PROPOSAL TO INTRODUCE A NEW COURSE

1. COURSE DETAILS

1.1 Course ID COMP 6721

1.2 Course name - Long

(In-)Formal Methods: The Lost Art

1.3 Course name - Abbreviated

(In-)Formal Methods: The Lost Art

1.4 Course Authority ext/email

Prof Carroll Morgan	55317/carrollm@cse.unsw.edu.au

1.5 Organisational Unit responsible for course

Prof Carroll Morgan

School: CSE Faculty: Engineeering

Academic Group Code (Faculty):	School of Computer Science and Engineering, AOU Code COMPSC

Academic Organisation Code (Owner): Faculty of Engineering (ENG)

1.6 Justification of Proposal

Formal Methods is the study and application of theoretical (mathematical) computer-science principles to the construction of correct software, and to the checking that (existing, e.g. legacy) software is correct. At the undergraduate level it is generally considered to be too onerous, and to much of a distraction, to be worth the effort; and it does make higher-than-average mathematical demands on students. Its application to industrial-strength systems requires specialised software tools operated by highly trained software analysts.

(In-)Formal Methods (intended to be a provocative title) is the collection of program structuring- and design principles that are based on and justified by Formal Methods — but because Formal Methods has its reputation of being difficult and esoteric, the principles are largely ignored. In spite of their being known and understood by specialists for 40 years, it is rare to find an undergraduate course in which they are taught. As a result, *programmers of average aptitude produce code of a very low standard.* (Programmers of high natural aptitude discover their own versions of some of these principles for themselves — eventually.)

Thus this proposal –in its first component– is to introduce the mathematically justified principles of program structure in the style of "advanced programming techniques" but without the emphasis on theory that typically dooms Formal Methods courses to small specialised audiences. Good students will find their intuitions justified, and (some) will be stimulated to look into the material more deeply; average students will improve their programming skills significantly.

The second component of the course will focus on two up-to-date system paradigms specifically: randomised algorithms and secure computation. The emphasis will be on how the principles set out in the first half of the course can be extended to these more specialised topics.

More able students completing the course will be positioned to study Formal Methods (itself) more deeply, a career trajectory that leads to very highly regarded (and -paid) jobs in industry where computer-system correctness is at a premium. Furthermore, the methods apply equally to hardware as they do to software.

It is disjoint from existing courses on formal-methods tools (The B-methods course COMP 2111, System Modelling and Design COMP 9116) because it doesn't rely on tools; it is disjoint from existing courses on (random) algorithms (to the extent they appear in COMP3121, COMP3821, COMP4121, COMP9101, COMP9801) and security (COMP 3441/9441, COMP 9447, COMP 4442) because it is not an introduction to those topics *per se* but rather concentrated on the programming principles that should accompany them.

1.7 Consultation Process

Lecturers of the related CSE courses on B method, security and algorithms have been consulted, as as well as the program coordinators and the school Teaching Committee.

The School of Mathematics has been consulted on pre-requisites.

1.8 Units of credit (UOC) 6

Session/s offered s1
Hours Per Week 3L 1T

1.9 Pre-requisites:

UGRD: MATH1081 or 6UoC MATH2###; completion of 12UoC of Level 3 COMP.
PGRD: COMP9020 or equivalent.

Co-requisites:
Exclusions:

1.10 Proposed Entry in the Faculty Handbook (including course description)

(In-)Formal Methods are practical structuring and design patterns that encourage programming that is easy to understand and to maintain. They are only a part of the large body of "good programming practices," distinguished from that larger set because –for the methods we consider–

the computer-science community has determined the *science* behind the structures: we know why they are effective.

Unusually, this course does not take the traditional route of teaching that science first, and then turning it into practical programming "tools-of-thought." Instead, we teach the mental tools first, try them on examples and only then, once their effectiveness has been demonstrated, will we look behind the scenes to see where they come from.

Initially the material will deal with conventional programs, those that must "give the right output." (This is known as *functional* correctness, and a sorting program is a simple example.) Later in the course we will look at additional correctness criteria, such as *security* (perform this calculation in a way that keeps part of the answer hidden) and *randomisation* (implement over-the-internet protocols that depend intrinsically on coin-flipping). Those last two topics will draw on up-to-the-minute research.

1.11 Is this course replacing an existing course? NO
1.12 Undergraduate & Postgraduate Both.
1.13 Elective

1.14 Program stage
Stage 4 or Masters, first offered S1 2010

1.15 Program/s in which course is be available
All CSE programs

1.16 Proposed teaching methods and assessment practices
Lectures plus tutorials and homework assignments

1.17 Assessment grades to be used
Full range of grades ie. HD, DN, CR, PS, FL;

1.18 Mode of delivery

Internal X	
External	
Other (specify)	

1.19 Information Technology Requirements for students
None.

1.20 Textbooks
No set text, the course will be based on selected readings from the literature.

1.21 Industrial experience component
None.

2. RESOURCE STATEMENT

2.1 Enrolments

Estimated or proposed enrolments for the next three years.

2010: 15
2011: 30
2012: 40

2.2 Resource Requirements

Staffing Requirements:

Hours per week

10	Full-time Academic Staff
	Part-time Teaching Staff
	General Staff

Field Costs:	
Studio/Laboratory Requirements:	
Materials Requirements:	
Equipment Costs:	
Computing Requirements:	
Library Requirements:	
Capital Funds Requirements:	

2.3 Servicing Implications:

N/A

2.4 Teaching Arrangements:

(i) Will other units contribute on a regular basis to the teaching of this course?

YES	
NO X	

(ii) If so, which units are involved and what proportion of the course will they teach?

1. Alternative Delivery Arrangements:

N/A

2.6 Details of Tuition Fees:

Fees for courses are calculated on a pro-rata basis.

Proposed fee: Standard

$	for non-award enrolment (local)
$	for non-award enrolment (international)
$	for course which forms part of full fee-paying program (for local students)
$	for course which forms part of full fee-paying program (for international students)

3. AUTHORISATION

3.1 University Librarian's Endorsement

Note: *this section of the Proposal must be signed by a Library representative, stating:*

I have examined the Library needs related to the above proposal and certify that existing Library holdings, staffing, services and accommodation are adequate / inadequate (delete one) to cover the demands that are inherent in it.

Appropriate arrangements for the use of digitised material to support this course have been made by the Course Authority with the University Librarian.

Further Comments:

University Librarian
/ /2009

3.2 Head of School's Approval

Note: *this section of the Proposal must be signed by the Head of School, stating:*

I have examined the resource implications of the above proposal in regard to staff, space, materials, equipment, capital funds, and computing, and certify that the School can cover the demands that are inherent in it.

Further Comments:

Head of School
/ /2009

3.3 Dean's Approval

Note: *this section of the Proposal must be signed by the Dean, stating:*

I have examined the resource implications of the above proposal in regard to staff, space, materials, equipment, capital funds, and computing, and certify that:

(Tick whichever is applicable)

3.3.1 (i) the proposal involves no additional resources. (A statement from the Head of School explaining how this can be achieved must be provided); or

(ii) the proposal involves additional resources and it is proposed to redeploy existing resources within the faculty. (A statement from the Head of School explaining how this will be achieved must be provided); or

(iii) the proposal involves additional resources to be obtained as set out below; or

(iv) the additional resources essential to bring the proposal into effect cannot be found within resources available to the faculty.

3.3.2 **Fees** (delete if not applicable):

A fee will not be charged for this program (other than HECS)

If a fee is to be charged the Dean certifies as follows:

I have ensured that the Vice-Chancellor has been advised of the proposed fee arrangements, and note that approval of fee arrangements is needed before the new program can be implemented.

3.3.3 the proposal conforms to the University's commitment to Equal Opportunity in Education.

Statement from Head of School on Source of Additional Resources and/or Further Comments:

Dean
 / /2009