Faculty of Engineering & Built Environment

School of Electrical Engineering and Computing

SENG1120: Data Structures

Callaghan

Semester 1 - 2018

COURSE OUTLINE

OVERVIEW

Course Description

This course expands the problem-solving techniques of SENG1110 to large problems, with a study of an object-oriented software analysis and design methodology. Software implementation techniques and standards are introduced with the aim of improving programming skills. Students use fundamental algorithmic techniques and structures such as stacks, queues, trees and heaps as tools for problem solving design and implementation.

Assumed Knowledge

SENG1110 or INFT2012

Contact Hours

Callaghan
Computer Lab
Face to Face On Campus
2 hour(s) per Week for Full Term
PSB students enrolled in the part-time evening programme at UoN Singapore
will receive equivalent instruction delivered in a block mode of 7 teaching
weeks.
Lecture
Face to Face On Campus
2 hour(s) per Week for Full Term
PSB students enrolled in the part-time evening programme at UoN Singapore
will receive equivalent instruction delivered in a block mode of 7 teaching
weeks.

Unit Weighting

10

Workload

Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Callaghan
Dr Alexandre Mendes
Alexandre.Mendes@newcastle.edu.au
(02) 4921 6172
Consultation: Monday 2PM-4PM (room ES236)

Teaching Staff

Other teaching staff will be advised on the course Blackboard site.

School Office

School of Electrical Engineering and Computing
ICT307
ICT Building
Callaghan
+61 2 4921 5330
9.00am-1.00pm and 2.00pm-5.00pm (Monday to Friday)

SYLLABUS

Course Content

1. Object oriented programming techniques
2. Stacks, queues, trees, heaps, hash tables
3. Methods for searching and sorting
4. Recursion
5. Hashing

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. To understand the Object-Oriented notions and how the notions are implemented in object-oriented programming languages.

2. To understand the need for the most appropriate data structure to provide the best solution to a problem

3. To understand and use Linear, Hierarchical and Graph Structures in problem solving and algorithms

4. To understand and use arrays and linked structures in implementing data structures

Course Materials

Recommended reading:

• “C++ Programming: Program Design Including Data Structures”, 7th Edition, D.S. Malik, Cengage Learning, 2014.

COMPULSORY REQUIREMENTS

In order to pass this course, each student must complete ALL of the following compulsory requirements:

Contact Hour Requirements:

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Course Assessment Requirements:

- Assessment 5 - Formal Examination: Minimum Grade / Mark Requirement - Students must obtain a specified minimum grade / mark in this assessment item to pass the course. Students whose overall mark in the course is 50% or more, but who score less than 40% in the compulsory item and thus fail to demonstrate the required proficiency, will be awarded a Criterion Fail grade, which will show as FF on their formal transcript. However, students in this position who have scored at least 25% in the compulsory item will be allowed to undertake a supplementary 'capped' assessment in which they can score at most 50% of the possible mark for that item.

Pre-Placement Requirements:

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ASSESSMENTS

This course has 5 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Class Exam	Week 5	Individual	10%	1, 2
2	Assignment 1	Week 6	Individual	15%	1, 2, 3, 4
3	Assignment 2	Week 9	Individual	10%	1, 2, 3, 4
4	Assignment 3	Week 13	Individual	15%	1, 2, 3, 4
5	Formal Examination*	Examinations period	Individual	50%	1, 2, 3, 4

* This assessment has a compulsory requirement.

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Class Exam

Assessment Type In Term Test
Description Written exam to demonstrate that the student has learned the content of the first 5 weeks of lectures
Weighting 10%
Due Date Week 5
Submission Method In class
Assessment Criteria
Return Method
Feedback Provided

Assessment 2 - Assignment 1

Assessment Type	Software programming
Description	To code a linked list data structure with basic functionality to solve an underlying problem
Weighting	15%
Due Date	Week 6
Submission Method	Online
Assessment Criteria	
Return Method	
Feedback Provided	

Assessment 3 - Assignment 2

Assessment Type	Software programming
Description	To demonstrate the knowledge on how to extend the linked list to a more specialized data structure (e.g. stack, queue, etc.)
Weighting	10%
Due Date	Week 9
Submission Method	Online
Assessment Criteria	
Return Method	
Feedback Provided	

Assessment 4 - Assignment 3

Assessment Type	Software programming
Description	To demonstrate the knowledge on how to implement a binary tree data structure with basic functionality, to solve an underlying problem
Weighting	15%
Due Date	Week 13
Submission Method	Online
Assessment Criteria	
Return Method	
Feedback Provided	

Assessment 5 - Formal Examination

Assessment Type	Formal Examination
Description	
Weighting	50%
Compulsory Requirements	Minimum Grade / Mark Requirement - Students must obtain a specified minimum grade / mark in this assessment item to pass the course.
Due Date	Examinations period
Submission Method	Formal exam
Assessment Criteria	
Return Method	
Feedback Provided	

Opportunity to Reattempt

Students WILL be given the opportunity to reattempt this assessment.
Refer to course outline for details

2017 - Retention of Assignment Scripts

In 2018, the University of Newcastle will undergo its 5 yearly accreditation cycle with the Australian Computer Society and Engineers Australia. Part of this routine process is the collection of a sample of student assignments over a 1+ year period. The objective is to provide the accrediting panel an indication of educational rigour across all courses. In 2017, we will commence collecting sample assignments from each and every assessment task, across the full spectrum of marks. They will be provided to the panel but not de-identified. If you object to your assignment being retained with your name associated, please indicate this on the submission, and if retained, we will de-identify your paper. All papers will be destroyed at the completion of the accreditation process.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity policy, refer to http://www.newcastle.edu.au/policy/000608.html.

Adverse Circumstances	You are entitled to apply for special consideration because adverse circumstances have had an impact on your performance in an assessment item. This includes applying for an extension of time to complete an assessment item. Prior to applying you must refer to the Adverse Circumstances Affecting Assessment Items Procedure, available at http://www.newcastle.edu.au/policy/000940.html. All applications for Adverse Circumstances must be lodged via the online Adverse Circumstances system, along with supporting documentation.
Important Policy Information	The 'HELP for Students' tab in UoNline contains important information that all students should be familiar with, including various systems, policies and procedures.

GRADUATE PROFILE STATEMENTS

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers - Graduate Attributes):

	Engineers Australia Stage 1 Graduate Competencies	Taught	Practised	Assessed	Level of capability
	Knowledge Base				
1	1.1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	☑	☑	☑	2
2	1.2. Conceptual understanding of the, mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.	☑	☑	☑	2
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	☑	☑	☑	1
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.	☑	☑	☑	1
5	1.5. Knowledge of contextual factors impacting the engineering discipline.				
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.				
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.	☑	☑	☑	1
8	2.2. Fluent application of engineering techniques, tools and resources.	☑	☑	☑	1
9	2.3. Application of systematic engineering synthesis and design processes.	☑	☑	☑	1
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability				
12	3.2. Effective oral and written communication in professional and lay domains.	☑	☑	☑	1
13	3.3. Creative, innovative and pro-active demeanour.				
14	3.4. Professional use and management of information.				
15	3.5. Orderly management of self, and professional conduct.				
16	3.6. Effective team membership and team leadership.				

	University of Newcastle Computer Science Graduate Profile Statements	Taught	Practised	Assessed	Level of Capability
1	Knowledge of basic science and computer science fundamentals.	☑	☑	☑	2
2	In depth technical competence in the discipline of computer science	☑	☑	☑	1
3	An ability to carry out problem analysis, requirements capture, problem formulation and integrated software development for the solution of a problem.	☑	☑	☑	2
4	Capacity to continue developing relevant knowledge, skills and expertise in computer science throughout their careers.	☑	☑		1
5	An ability to communicate effectively with other Computer Scientists, Software Engineers, other professional disciplines, managers and the community generally.	☑	☑	☑	1
6	Ability to undertake and co-ordinate large computer science projects and to identify problems, their formulation and solution.				
7	Ability to function effectively as an individual, a team member in multidisciplinary and multicultural teams and as leader/manager with capacity to assist and encourage those under their direction.				
8	Understanding of social, cultural, global and business opportunities of the professional computer scientist; understanding the need for and principles of sustainability and adaptability				
9	Understanding of professional and ethical responsibilities and a commitment to them.				
10	Understanding of entrepreneurship; need of and process of innovation, as well as the need of and capacity for lifelong learning.				

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.