

SENG2200: Programming Languages and Paradigms

Callaghan

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description	This course places the programming from year 1 into its correct theoretical context with the following topics:- Elementary Language Theory and Specification.- Low level implementation of language mechanisms (e.g. pointers, parameters, activation records and method tables).- Implementation of software structures in both Java and C++.- A comparison of object models in different object-oriented languages.- An introduction to non-object programming paradigms, e.g. list processing, functional and declarative languages.
Academic Progress Requirements	Nil
Assumed Knowledge	SENG1110 Introduction to Software Engineering 1 and SENG1120 Introduction to Software Engineering 2.
Contact Hours	Callaghan Computer Lab Face to Face On Campus 2 hour(s) per week(s) for 13 week(s) starting Week 1 Lecture Face to Face On Campus 2 hour(s) per week(s) for 13 week(s) starting Week 1
Unit Weighting Workload	10 Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator **Callaghan**
Dr Adrian Tan
Adrian.Tan10@newcastle.edu.au
(02) 4055 0700
Consultation: Thursdays 9 am to 11 am (or other times by appointment) at ES233

Teaching Staff Other teaching staff will be advised on the course Canvas site.

School Office **School of Information and Physical Sciences**
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SYLLABUS

Course Content This course places the programming from year 1 into its correct theoretical context with the following topics:

- Elementary Language Theory and Specification
- A second object-oriented language
- Low level implementation of language mechanisms
 1. pointers
 2. activation records
 3. method tables
 4. memory allocation/de-allocation and garbage collection
 5. process and thread activation and communication
- Parameter passing mechanisms
- A comparison of object models in different object-oriented languages.
- An introduction to advanced programming language features.
- An introduction to concurrency and inter-process communication.
- An introduction to non-object programming paradigms, eg.
 1. list processing
 2. functional languages
 3. declarative languages.

Course Learning Outcomes **On successful completion of this course, students will be able to:**

1. Use Elementary Language Theory and Specification to describe language features
2. Program using advanced features of object-oriented languages
3. Compare the low level implementation of language mechanisms, such as pointers and references, activation records, method tables, memory allocation/de-allocation and garbage collection, thread activation and communication
4. Compare and analyse alternate parameter passing mechanisms
5. Compare the object models in different object-oriented languages
6. Describe and evaluate advanced programming language features
7. Demonstrate an introductory understanding of concurrency and inter-process communication.
8. Demonstrate an introductory understanding of the area of machine intelligence
9. Describe the operation of non-object programming paradigms, eg. List processing, functional languages, and declarative languages.

Course Materials

Recommended Text:

- RW Sebesta, Concepts of Programming Languages, 10e (11e), Pearson, 2012 (2016).

COMPULSORY REQUIREMENTS

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

Contact Hour Requirements:

-

Course Assessment Requirements:

- Assessment 5 - Formal Examination: Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.

Compulsory Placement and WHS Requirements:

-

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	26 Feb	Introduction		Assessment 1 Released
2	4 Mar	Memory Management	Lab 1	
3	11 Mar	Inheritance	Lab 2	
4	18 Mar	Polymorphism	Lab 3	Assessment 1 Due Assessment 2 Released
5	25 Mar	Generics	Lab 4	
6	1 Apr	Iterators	Lab 5	
7	8 Apr	Quiz		Assessment 4 (Quiz)
Mid-Semester Recess				
Mid-Semester Recess				
8	29 Apr	Parameter-Passing	Lab 6	Assessment 2 Due Assessment 3 Released
9	6 May	Concurrency	Lab 7	
10	13 May	Functional Programming I	Lab 8	
11	20 May	Functional Programming II	Lab 9	
12	27 May	Logical Programming	Lab 10	Assessment 3 Due
13	3 Jun	Revision		
Examination Period				
Examination Period				

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	Assignment 1	Week 4 (22 March 2024, 23:59 pm)	Individual	10%	2, 3
2	Assignment 2	Week 8 (03 May 2024, 23:59 pm)	Individual	15%	2, 3, 6
3	Assignment 3	Week 12 (31 May 2024, 23:59 pm)	Individual	15%	2, 3, 6
4	Quiz	Week 7 (11 April 2024, during lecture period)	Individual	10%	1, 2, 3, 5
5	Formal Examination*	Formal examination period	Individual	50%	1, 2, 4, 5, 6, 7, 8, 9

* 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 - Assignment 1

Assessment Type Written Assignment
Purpose Programming assignment meets the course objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to produce articulate and concise documents and artefacts which convey evidence-based understanding of the concepts and topics.
Description Program code and written report.
Weighting 10%
Due Date Week 4 (22 March 2024, 23:59 pm)
Submission Method Online
Assessment Criteria Correctness of program code and clarity of documentation and written report.
Return Method Not Returned
Feedback Provided Online - .
Opportunity to Reattempt Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 2 - Assignment 2

Assessment Type Written Assignment
Purpose Programming assignment meets the course objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to produce articulate and concise documents and artefacts which convey evidence-based understanding of the concepts and topics.
Description Program code and written report.
Weighting 15%
Due Date Week 8 (03 May 2024, 23:59 pm)
Submission Method Online
Assessment Criteria Correctness of program code and clarity of documentation and written report.
Return Method Not Returned
Feedback Provided Online - .
Opportunity to Reattempt Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 3 - Assignment 3

Assessment Type Written Assignment
Purpose Programming assignment meets the course objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to produce articulate and

	concise documents and artefacts which convey evidence-based understanding of the concepts and topics.
Description	Program code and written report.
Weighting	15%
Due Date	Week 12 (31 May 2024, 23:59 pm)
Submission Method	Online
Assessment Criteria	Correctness of program code and clarity of documentation and written report.
Return Method	Not Returned
Feedback Provided	Online - .
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 4 - Quiz

Assessment Type	Quiz
Purpose	The purpose and benefit of this quiz is to provide students with regular feedback on student learning. This quiz highlights areas of concern and may stimulate discussion with tutors and lecturers.
Description	Mid-term quiz.
Weighting	10%
Due Date	Week 7 (11 April 2024, during lecture period)
Submission Method	In Class
Assessment Criteria	Clarity/correctness of written answers and program code.
Return Method	Not Returned
Feedback Provided	In Class - .
Opportunity to Reattempt	Students WILL NOT be given the opportunity to reattempt this assessment.

Assessment 5 - Formal Examination

Assessment Type	Formal Examination
Purpose	Formal examination is designed to test students' knowledge and understanding of the course material and their ability to analyse the material.
Description	Formal examination.
Weighting	50%
Compulsory Requirements	Pass requirement 40% - Must obtain 40% in this assessment item to pass the course..
Due Date	Formal examination period
Submission Method	Formal Exam
Assessment Criteria	
Return Method	Not Returned
Feedback Provided	No Feedback - .
Opportunity to Reattempt	Students WILL be given the opportunity to reattempt this assessment.

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:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.
- Face to Face: Communication will be provided via face to face meetings or supervision.

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.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

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 <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

Adverse Circumstances

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>

Important Policy Information

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

GRADUATE PROFILE STATEMENTS

The following table illustrates how this course contributes towards building the skills students will need to work in their profession.

Level of capability

- Level 1 indicates an introduction to a topic at a university level
- Levels 2 and 3 indicate progressive reinforcement of that topic
- Level 4 indicates skills commensurate with a graduate – entry to professional practice
- Level 5 indicates highly specialist or professional ability

Bachelor of Engineering

	University of Newcastle Bachelor of Engineering Graduate Profile Statements	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	1.2. Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.				
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	X	X	X	2
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.	X	X	X	2
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.	X	X	X	2
8	2.2. Fluent application of engineering techniques, tools and resources.	X	X	X	2
9	2.3. Application of systematic engineering synthesis and design processes.				
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.				
13	3.3. Creative, innovative and pro-active demeanour.				
14	3.4. Professional use and management of information.	X	X	X	2
15	3.5. Orderly management of self, and professional conduct.				
16	3.6. Effective team membership and team leadership.				

Bachelor of Computer Science

	University of Newcastle Bachelor of Computer Science Graduate Profile Statements	Taught	Practised	Assessed	Level of capability
1	Knowledge of basic science and computer science fundamentals.				
2	In depth technical competence in the discipline of computer science.	X	X	X	2
3	An ability to carry out problem analysis, requirements capture, problem formulation and integrated software development for the solution of a problem.	X	X	X	2
4	Capacity to continue developing relevant knowledge, skills and expertise in computer science throughout their careers.	X	X	X	2
5	An ability to communicate effectively with other Computer Scientists, Software Engineers, other professional disciplines, managers and the community generally.				
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.

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