INFS 3021 FORMAL SOFTWARE ENGINEERING (ADVANCED)

Credit Points 10

Description This subject introduces the theory and practice of formal software engineering. It is concerned with the design, development, and maintenance of computer software systems. The subject teaches complex software system modelling and verification, it covers most fundamental and important topics in this area, such as currency system modelling, Linear Temporal Logic (LTL) and Computation Tree Logic (CTL) model checking algorithms, as well as the practical model checker system SPIN. Students will be also trained for practical problem solving by applying the theories, methodologies and tools taught from this subject.

School Computer, Data & Math Sciences

Student Contribution Band HECS Band 2 10cp

Check your fees via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Undergraduate Level 3 subject

Pre-requisite(s) MATH1006
COMP2030

Assumed Knowledge

Basic understanding of data structures and discrete mathematics
Basic programming skills in C, C++, Java, Python, etc.

Learning Outcomes

After successful completion of this Subject, students will be able to:

1. Describe the general concepts and principles of formal methods for software development and verification.
2. Model concurrent systems using the concepts and formal notations of transition systems and program graphs.
3. Apply Linear Temporal Logic (LTL) and Computation Tree Logic (CTL) to specify the required properties.
4. Perform model checking using SPIN model checker.
5. Formulate PROMELA programs and use SPIN to specify and check the correctness of given software systems and programs.
6. Apply the advanced verification tools to undertake essential formal specification and verification tasks.
7. Undertake complex software system maintenance and verification by applying LTL/CTL model checking algorithms, formal proofs and practical PROMELA programming.

Subject Content

1. Concept and Development of Formal Methods and System Verifications
2. State Transition Systems and Concurrent Systems Modelling
3. Linear Time Properties
4. Linear Temporal Logic (LTL) and Algorithm
5. Computation Tree Logic (CTL) and Algorithm
6. SPIN Model Checker
7. PROMELA Programming Language
8. Problem Solving for Software Systems Verifications

Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/ Group Task
Practical	To take place during practicals	40	N	Individual
Quiz	1.5 hours	20	N	Individual
Quiz	1.5 hours	20	N	Individual
Report	10 hours	20	N	Individual

Prescribed Texts

Baier, C. (2008). Principles of model checking. MIT Press.

Clarke, E. M., Henzinger, T. A., Veith, H., & Bloem, R. (Eds.). (2018). Handbook of model checking. Springer.