

Module Information

Module Identifier	CS20410
Module Title	The Advanced Mathematics Driving License for Computer Science
Academic Year	2014/2015
Co-ordinator	<u>Dr Lynda Ann Thomas (mailto:ltt@aber.ac.uk?subject=CS20410)</u>
Semester	Semester 1
Mutually Exclusive	<u>CS10510 (?m=CS10510)</u>
Pre-Requisite	<u>CS10410 (?m=CS10410)</u>
Other Staff	<u>Dr Lynda Ann Thomas (mailto:ltt@aber.ac.uk?subject=CS20410)</u> <u>Dr Frederick William Long (mailto:fwl@aber.ac.uk?subject=CS20410)</u>

Course Delivery

Delivery Type	Delivery length / details
Lecture	20 Hours.
Practical	6 x 1 hour workshops

Assessment

Assessment Type	Assessment length / details	Proportion
Semester Exam	2 Hours CONVENTIONAL WRITTEN EXAM	100%
Supplementary Exam	2 Hours SUPPLEMENTARY WRITTEN EXAM	100%

Learning Outcomes

On successful completion of this module students should be able to:

1. Number Representation

- Carry out calculations in 2's complement and excess-n representations
- Calculate precision and accuracy of floating point representations
- Give examples of unexpected results of comparison that occur with floating point representations, and suggest programming alternatives.

2. Geometry

- relate concepts from 2 and 3-dimensional coordinate geometry to vector algebra
- perform computations using vectors and matrices to implement elementary algorithms used in computer graphics and robotics

3. Counting Techniques

Use sum and product rules, inclusion exclusion and the pigeonhole principle to answer questions about data and communications resources.

4. Probability and Statistics

- describe the concept of variability and its manifestation in statistical diagrams;
- describe the concepts involved in the statistical modelling of randomness.

5. Induction

Carry out proof by induction and complete induction over N.

6. Calculus

- calculate the gradient of a curve and locate maxima, minima and turning points of a function;

b) calculate indefinite and definite integrals and find the area under a curve;

Brief description

The module will provide a range of skills needed for successful study in graphics, communications, algorithm analysis, artificial intelligence, robotics and formal methods.

Content

This module aims to provide students with the skills needed for successful completion of Part II courses on: Graphics (geometry), Communications (information theory and coding, network planning, network management), Robotics (kinematics), Artificial Intelligence (learning), Vision (functions and their gradients), Image processing (vectors and matrices) and Quantitative Methods (metrics).

1.Number representation: (4 lectures)

Calculations in 2's complement and excess-n representations; precision and accuracy of floating point representations; examples of zero-divisions and unexpected results of comparison that occur because a floating point representation comprises a finite set of representatives of real intervals; programming alternatives; cancellation and guard digits.

2.Geometry: (4 lectures)

2 and 3-dimensional coordinate geometry; basic trigonometrical functions and identities, relating angles in different quadrants; vector and matrix algebra; elementary algorithms in computer graphics and robotics.

3.Counting Techniques: (4 lectures)

Sum and product rules, inclusion exclusion and the pigeonhole principle; application of counting techniques to problems in data structures and communications. Summarising data. Shapes of distributions. Binomial experiments and large sample behaviour. The Poisson distribution as a model for randomness. Quick and graphical tests for the Poisson distribution. Waiting times and the exponential distribution. Basic ideas of significance and goodness of fit.

4.Induction: (4 lectures)

What is induction? Proof by induction over N ; the Principle of Complete Induction.

5.Calculus: (4 lectures)

Gradient of a curve; maxima, minima and turning points of a function; indefinite and definite integrals; area under a curve.

Module Skills

Skills Type	Skills details
Application of Number	a principal focus of the module, along with application of symbols
Improving own Learning and Performance	by mastering Mathematical skills which facilitate learning in many other areas of Computer Science and Software Engineering
Problem solving	by completing set worksheets
Subject Specific Skills	Numeracy, symbol manipulation, abstraction

Reading List

Recommended Text

Croft, Tony (1997.) *Foundation maths /Anthony Croft, Robert Davison*. 2nd ed. Addison Wesley [Primo search](#)
(http://primo.aber.ac.uk/primo_library/libweb/action/search.do?v1%28freeText0%29=Foundation+maths+%2FAnthony+Croft%2C+Robert+Davison.+Croft%2C+Tony&fn=search&vid=ABERU_VU1)

James, Glyn. (2001.) *Modern engineering mathematics /Glyn James ... [et al.]*. 3rd ed. Prentice Hall [Primo search](#)
(http://primo.aber.ac.uk/primo_library/libweb/action/search.do?v1%28freeText0%29=Modern+engineering+mathematics+%2FGlyn+James+...+%5Bet+al.%5D.+James%2C+Glyn.&fn=search&vid=ABERU_VU1)

Rosen, Kenneth H. (1999.) *Discrete mathematics and its applications /Kenneth H. Rosen*. 4th ed. WCB/McGraw-Hill [Primo search](#)
(http://primo.aber.ac.uk/primo_library/libweb/action/search.do?v1%28freeText0%29=Discrete+mathematics+and+its+applications+%2FKenneth+H.+Rosen.+Rosen%2C+Kenneth+H.&fn=search&vid=ABERU_VU1)

Notes

This module is at CQFW (<http://wales.gov.uk/topics/educationandskills/qualificationsinwales/creditqualificationsframework/?lang=en>) Level 5