, 8:30AM to 9:50AM  - Black board virtual room

# Course Objective: What this course is about?

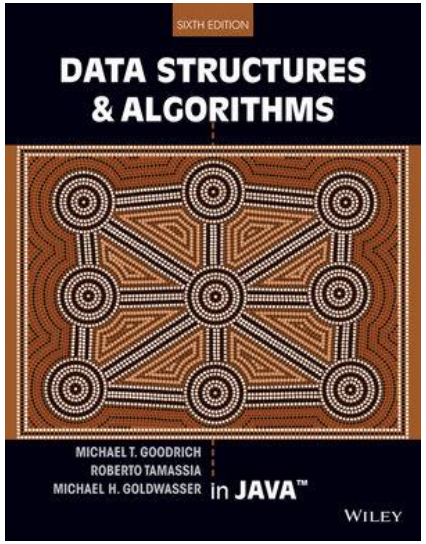
- Teach fundamental data structures models and concepts.
- Introduce the students to basic algorithm design and analysis techniques
- Teach techniques to select appropriate data structure and algorithm
- design method for a specified application
- Teach different algorithm design paradigms such as divide and conquer,
- greedy algorithms, dynamic programming.
- Explain how to apply linear and nonlinear data structures to solve
- different problems
- Expose the students to advanced data sorting and searching techniques.

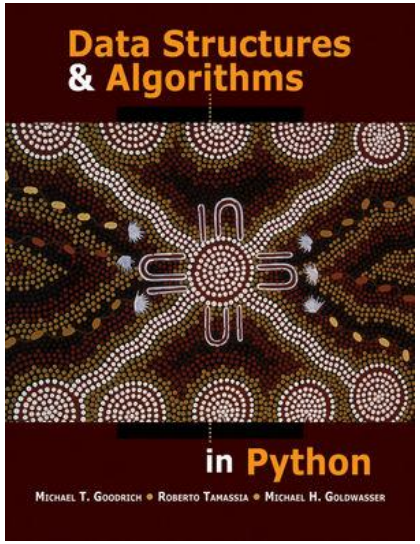
# Learning Outcomes

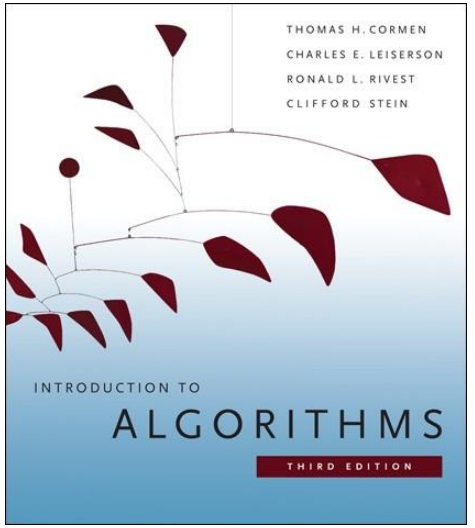
- Assess the pros and cons of using a specific data structure to solve a particular problem.
- Implement basic operations like searching, insertion, deletion, traversing on various data structures.
- Conduct basic algorithm time and space complexity analysis.
- Apply different algorithm design paradigms such as (divide and conquer, greedy algorithms, dynamic programming, etc.) to implement effective solutions for complex problems.

# Recommended References

- Data Structures and Algorithms in Java, 6th Edition, by M. Goodrich and R. Tamassia, Wiley, 2014.
- Data Structures and Algorithms in Python, by M. Goodrich and R. Tamassia, Wiley, 2013.
- Introduction to Algorithms, 3rd. Edition, by Thomas Cormen et al., MIT Press, 2009



# Course Schedule (Tentative)

| | | | |
|---|---|---|---|
| Week 1 | May 20: Introduction to Data Structures and Algorithms | | |
| Week 2 | May 25: Arrays | May 27: Linked Lists | |
| Week 3 | June 1: Stacks | June 3: Queues | June 1st ADD/DROP |
| Week 4 | June 8: Searching | June 10: Algorithm Analysis | |
| Week 5 | June 15: Sorting | June 17: Mid Exam 1 | June 15th Final Drop |
| Week 6 | June 22 & 24: Searching and Sorting | | |
| Week 7 | June 29 to July 1: READING WEEK | | Reading week |
| Week 8: | July 6 & 8: Graph & Trees | | |
| Week 9: | July 13 & 15: AVL Trees | | |
| Week 10: | July 20 & 22: Red-black Trees | | |
| Week 11: | July 27: Graph Algorithms | July 29: Mid Exam 2 | July 27th VW |
| Week 12: | August 3 & 5: Dynamic Programing | | |
| Week 13: | August 10: Recursive & Back Tracking | August 12: Final Project | |
| Week 14: | August 17: Greedy Algorithm | | |

# Course Evaluation

| | | |
|---|---|---|
| Class participation and discussions | 10 % | |
| Mid 1 & Mid 2 | 30 % | Mid 1: Wednesday, June 17th (in class)<br>Mid 2: Wednesday, July 27th (in class) |
| Project | 20 % | Group work |
| Challenge | 10 % | Individual work |
| Labs | 30 % | 5 individual labs |

# Class participation and discussions

- It can be
  - In class Assignment
  - Preview Assignment
  - In class Quiz
  - Group discussion

# Challenges

- You will have challenge biweekly (total 5 challenges).
- Challenges are due at midnight on the day published the question on BB.
- Helpful for interviews.
- Each challenge will be 2% of the total grade.

# Lab Information

Monday (10:00 AM – 11:20 AM) - Sec 51

Monday (11:30 AM – 12:50 PM) - Sec 53

Wednesday (10:00 AM – 11:20 AM) - Sec 52

Wednesday (4:00 PM – 5:20 PM) - Sec 54

Friday (10:00 AM – 11:20 AM) - Sec 55

Lab will be through **MS Teams**

# Lab Information

- Attending all labs through online is required.
- Lab assignments must be submitted and marked during the labs' hours. No assignments will be accepted by email or other means. GAs/TAs and Instructor will be available through BB/MS Team for your help. When your lab work is completed, you can message to the GAs/TAs to grade your lab work.
- Labs will run on Mon, Wed and Fri every week, and will start on May 25, and will finish on Aug 10.
- There will be 10 lab sessions. In each odd-numbered lab session (1, 3, 5, 7 and 9), the lab assignment will be explained, and students will start working on it.
- Lab assignments will be submitted in even-numbered lab sessions (2, 4, 6, 8 and 10). Each lab assignment is worth 6% of the course grade. If you finish earlier, namely in the corresponding odd-numbered session, you can submit the lab at that time and do not have to come to the next session (the corresponding even-numbered lab).

# Final Project

Your goal for the COMP 2540 final project is to apply the data structures and algorithms we have discussed this semester in an application of your choosing. Your task is to build a project that utilizes any of the following data structures and algorithms in a novel manner.

- **Priority Queue**
- **Trees** (B-Trees, AVL trees, Red-Black Trees)
- **Hash Tables**
- **Graphs** (Shortest Path, Minimum Spanning Tree)

You can use any programming language you wish.
You cannot use any build-in standard template libraries. For example, using list, tuple, dict, and set in Python. – It is not considered as novel.

You should analyze the performance of your data structure and algorithm in terms of execution time or memory usage.

# Final Project

**Presentation and Grouping:**

- You will get in groups of 3 (or 4 if unavoidable) with lab mates.
- Students **may not** work on project in groups of 2 or individually.
- Your group should do a 5 minutes presentation during lab hours.
  - Include: Introduction, Background, Measurement, Analysis and Conclusion

**Submission:**

Create a pdf file with the following information and submit on black board. You should submit a single file for a group. Don't submit individually.

- Project Name
- Group Members (Name and Student id)
- Project Description: a brief summary of your project.
- Data Structures / Algorithms: Explain the data structure or algorithm you utilized.
- The URL to your Git repository: include your code and presentation slides

# Final Project

| | Due date |
|---|---|
| Group formation | June 20 |
| Project title and Summary | July 11 |
| Presentation | Week 13 (in your lab session) Aug 10 to 14 |
| Final Submission | August 18 |

# Course Instructor & GA/TAs

- Course Instructor: Kalyani Selvarajah
  - PhD in Computer Science, University of Windsor
  - MSc in Computer Science, University of Peradeniya
  - BSc in Computer Science, University of Peradeniya
- LinkedIn: www.linkedin.com/in/kalyani-selvarajah-01088739
- Course email: kalyanis@uwindsor.ca
- Office hours:
  - Wednesday 3:00pm to 5:00pm
  - @ BB
  - Other times can be arranged by appointment (meaning if you are unable to make my office hours to discuss a concept in a given week, you are encouraged to send me an e-mail asking for a different time. Please include a list of proposed times since I do not have access to your schedule.)

# Course Instructor & GA/TAs

## Course GA/TAs and Lab Instructors

| GA/TA Names | Office hours | Email | |
|---|---|---|---|
| Akshay Mukundbhai Shah | Tuesday 1:00 pm to 2:00 pm | shah1bz@uwindsor.ca | Lab Instructor |
| Alayna Tieu | Monday 11:30 pm to 12:30pm | tieu11@uwindsor.ca | |
| Nandini Patel | Wed 2:00 pm to 3:00 pm | patel23l@uwindsor.ca | |
| Alina Noor | Fri 11 am to 12 pm &<br>Thu 4:30 to 5:30 | noor112@uwindsor.ca | |
| Christopher Seniow | Monday 1:00 pm to 2:00pm | seniow@uwindsor.ca | |
| Kabir Ansari | Fri 4:00 pm to 5:00 pm | ansarik@uwindsor.ca | |
| Raiyan Afiz | Thu 1:00 pm to 2:00 pm | afiz@uwindsor.ca | |

# Any Question?

Write on me