

School of Computer Science and Statistics
 B.A. (Mod) Computer Science
 ECTS Module Descriptor 2011-12

Academic Year	2011/12
Module Code	CS4003
Module Title	Formal Methods
Pre-requisites	For 2011/12 only: Having taken CS3001 Formal Methods in 2010/09 is desirable. Maths students with a good feel for 1 st order Predicate Calculus should be able to cope From 2012/13 onwards: logic, set theory
ECTS	5
Chief Examiner	Andrew Butterfield
Teaching Staff	Andrew Butterfield
Delivery	The course runs in the first semester (11 teaching weeks) and is an elective in the SS year. Three contact hours per week (total of 33 hours in the course). The teaching strategy is a mix of lectures and weekly hands-on programming tasks illustrating and reinforcing the lecture material.
Aims	This is a once-off course that follows on material presented in CS3001, which introduces the Unifying Theories of Programming framework (UTP) and showed how it could be used to reason about sequential imperative programs. This follow-on course explores using the UTP to reason about programs that interact with their environment, and to explore how to model concurrent and parallel execution. It also looks in more detail at the unification aspects of UTP. In addition it looks at other formal theories outside of UTP, and their associated tool support.
Learning Outcomes	<p>On successful completion of this module, students will be able to</p> <ul style="list-style-type: none"> • Produce formal descriptions of concurrent/interacting systems • Analyse a concurrent/interacting system to check for anomalous behaviours • Characterise concurrency notations based on formal similarities and differences • Use appropriate tools to explore concurrent systems with formal descriptions

Syllabus	<ul style="list-style-type: none"> • Quick UTP Refresher (CS3001 in a nutshell) • Modelling interaction in the UTP • Modelling concurrency in the UTP • Recursion in the UTP • Linking different UTP theories • Comparisons with other formalisms • Exploring tool support for formal analysis
Assessment	<p>Assessment is by examination (80%) and continuous assessment (20%).</p> <p>The two-hour examination requires students to answer 3 out of 4 questions.</p> <p>Continuous assessment is composed of:</p> <ul style="list-style-type: none"> • Weekly tutorial sessions (10%) • One substantial project (10%)
Bibliography	<p>The course will be based on</p> <ul style="list-style-type: none"> • C.A.R. Hoare and J. He, "Unifying Theories of Programming" • J. Woodcock, "Using Z" • C.A.R. Hoare, "Communicating Sequential Processes" <p>All of these are available online, free-of-charge</p>
Website	<p>https://www.cs.tcd.ie/Andrew.Butterfield/Teaching/CS4003/</p>