



THE UNIVERSITY OF WESTERN AUSTRALIA
Achieving International Excellence

Faculty of Engineering, Computing and Mathematics

Bachelor of Computer and Mathematical Sciences

Standard Courses Booklet 2009

This guide is intended for students entering or re-enrolling in the Bachelor of Computer and Mathematical Sciences course. It should be read in conjunction with the 2009 Undergraduate Handbook which contains the Faculty of Engineering, Computing and Mathematics Rules and descriptions of the various units available in the course. The full-length Undergraduate Handbook is available on the web at <http://handbooks.uwa.edu.au/undergraduate>.

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Introduction

The Bachelor of Computer and Mathematical Sciences (BCM) course is taught primarily by the Schools of Computer Science and Software Engineering (CSSE) and Mathematics and Statistics (M&S). It is intended for students with strong interests in computer science and/or mathematics who wish to pursue a career in which these subjects form a central part or complement another discipline.

The course is structured so that all students undertake at least two units in both computer science and mathematics at levels one and two. At level three, all students in the BCM course must take two majors. At least one major must be from CSSE or M&S Majors available from these schools and their codes are listed below:

- Systems MJ-SYSTEM
- Web Technologies MJ-TCHWB
- Entertainment Technologies MJ-TCHET
- Computation MJ-COMPT
- Applied Mathematics MJ-MTAPP
- Pure Mathematics MJ-MTPUR
- Mathematical Sciences MJ-MTHSC
- Mathematical Statistics MJ-MTSTS
- Applied Statistics MJ-MTAST

These studies may also be combined with other approved majors available within the Engineering Schools in the Faculty, or within the University including majors from the UWA Business School, Arts, Humanities and Social Sciences, and Life and Physical Sciences.

Handbook

The details of units, including any unit pre-requisites, are available in the UWA Handbook at: <http://units.handbook.uwa.edu.au>

The rules for the BCM course, and the general rules applying to all students are also available in the UWA Handbook at: www.handbook.uwa.edu.au

Students Enrolling for the First Time

Students entering the University for the first time should see a course adviser for the BCM to discuss their proposed course. Advisers will be available at the scheduled enrolment session for new students in January 2008. A detailed enrolment information package, giving details of the sessions and enrolment procedures, will be sent to new students. Students can also contact the Faculty Office (details below).

Re-enrolling Students

Students are expected to re-enrol online in approximately late-November – early-December of every year. Details of enrolment dates will be sent out in an email from Student Administration to your student email address.

Students who need assistance with re-enrolment should contact a course adviser or the Faculty Office (details below).

Contact Details

Students can obtain course advice from the Schools of Mathematics and Statistics and Computer Science as well as the Faculty Office.

For a list of advisers, please visit <http://www.ecm.uwa.edu.au/studentnet/undergrad-advisors>
The contact details for the Faculty Office are as follows:

Associate Dean (Students)

Phone: (+61 8) 6488 3061

Email: Sub-dean.ecm@uwa.edu.au

Also, you can visit the Faculty Office, which is located on the Second Floor of the Electrical Engineering Building (near Fairway entrance 2). A map and further contact details are available at: <http://www.ecm.uwa.edu.au/studentnet/student-centres>.

Section A: Course Structure

Students may wish to consult the *Bachelor of Computer and Mathematical Sciences study guide for 2009* available online at: www.ecm.uwa.edu.au/studentnet/study-guides. The study guide contains an overview of the course structure (which is also provided below).

The BCM course is 144 points consisting of the following:

- Two majors, at least one of which must be from Computer Science or Mathematics and Statistics;
- At least 12 points Level 1 and 12 points Level 2 Computer Science units;
- At least 12 points Level 1 and 12 points Level 2 Mathematics and Statistics units;

A major in the Schools of Computer Science and Software Engineering and Mathematics and Statistics comprises Level 1 units in the relevant subject area to the value of 12 points and Level 2 or 3 units in the relevant subject area to the value of 42 points, of which at least 24 points must be from Level 3 units, including specific requirements as set out in the relevant rule for each major.

Students should choose their Computer Science, Mathematics and Statistics, and elective units **in light of the majors they intend to complete**. That is, students should have an idea of the majors they wish to complete, and should choose their units so as to meet the requirements of these majors.

A full time student would complete the course as follows:

Year 1
CITS1200 Java Programming
6 points Level 1 Computer Science units*
12 points Level 1 Mathematics and Statistics units*
24 points elective units/second major units*
Year 2
12 points Level 2 Computer Science units*
12 points Level 2 Mathematics and Statistics units*
24 points elective units/second major units
Year 3
24 points Level 3/Level 4 Computer Science or Mathematics and Statistics major units*
24 points elective units/second major units
* Students should select these units based on their intended majors to ensure that they have completed the correct pre-requisites.

Section B: Computer Science and Mathematics and Statistics Units 2009

Computer Science Units 2009

Level 1		
First Semester	Second Semester	Requisite prior studies
	CITS1005 Computing for Engineers and Scientists	TEE Applicable Mathematics or TEE Calculus or TEE Discrete Mathematics
CITS1200 Java Programming**	CITS1200 Java Programming**	TEE Discrete Mathematics or TEE Applicable Mathematics or TEE Calculus
	CITS1210 C Programming	TEE Discrete Mathematics or TEE Applicable Mathematics or TEE Calculus
CITS1231 Web Technologies		None
	CITS1220 Software Engineering	TEE Discrete Mathematics or TEE Applicable Mathematics or TEE Calculus

Level 2		
First Semester	Second Semester	Requisite prior studies
CITS2200 Data Structures and Algorithms		CITS1200 Java Programming or CITS1220 Software Engineering <i>Advisable prior study: an additional programming unit</i>
	CITS2211 Discrete Structures	None
CITS2220 Software Engineering: Design		None <i>Advisable prior study: CITS1220 Software Engineering is desirable</i>
	CITS2230 Operating Systems	CITS2200 Data Structures and Algorithms <i>Advisable prior study: knowledge of the C programming language; CITS1210 C Programming is desirable</i>
CITS2232 Databases		CITS1200 Java Programming or CITS1210 C Programming or CITS1220 Software Engineering or CITS1005 Computing for Engineers and Scientists. Incompatible: CITS3240 (old unit)
	CITS2231 Graphics	<i>one of</i> CITS1200 Java Programming, CITS1210 C Programming or CITS1220 Software Engineering

Level 3		
First Semester	Second Semester	Requisite prior studies
	CITS3200 Professional Computing	CITS2200 Data Structures and Algorithms
CITS3201 Human – Computer Interaction		(one of CITS1200 Java Programming, CITS1210 C Programming or CITS1220 Software Engineering) or CITS1005 Computing for Engineers and Scientists
	CITS3210 Algorithms	CITS2200 Data Structures and Algorithms
	CITS3220 Software Requirement and Project Management	<i>Advisable prior study:</i> experience in software development
CITS3230 Computer Networks		CITS2200 Data Structures and Algorithms <i>advisable prior study:</i> CITS 1210 C Programming and CITS 2230 Operating Systems are desirable
	CITS3231 Security and Privacy	CITS2230 Operating Systems or CITS3230 Computer Networks <i>Advisable prior study:</i> knowledge of the C language; CITS1210 C Programming is desirable
CITS3241 Robotics		<i>Advisable prior study:</i> Students must have the ability to program in a high-level programming language and to reason in linear algebra and calculus at the level of MATH1050 Calculus C or equivalent.
CITS3242 Programming Paradigms		CITS2200 Data Structures and Algorithms

Level 4		
First Semester	Second Semester	Requisite prior studies
CITS4211 Artificial Intelligence		CITS2200 Data Structures and Algorithms <i>Incompatibility:</i> CITS7210 Algorithms for Artificial Intelligence
CITS4220 Software Quality & Measurement		CITS2220 Software Engineering: Design
	CITS4222 Software Engineering Industry Project Leadership	CITS3200 Professional Computing and completion of three years of a bachelor's degree
	CITS4230 Internet Technologies	one of CITS1200 Java Programming, CITS1210 C Programming, CITS1220 Software Engineering <i>Advisable prior study:</i> CITS2232 Databases
CITS4240 Computer Vision		<i>Advisable prior study:</i> Students must have the ability to program in a high-level programming language and the ability to reason in linear algebra and calculus
	CITS4242 Game Design and Multimedia	CITS2231 Graphics

Mathematics and Statistics Units 2009

Level 1		
First Semester	Second Semester	Requisite prior studies
MATH1010 Calculus and Linear Algebra **	MATH1010 Calculus and Linear Algebra **	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods
MATH1020 Calculus, Probability and Statistics **	MATH1020 Calculus, Probability and Statistics **	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> STAT1510 Statistics A, STAT1530 Statistics B, STAT1520 Economic and Business Statistics, MATH2030 Calculus and Matrix Methods, STAT1160 Statistics A, STAT1123 Statistics B, STAT1106 Economic and Business Statistics, MATH1025 Calculus and Matrix Methods
MATH1025 Calculus and Matrix Methods		Both TEE Applicable Mathematics and TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability, MATH2030 Calculus and Matrix Methods
MATH1040 Calculus B		TEE Applicable Mathematics or MATH1050 Calculus C <i>incompatibility:</i> a score of greater than 54 in TEE Calculus; MATH1030 Calculus A
	STAT1510 Statistics A	TEE Applicable Mathematics or TEE Calculus or MATH1030 Calculus A or MATH1040 Calculus B or a scaled mark of at least 69 in MATH1050 Calculus C. Basic Calculus will be assumed <i>incompatibility:</i> MATH1020 Calculus, Statistics and Probability, STAT1530 Statistics B, STAT1520 Economic and Business Statistics, STAT1123 Statistics B, STAT1106 Economic and Business Statistics, STAT1160 Statistics A, STAT2210 Biometrics 1
Students with a mark of 50-54% in TEE Calculus are strongly advised not to take MATH1010 or MATH1020.		

Level 2		
First Semester	Second Semester	Requisite prior studies
MATH2209 Calculus and Probability		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods, MATH2210 Calculus and Algebra
	MATH2020 Multivariable Calculus and Linear Algebra	MATH2209 Calculus and Probability <i>incompatibility:</i> MATH2217 Mathematics E2A, MATH2235 Mathematics E2C, MATH2040 Engineering Mathematics, MATH2213 Algebra A, MATH2223 Calculus Methods
MATH2030 Calculus and Matrix Methods		Both TEE Applicable Maths and TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability, MATH1025 Calculus and Matrix Methods
	MATH2300 Fundamental Concepts in Mathematics	MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability
MATH2224 Operations Research		MATH1010 Calculus and Linear Algebra or MATH2030 Calculus and Matrix Methods (may be taken concurrently) or MATH1025 Calculus and Matrix Methods (may be taken concurrently)
MATH2200 Applied Mathematics		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>co-requisite:</i> M2209 Calculus and Probability <i>incompatibility:</i> MATH2040 Engineering Mathematics, MATH2235 Mathematics E2C, MATH2217 Mathematics E2A

Continued on next page

Level 2 cont.		
	STAT2225 Statistical Science	MATH2209 Calculus and Probability or all of MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability and FINA2205 Quantitative Methods for Finance <i>incompatibility:</i> STAT2226 Statistical Models for Data
STAT2227 Applied Linear Modelling		STAT1160 Statistics A or STAT1106 Economics and Business Statistics or STAT1510 Statistics A or STAT1520 Economic and Business Statistics or MATH1020 Calculus, Statistics and Probability
	STAT2226 Statistical Models for Data	STAT1160 Statistics A or STAT1106 Economic and Business Statistics or STAT1510 Statistics A or STAT1520 Economic and Business Statistics or MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> STAT2225 Statistical Science

Level 3		
First Semester	Second Semester	Requisite prior studies
MATH3300 3PO: Introduction to Geometric Topology		MATH2209 Calculus and Probability or MATH2040 Engineering Mathematics
	MATH3321 3OR: Operations Research	MATH2224 Operations Research
MATH3322 3A2: Numerical Analysis and Numerical Computing		(MATH2209 Calculus and Probability and MATH2020 Multivariable Calculus and Linear Algebra) or (MATH2209 Calculus and Probability and MATH2213 Algebra A)
MATH3324 3A4: Control Theory		MATH2209 Calculus and Probability or MATH2040 Engineering Mathematics
	MATH3325 3A5: Continuum Mechanics and Industrial Modelling	(MATH2209 Calculus and Probability and MATH2020 Multivariable Calculus and Linear Algebra) or (MATH2209 Calculus and Probability and MATH2213 Algebra A and MATH2223 Calculus Methods)
	MATH3327 3A7: Chaos and Dynamical Systems	(MATH2209 Calculus and Probability and MATH2020 Multivariable Calculus and Linear Algebra) or (MATH2209 Calculus and Probability and MATH2213 Algebra A)

Level 3 cont.		
MATH3329 3A9: Advanced Topics in Applied Mathematics	MATH3329 3A9: Advanced Topics in Applied Mathematics	Available only by invitation from the Head of the School of Mathematics and Statistics
	MATH3333 3P3: Linear Analysis	(MATH2209 Calculus and Probability and MATH2213 Algebra A) or (MATH2209 Calculus and Probability and MATH2020 Multivariable Calculus and Linear Algebra)
	MATH3334 3CC: Codes and Ciphers	(MATH2213 Algebra A or MATH2214 Algebra B or MATH2040 Engineering Mathematics) or (MATH2020 Multivariable Calculus and Linear Algebra and MATH2040 Engineering Mathematics)
MATH3335 3P5: Groups and Symmetry		MATH2213 Algebra A or MATH2214 Algebra B or MATH2020 Multivariable Calculus and Linear Algebra
MATH3339 3P9: Advanced Topics in Pure Mathematics	MATH3339 3P9: Advanced Topics in Pure Mathematics	Available only by invitation from the Head of the School of Mathematics and Statistics
MATH3341 3M1: Mathematical Methods		(MATH2209 Calculus and Probability and MATH2020 Multivariable Calculus and Linear Algebra and MATH2200 Applied Mathematics) or (MATH2209 Calculus and Probability and MATH2213 Algebra A and MATH2223 Calculus Methods)
	MATH3342 3M2: Complex Variable Methods	MATH2209 Calculus and Probability or MATH2040 Engineering Mathematics <i>incompatibility:</i> MATH3358 Mathematics E3A
	MATH3370 3ALG: Rings, Fields and Matrix Algebras	MATH2020 Multivariable Calculus and Linear Algebra or MATH2213 Algebra A or MATH2300 Fundamental Concepts in Mathematics
STAT3361 3S1: Random Processes and Their Applications		MATH2209 Calculus and Probability or STAT2226 Statistical Models for Data or MATH2218 Mathematics E2B or FINA2205 Quantitative Methods for Finance
	STAT3364 3S4: Applied Probability in Commerce and Finance	STAT2225 Statistical Science or MATH3358 Mathematics E3A or MATH3359 Mathematics E3B or FINA2205 Quantitative Methods for Finance <i>advisable prior study:</i> STAT3361 3S1: Random Processes and Their Applications

Level 3 cont.		
	STAT3365 3S5: Industrial Statistics and Total Quality Management	STAT2226 Statistical Models for Data or MATH1020 Calculus, Statistics and Probability or MATH2218 Mathematics E2B or STAT1106 Economic and Business Statistics or STAT1160 Statistics A or STAT1520 Economic and Business Statistics or STAT 1510 Statistics A
STAT3366 3S6: Applied Statistical Methods		(STAT2225 Statistical Science or STAT2226 Statistical Models for Data) and at least concurrently STAT2227 Applied Linear Modelling
STAT3368 3S8: Practicum in Statistics	STAT3368 3S8: Practicum in Statistics	STAT2225 Statistical Science and at least concurrently STAT2227 Applied Linear Modelling) or (STAT2226 Statistical Models for Data and at least concurrently STAT2227 Applied Linear Modelling)
STAT3369 3S9: Advanced Topics in Mathematical Statistics	STAT3369 3S9: Advanced Topics in Mathematical Statistics	Available only by invitation from the Head of the School of Mathematics and Statistics
	STAT3400 3S0: Mathematical Statistics, Large Sample Theory	STAT2225 Statistical Science

Section C: Computer Science and Mathematics and Statistics Majors

Computer Science Majors

The following majors are available in Computer Science:

- Systems (MJ-SYSTEM) (Page 13)
- Web Technologies (MJ-TCHWB) (Page 14)
- Entertainment Technologies (MJ-TCHET) (Page 15)
- Computation (MJ-COMPT) (Page 16)
- Systems Management (MJ-SYSTEM) (Page 17)

SYSTEMS MAJOR (MJ-SYSTEM)

Level 1		
First Semester	Second Semester	Requisite prior studies
CITS1200 Java Programming	CITS1200 Java Programming	TEE Discrete Maths or TEE Applicable Maths or TEE Calculus
Level 2		
First Semester	Second Semester	Requisite prior studies
CITS2200 Data Structures and Algorithms		CITS1200 Java Programming or CITS1220 Software Engineering <i>Advisable prior study:</i> an additional programming unit
	CITS2230 Operating Systems	CITS2200 Data Structures and Algorithms <i>Advisable prior study:</i> knowledge of the C programming language; CITS1210 C Programming is desirable
CITS2232 Databases		CITS1200 Java Programming or CITS1210 C Programming or CITS1220 Software Engineering or CITS1005 Computing for Engineers and Scientists <i>Incompatibility:</i> CITS3240 Databases (old unit)
Level 3		
First Semester	Second Semester	Requisite prior studies
	CITS3200 Professional Computing	CITS2200 Data Structures and Algorithms
CITS3230 Computer Networks		CITS2200 Data Structures and Algorithms <i>Advisable prior study:</i> CITS1210 C Programming and CITS2230 Operating Systems are desirable
	CITS3231 Security and Privacy	CITS2230 Operating Systems or CITS3230 Computer Networks <i>Advisable prior study:</i> knowledge of the C language; CITS1210 C Programming is desirable

WEB TECHNOLOGIES MAJOR (MF-TCHWB)

Level 1		
First Semester	Second Semester	Requisite prior studies
CITS1200 Java Programming	CITS1200 Java Programming	TEE Discrete Maths or TEE Applicable Maths or TEE Calculus
Level 2		
First Semester	Second Semester	Requisite prior studies
CITS2200 Data Structures and Algorithms		CITS1200 Java Programming or CITS1220 Software Engineering <i>Advisable prior study:</i> an additional programming unit
CITS2232 Databases		CITS1200 Java Programming or CITS1210 C Programming or CITS1220 Software Engineering or CITS1005 Computing for Engineers and Scientists <i>Incompatibility:</i> CITS3240 Databases (old unit)
Level 3		
First Semester	Second Semester	Requisite prior studies
	CITS3200 Professional Computing	CITS2200 Data Structures and Algorithms
CITS3201 Human Computer Interaction –		(one of CITS1200 Java Programming, CITS1210 C Programming, CITS1220 Software Engineering) or CITS1005 Computing for Engineers and Scientists
	CITS4230 Internet Technologies	one of CITS1200 Java Programming, CITS1210 C Programming, CITS1220 Software Engineering <i>Advisable prior study:</i> CITS2232 Databases

ENTERTAINMENT TECHNOLOGIES MAJOR (MJ-TCHET)

Level 1		
First Semester	Second Semester	Requisite prior studies
CITS1200 Java Programming	CITS1200 Java Programming	TEE Discrete Maths or TEE Applicable Maths or TEE Calculus
Level 2		
First Semester	Second Semester	Requisite prior studies
CITS2200 Data Structures and Algorithms		CITS1200 Java Programming or CITS1220 Software Engineering <i>Advisable prior study:</i> an additional programming unit
	CITS2231 Graphics	one of CITS1200 Java Programming, CITS1210 C Programming, CITS1220 Software Engineering
Level 3		
First Semester	Second Semester	Requisite prior studies
	CITS3200 Professional Computing	CITS2200 Data Structures and Algorithms
CITS3241 Robotics		<i>Advisable prior study:</i> Students must have the ability to program in a high-level programming language and to reason in linear algebra and calculus at the level of MATH1050 Calculus C or equivalent.
	CITS4242 Game Design and Multimedia	CITS2231 Graphics
CITS4211 Artificial Intelligence		CITS2200 Data Structures and Algorithms <i>Incompatibility:</i> CITS7210 Algorithms for Artificial Intelligence

COMPUTATION MAJOR (MJ-COMPT)

Level 1		
First Semester	Second Semester	Requisite prior studies
CITS1200 Java Programming	CITS1200 Java Programming	TEE Discrete Maths or TEE Applicable Maths or TEE Calculus
Level 2		
First Semester	Second Semester	Requisite prior studies
CITS2200 Data Structures and Algorithms		CITS1200 Java Programming or CITS1220 Software Engineering <i>Advisable prior study:</i> an additional programming unit
	CITS2211 Discrete Structures	None
Level 3		
First Semester	Second Semester	Requisite prior studies
	CITS3200 Professional Computing	CITS2200 Data Structures and Algorithms
	CITS3210 Algorithms	CITS2200 Data Structures and Algorithms
CITS3242 Programming Paradigms		CITS2200 Data Structures and Algorithms
CITS4211 Artificial Intelligence		CITS2200 Data Structures and Algorithms <i>Incompatibility:</i> CITS7210 Algorithms for Artificial Intelligence

SOFTWARE MANAGEMENT MAJOR (MJ-SFTMT)

Level 1		
First Semester	Second Semester	Requisite prior studies
CITS1200 Java Programming	CITS1200 Java Programming	TEE Discrete Maths or TEE Applicable Maths or TEE Calculus
Level 2		
First Semester	Second Semester	Requisite prior studies
CITS2200 Data Structures and Algorithms		CITS1200 Java Programming or CITS1220 Software Engineering <i>Advisable prior study:</i> an additional programming unit
CITS2220 Software Engineering: Design		<i>Advisable prior study:</i> CITS1220 Software Engineering is desirable
Level 3		
First Semester	Second Semester	Requisite prior studies
	CITS3200 Professional Computing	CITS2200 Data Structures and Algorithms
CITS3201 Human Computer Interaction		(one of CITS1200 Java Programming, CITS1210 C Programming, CITS1220 Software Engineering) or CITS1005 Computing for Engineers and Scientists
	CITS3220 Software Requirements and Project Management	<i>Advisable prior study:</i> experience in software development
CITS4220 Software Quality and Measurement		CITS2220 Software Engineering: Design

Mathematics and Statistics Majors

The following majors are available in Mathematics and Statistics:

- Applied Mathematics (MJ-MTAPP) (Pages 19 to 20)
- Pure Mathematics (MJ-MTPUR) (Pages 21 to 22)
- Mathematical Sciences (MJ-MTHSC) (Pages 23)
- Mathematical Statistics (MJ-MTSTS) (Pages 24 to 25)
- Applied Statistics (MJ-MTAST) (Pages 26 to 28)

The following tables set out the requirements for the majors in Mathematics and Statistics in the BCM. Where a student is given the choice of a specific level of unit, students are free to choose from any unit of that level from Mathematics and Statistics, but **should choose the units carefully so that they fulfil the pre-requisites for the units they are required to complete as part of the major.**

APPLIED MATHEMATICS MAJOR (MJ-MTAPP)

Level 1		
First Semester	Second Semester	Requisite prior studies
MATH1010 Calculus and Linear Algebra	MATH1010 Calculus and Linear Algebra	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods and MATH2030 Calculus and Matrix Methods
MATH1020 Calculus, Statistics and Probability	MATH1020 Calculus, Statistics and Probability	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> <u>STAT1510</u> Statistics A, <u>STAT1530</u> Statistics B, <u>STAT1520</u> Economic and Business Statistics, <u>MATH2030</u> Calculus and Matrix Methods, STAT1160 Statistics A, STAT1123 Statistics B, STAT1106 Economic and Business Statistics, <u>MATH1025</u> Calculus and Matrix Methods
Level 2		
First Semester	Second Semester	Requisite prior studies
	MATH2020 Multivariable Calculus and Linear Algebra	MATH2209 Calculus and Probability <i>incompatibility:</i> MATH2217 Mathematics E2A, MATH2235 Mathematics E2C, <u>MATH2040</u> Engineering Mathematics, MATH2213 Algebra A, MATH2223 Calculus Methods
MATH2200 Applied Mathematics		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>co-requisite:</i> M2209 Calculus and Probability <i>incompatibility:</i> <u>MATH2040</u> Engineering Mathematics, MATH2235 Mathematics E2C, MATH2217 Mathematics E2A
MATH2209 Calculus and Probability		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> <u>MATH1025</u> Calculus and Matrix Methods, <u>MATH2030</u> Calculus and Matrix Methods, MATH2210 Calculus and Algebra

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Level 3		
First Semester	Second Semester	Requisite prior studies
At least 3 units from the following units:		
	ENVE3605 Mathematical Applications in Environmental Engineering	<u>MATH2020</u> Multivariable Calculus and Linear Algebra <i>and</i> (<u>MATH2209</u> Calculus and Probability <i>or</i> <u>MATH2040</u> Engineering Mathematics <i>or</i> equivalent) <i>advisable prior study:</i> equivalent to Level 2 fluid mechanics, introductory programming skills
	MATH3321 30R: Operations Research	MATH2224 Operations Research
MATH3322 3A2: Numerical Analysis and Numerical Computing		(<u>MATH2209</u> Calculus and Probability <i>and</i> <u>MATH2020</u> Multivariable Calculus and Linear Algebra) <i>or</i> (<u>MATH2209</u> Calculus and Probability <i>and</i> MATH2213 Algebra A)
MATH3324 3A4: Control Theory		MATH2209 Calculus and Probability <i>or</i> MATH2040 Engineering Mathematics
	MATH3325 3A5: Continuum Mechanics and Industrial Modelling	(<u>MATH2209</u> Calculus and Probability <i>and</i> MATH2020 Multivariable Calculus and Linear Algebra) <i>or</i> (<u>MATH2209</u> Calculus and Probability <i>and</i> MATH2213 Algebra A <i>and</i> MATH2223 Calculus Methods)
	MATH3327 3A7: Chaos and Dynamical Systems	(<u>MATH2209</u> Calculus and Probability <i>and</i> MATH2020 Multivariable Calculus and Linear Algebra) <i>or</i> (<u>MATH2209</u> Calculus and Probability <i>and</i> MATH2213 Algebra A)
MATH3329 3A9 Advanced Topics in Applied Mathematics	MATH3329 3A9 Advanced Topics in Applied Mathematics	Available only by invitation from the Head of the School of Mathematics and Statistics
MATH3341 3M1: Mathematical Methods		(<u>MATH2209</u> Calculus and Probability <i>and</i> MATH2020 Multivariable Calculus and Linear Algebra <i>and</i> MATH2200 Applied Mathematics) <i>or</i> (<u>MATH2209</u> Calculus and Probability <i>and</i> MATH2213 Algebra A <i>and</i> MATH2223 Calculus Methods)
and		
A Level 3 unit from Mathematics and Statistics (<i>which can include an additional Level 3 unit from the list above</i>)		

PURE MATHEMATICS MAJOR (MJ-MTPUR)

Level 1		
First Semester	Second Semester	Requisite prior studies
MATH1010 Calculus and Linear Algebra	MATH1010 Calculus and Linear Algebra	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods
MATH1020 Calculus, Statistics and Probability	MATH1020 Calculus, Statistics and Probability	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> STAT1510 Statistics A, STAT1530 Statistics B, STAT1520 Economic and Business Statistics, MATH2030 Calculus and Matrix Methods, STAT1160 Statistics A, STAT1123 Statistics B, STAT1106 Economic and Business Statistics, MATH1025 Calculus and Matrix Methods
Level 2		
First Semester	Second Semester	Requisite prior studies
MATH2209 Calculus and Probability		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods, MATH2210 Calculus and Algebra
	MATH2300 Fundamental Concepts in Mathematics	MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability
A Level 2 or Level 3 unit from Mathematics and Statistics		
Level 3		
First Semester	Second Semester	Requisite prior studies
At least 3 units from the following units:		
MATH3300 3PO: Introduction to Geometric Topology		MATH2209 Calculus and Probability or MATH2040 Engineering Mathematics
	MATH3333 3P3: Linear Analysis	(MATH2209 Calculus and Probability and MATH2213 Algebra A) or (MATH2209 Calculus and Probability and MATH2020 Multivariable Calculus and Linear Algebra)
	MATH3334 3CC: Codes and Ciphers	(MATH2213 Algebra A or MATH2214 Algebra B or MATH2040 Engineering

		Mathematics) or (MATH2020 Multivariable Calculus and Linear Algebra and MATH2040 Engineering Mathematics)
MATH3335 3P5: Groups and Symmetry		MATH2213 Algebra A or MATH2214 Algebra B or <u>MATH2020</u> Multivariable Calculus and Linear Algebra
MATH3339 3P9: Advanced Topics in Pure Mathematics	MATH3339 3P9: Advanced Topics in Pure Mathematics	Available only by invitation from the Head of the School of Mathematics and Statistics
	MATH3342 3M2: Complex Variable Methods	<u>MATH2209</u> Calculus and Probability or <u>MATH2040</u> Engineering Mathematics <i>incompatibility:</i> MATH3358 Mathematics E3A
	MATH3370 3ALG: Rings, Fields and Matrix Algebras	<u>MATH2020</u> Multivariable Calculus and Linear Algebra or MATH2213 Algebra A or <u>MATH2300</u> Fundamental Concepts in Mathematics
and		
A Level 3 unit from Mathematics and Statistics (<i>which can include an additional Level 3 unit from the list above</i>)		

MATHEMATICAL SCIENCES (MJ-MTHSC)

Level 1		
First Semester	Second Semester	Requisite prior studies
Level 1 Mathematics and Statistics unit*		
Level 1 Mathematics and Statistics unit*		
Level 2		
First Semester	Second Semester	Requisite prior studies
Level 2 Mathematics and Statistics unit*		
Level 2 Mathematics and Statistics unit*		
Level 2 Mathematics and Statistics unit*		
Level 3		
First Semester	Second Semester	Requisite prior studies
Level 3 Mathematics and Statistics unit		
Level 3 Mathematics and Statistics unit		
Level 3 Mathematics and Statistics unit		
Level 3 Mathematics and Statistics unit		

***Students must complete one of the following units as part of their Level 1 or Level 2 units in order to complete the Mathematical Sciences major:**

First Semester	Second Semester	Requisite prior studies
MATH1025 Calculus and Matrix Methods		Both TEE Applicable Mathematics and TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability, MATH2030 Calculus and Matrix Methods
MATH2030 Calculus and Matrix Methods		Both TEE Applicable Maths and TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability, MATH1025 Calculus and Matrix Methods
MATH2209 Calculus and Probability		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods, MATH2210 Calculus and Algebra

MATHEMATICAL STATISTICS (MJ-MTSTS)

Level 1		
First Semester	Second Semester	Requisite prior studies
MATH1010 Calculus and Linear Algebra	MATH1010 Calculus and Linear Algebra	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods
MATH1020 Calculus, Statistics and Probability	MATH1020 Calculus, Statistics and Probability	TEE Applicable Mathematics and one of TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> STAT1510 Statistics A, STAT1530 Statistics B, STAT1520 Economic and Business Statistics, MATH2030 Calculus and Matrix Methods, STAT1160 Statistics A, STAT1123 Statistics B, STAT1106 Economic and Business Statistics, MATH1025 Calculus and Matrix Methods
Level 2		
First Semester	Second Semester	Requisite prior studies
	MATH2020 Calculus and Linear Algebra	MATH2209 Calculus and Probability <i>incompatibility:</i> MATH2217 Mathematics E2A, MATH2235 Mathematics E2C, MATH2040 Engineering Mathematics, MATH2213 Algebra A, MATH2223 Calculus Methods
MATH2209 Calculus and Probability		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods, MATH2210 Calculus and Algebra
	STAT2225 Statistical Science	MATH2209 Calculus and Probability or all of MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability and FINA2205 Quantitative Methods for Finance <i>incompatibility:</i> STAT2226 Statistical Models for Data

Continued on next page

Level 3		
First Semester	Second Semester	Requisite prior studies
At least 3 units from the following units:		
STAT3361 3S1: Random Processes and Their Applications		MATH2209 Calculus and Probability or STAT2226 Statistical Models for Data or MATH2218 Mathematics E2B or FINA2205 Quantitative Methods for Finance
	STAT3364 3S4: Applied Probability in Commerce and Finance	STAT2225 Statistical Science or MATH3358 Mathematics E3A or MATH3359 Mathematics E3B or FINA2205 Quantitative Methods for Finance <i>advisable prior study:</i> STAT3361 3S1: Random Processes and Their Applications
	STAT3365 3S5: Industrial Statistics and Total Quality Management	STAT2226 Statistical Models for Data or MATH1020 Calculus, Statistics and Probability or MATH2218 Mathematics E2B or STAT1106 Economic and Business Statistics or STAT1160 Statistics A or STAT1520 Economic and Business Statistics or STAT 1510 Statistics A
STAT3369 3S9: Advanced Topics in Mathematical Statistics	STAT3369 3S9: Advanced Topics in Mathematical Statistics	Available only by invitation from the Head of the School of Mathematics and Statistics
	STAT3400 3S0: Mathematical Statistics, Large Sample Theory	STAT2225 Statistical Science
and		
A Level 3 unit from Mathematics and Statistics (<i>which can include an additional Level 3 unit from the list above</i>)		

APPLIED STATISTICS (MJ-MTAST)

LEVEL 1		
First Semester	Second Semester	Requisite prior studies
Level 1 Mathematics and Statistics unit (<i>See below</i>)		
Level 1 Mathematics and Statistics unit (<i>See below</i>)		
Level 2		
First Semester	Second Semester	Requisite prior studies
Level 2 Mathematics and Statistics unit (<i>See below</i>)		
Level 2 Mathematics and Statistics unit (<i>See below</i>)		
Level 2 Mathematics and Statistics unit (<i>See below</i>)		
Level 3		
First Semester	Second Semester	Requisite prior studies
STAT3366 3S6: Applied Statistical Methods		(STAT2225 Statistical Science or STAT2226 Statistical Models for Data) and at least concurrently STAT2227 Applied Linear Modelling
Level 3 Group E Unit (<i>see page 28</i>)		
Level 3 Group E or Group F Unit (<i>see page 28</i>)		
Level 3 Group E or Group F Unit (<i>see page 28</i>)		

Students must complete:

1. one of the following units as part of their Level 1 or Level 2 units chosen:

First Semester	Second Semester	Requisite prior studies
MATH1025 Calculus and Matrix Methods		Both TEE Applicable Mathematics and TEE Calculus or MATH1040 Calculus B or MATH1030 Calculus A <i>incompatibility:</i> MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability, MATH2030 Calculus and Matrix Methods
MATH2030 Calculus and Matrix Methods		(MATH1030 Calculus A or MATH1040 Calculus B) or (TEE Calculus and TEE Applicable Mathematics) <i>incompatibility:</i> MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability, MATH1025 Calculus and Matrix Methods
MATH2209 Calculus and Probability		MATH1010 Calculus and Linear Algebra and MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> MATH1025 Calculus and Matrix Methods, MATH2030 Calculus and Matrix Methods, MATH2210 Calculus and Algebra

2. one of the following two combinations (Combination A or B):

Combination A

First Semester	Second Semester	Requisite prior studies
	STAT2225 Statistical Science	MATH2209 Calculus and Probability or all of MATH1010 Calculus and Linear Algebra, MATH1020 Calculus, Statistics and Probability and FINA2205 Quantitative Methods for Finance <i>incompatibility:</i> STAT2226 Statistical Models for Data
And one of the following two units:		
	MATH2020 Multivariable Calculus and Linear Algebra	MATH2209 Calculus and Probability <i>incompatibility:</i> MATH2217 Mathematics E2A, MATH2235 Mathematics E2C, MATH2040 Engineering Mathematics, MATH2213 Algebra A, MATH2223 Calculus Methods
STAT2227 Applied Linear Modelling		STAT1160 Statistics A or STAT1106 Economic and Business Statistics or STAT1510 Statistics A or STAT1520 Economic and Business Statistics or MATH1020 Calculus, Statistics and Probability

Combination B

First Semester	Second Semester	Requisite prior studies
Both of the following units		
	STAT2226 Statistical Models for Data	STAT1160 Statistics A or STAT1106 Economic and Business Statistics or STAT1510 Statistics A or STAT1520 Economic and Business Statistics or MATH1020 Calculus, Statistics and Probability <i>incompatibility:</i> STAT2225 Statistical Science
STAT2227 Applied Linear Modelling		STAT1160 Statistics A or STAT1106 Economics and Business Statistics or STAT1510 Statistics A or STAT1520 Economic and Business Statistics or MATH1020 Calculus, Statistics and Probability

Group E		
First Semester	Second Semester	Requisite prior studies
STAT3361 3S1: Random Processes and Their Applications		MATH2209 Calculus and Probability or STAT2226 Statistical Models for Data or MATH2218 Mathematics E2B or FINA2205 Quantitative Methods for Finance
	STAT3365 3S5: Industrial Statistics and Total Quality Management	STAT2226 Statistical Models for Data or MATH1020 Calculus, Statistics and Probability or MATH2218 Mathematics E2B or STAT1106 Economic and Business Statistics or STAT1160 Statistics A or STAT1520 Economic and Business Statistics or STAT1510 Statistics A
STAT3368 3S8: Practicum in Statistics	STAT3368 3S8: Practicum in Statistics	(STAT2225 Statistical Science and at least concurrently STAT2227 Applied Linear Modelling) or (STAT2226 Statistical Models for Data and at least concurrently STAT2227 Applied Linear Modelling)
STAT3369 3S9: Advanced Topics in Mathematical Statistics	STAT3369 3S9: Advanced Topics in Mathematical Statistics	Available only by invitation from the Head of the School of Mathematics and Statistics
Group F		
First Semester	Second Semester	Requisite prior studies
	ECON3371 Econometrics	ECON2272 Mathematics for Economists (or equivalent matrix algebra and statistics) and ECON2271 Business Econometrics (or equivalent)
PSYC3301 Psychological Research Methods: Design and Analysis		PSYC1101 Psychology: Mind and Brain, PSYC1102 Psychology: Behaviour in Context and PSYC2203 Psychological Research Methods
	PUBH8769 Biostatistics II	PUBH8753 Biostatistics I or equivalent training/experience
	STAT3364 3S4: Applied Probability in Commerce and Finance	STAT2225 Statistical Science or MATH3358 Mathematics E3A or MATH3359 Mathematics E3B or FINA2205 Quantitative Methods for Finance <i>advisable prior study:</i> STAT3361 3S1: Random Processes and Their Applications
	STAT3400 3S0: Mathematical Statistics, Large Sample Theory	STAT2225 Statistical Science

Section D: Requirements for the Second Major in the Bachelor of Computer and Mathematical Sciences

Students in the Bachelor of Computer and Mathematical Sciences **must** complete **two majors**.

The **first major** must be selected from one of the majors available in Computer Science or Mathematics and Statistics (see pages 17 to 28).

The **second major** may be selected from the following:

- A second major in Computer Science (see pages 30 to 31)
- A second major in Mathematics and Statistics (see page 32)
- A second major from Engineering (see page 33 to 36)
- A second major from elsewhere in the University (see pages 37 to 38)

It is essential that students choose their units in the first and second year so as to ensure that they have **both** the required pre-requisites for the units in the second major **and** the required units for the second major.

Students in the Bachelor of Computer and Mathematical Sciences **must** complete 144 points; however some combinations of majors and required units will leave students with less than 144 points. Students are then required to choose the remaining units as electives (see page 39 for details of electives).

A Second Major in Computer Science

If a student has completed a major in Mathematics and Statistics as their first major, then the Computer Science major is simply the required units for the major as set out in the tables on pages 13 - 17.

Where a student is undertaking their **first major in Computer Science** and wishes to also complete a second major in Computer Science, they must complete the following units in addition to the requirements of the first major:

1. The remaining units listed in the major requirements (see pages 13 to 17) (*the units that have not yet been taken as part of the course*); and
2. Enough units from the Level 3 and Level 4 units offered in Computer Science to ensure that they have completed a total of eight (8) Level 3/Level 4 units across the course (see tables below).

Any remaining units to make up 144 points should be taken as electives (see page 39).

Level 3 and Level 4 Computer Science Units

Level 3		
First Semester	Second Semester	Requisite prior studies
	CITS3200 Professional Computing	CITS2200 Data Structures and Algorithms
CITS3201 Human – Computer Interaction		(one of CITS1200 Java Programming, CITS1210 C Programming, CITS1220 Software Engineering) or CITS1005 Computing for Engineers and Scientists
	CITS3210 Algorithms	CITS2200 Data Structures and Algorithms
	CITS3220 Software Requirements and Project Management	<i>Advisable prior study:</i> experience in software development
CITS3230 Computer Networks		CITS2200 Data Structures and Algorithms <i>Advisable prior study:</i> CITS1210 C Programming and CITS2230 Operating Systems are desirable
	CITS3231 Security and Privacy	CITS2230 Operating Systems or CITS3230 Computer Networks <i>Advisable prior study:</i> knowledge of the C language; CITS1210 C Programming is desirable
CITS3241 Robotics		<i>Advisable prior study:</i> Students must have the ability to program in a high-level programming language and to reason in linear algebra and calculus at the level of MATH1050 Calculus C or equivalent.
CITS3242 Programming Paradigms		CITS2200 Data Structures and Algorithms

Continued on next page

Level 4		
First Semester	Second Semester	Requisite prior studies
CITS4211 Artificial Intelligence		CITS2200 Data Structures and Algorithms <i>Incompatibility:</i> CITS7210 Algorithms for Artificial Intelligence
CITS4220 Software Quality and Measurement		CITS2220 Software Engineering: Design
	CITS4230 Internet Technologies	one of CITS1200 Java Programming, CITS1210 C Programming, CITS1220 Software Engineering <i>Advisable prior study:</i> CITS2232 Databases
CITS4240 Computer Vision		<i>Advisable prior study:</i> Students must have the ability to program in a high-level programming language and the ability to reason in linear algebra and calculus.
	CITS4242 Game Design and Multimedia	CITS2231 Graphics

A Second Major in Mathematics and Statistics

Where a student has chosen their **first major** from Computer Science, and wishes to complete their **second major** in Mathematics and Statistics, they must complete the requirements for the major as set out in the tables on pages 18 to 28.

Where a student has chosen their **first major** from Mathematics and Statistics, and wants to complete a **second major in Mathematics and Statistics**, they must complete the following requirements:

1. The remaining units required for the major listed in the tables on pages 18 to 28 (*i.e. the units that have not yet been completed*) **except** for where the unit is just a general Mathematics and Statistics unit (e.g. "Level 2 Mathematics and Statistics unit") (*See note below*); and
2. Enough units from the Level 3 units offered in Mathematics and Statistics to ensure that they have completed a total of eight (8) Level 3 Mathematics and Statistics units across the course.

Please note: Students may not count a Level 3 unit towards more than one major, but students may count Level 1 and 2 units towards more than one major. Therefore, **a student must complete** at least 12 points Level Mathematics and Statistics, 18 points Level 2 Mathematics and Statistics and 48 points Level 3 Mathematics and Statistics to complete two Mathematics and Statistics majors.

A Second Major from Engineering

Students have the opportunity to complete their second major as an Engineering major. Students must complete the requirements for the majors as set out below.

The following Engineering majors are available in the BCM:

- Applied Ecology
- Electronics and Computer Hardware
- Environmental Fluid Dynamics
- Hydrology
- Mechanical Engineering
- Materials Engineering
- Mechatronics Engineering
- Oceanography

APPLIED ECOLOGY (MJ-EAPEC)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	Four of the following units:
MATH1020 Calculus, Statistics and Probability*	CHEM1101 Physical and Inorganic Chemistry	ENVE4608 Applied Aquatic Ecology
BIOL1130 Concepts in Biology	ENVE2602 Environmental Fluid Mechanics	ENVE3606 Contaminant Fate and Transport
ENVE2601 Data Collection and Analysis	ENVE3604 Ecological Engineering	SCIE3307 Biological Oceanography
ENVE1601 Environmental Systems Engineering		ENVT3305 Ecosystem Biogeochemistry
and one of the following units:		PLNT3313 Plant Environment Systems: Analysis and Simulation
EART1105 Earth and Environment: Dynamic Planet		ENVE4614 Oceanographic Engineering
PHYS1131 Introductory Physics		ENVE4615 Physical Oceanography
GENG1001 Engineering: Introduction to Engineering Mechanics		ENVE3601 Environmental Fluid Dynamics
* In order to complete this major, students should choose these Mathematics and Statistics units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units		

ELECTRONICS AND COMPUTER HARDWARE (MJ-ECHMD)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	ELEC2301 Digital Systems Design
MATH1020 Calculus, Statistics and Probability*	MATH2020 Multivariable Calculus and Linear Algebra*	ELEC4314 Robotics and Automation
PHYS1101 Advanced Physics A	ELEC2305 Signals and Systems 2	
ELEC1301 Digital Systems 1A	ELEC2300 Circuits and Electronic Systems 2	
GENG1002 Engineering: Introduction to Electrical and Electronic Engineering	ELEC2310 Computer Architecture	
* In order to complete this major, students should choose these Mathematics and Statistics		

units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units

ENVIRONMENTAL FLUID DYNAMICS (MJ-ENVM)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	ENVE3601 Environmental Fluid Mechanics
MATH1020 Calculus, Statistics and Probability*	MATH2020 Multivariable Calculus and Linear Algebra*	ENVE4614 Oceanographic Engineering
BIOL1130 Concepts in Biology	Three of the following units:	ENVE4615 Physical Oceanography
ENVE2601 Data Collection and Analysis	CHEM1101 Physical and Inorganic Chemistry	ENVE4606 Environmental Modelling
ENVE1601 Environmental Systems Engineering		
and one of the following units:	ENVE3606 Contaminant Fate and Transport	
EART1105 Earth and Environment: Dynamic Planet	CIVL2122 Geomechanics	
PHYS1131 Introductory Physics	ENVE2601 Environmental Fluid Mechanics (MUST DO PRIOR TO ENVE3601)	
GENG1001 Engineering: Introduction to Engineering Mechanics		

* In order to complete this major, students should choose these Mathematics and Statistics units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units

HYDROLOGY (MJ-EHYDR)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	ENVE3603 Quantitative Environmental Hydrology
MATH1020 Calculus, Statistics and Probability*	MATH2020 Multivariable Calculus and Linear Algebra*	
BIOL1130 Concepts in Biology	Three of the following units:	ENVT3305 Ecosystem Biogeochemistry
ENVE2601 Data Collection and Analysis	CHEM1101 Physical and Inorganic Chemistry	PLNT3313 Plant Environment Systems: Analysis and Simulation
ENVE1601 Environmental Systems Engineering		ENVE4606 Environmental Modelling
and one of the following units:	ENVE3606 Contaminant Fate and Transport	ENVE3601 Environmental Fluid Mechanics
EART1105 Earth and Environment: Dynamic Planet	ENVE2603 Introduction to Environmental Hydrology	
PHYS1131 Introductory Physics	ENVE2601 Environmental Fluid Mechanics (MUST DO PRIOR TO ENVE3601)	
GENG1001 Engineering: Introduction to Engineering Mechanics		

* In order to complete this major, students should choose these Mathematics and Statistics units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units

MECHANICAL ENGINEERING (MJ-EMECE)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	24 points of Level 3 or Level 4 Mechanical Engineering units (available in the Rules for the Mechanical Engineering programme)
MATH1020 Calculus, Statistics and Probability*	MATH2020 Multivariable Calculus and Linear Algebra*	
PHYS1101 Physics	MECH2401 Engineering Design	
GENG1001: Introduction to Engineering Mechanics	MECH2402 Manufacturing	
MATE1412 Materials Engineering 1		
MECH1401 Engineering Dynamics	MECH2403 Thermofluids	
* In order to complete this major, students should choose these Mathematics and Statistics units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units		

MATERIALS ENGINEERING (MJ-EMATE)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	MECH2401 Engineering Design
MATH1020 Calculus, Statistics and Probability*	MATH2020 Multivariable Calculus and Linear Algebra*	MECH2402 Manufacturing
PHYS1101 Physics	CHEM1101 Inorganic and Physical Chemistry	Either MATE3411 Fundamentals of Engineering Materials or MATE4413 Non-metallic Materials
CIVL2110 Statics and Solid Mechanics	MATE2412 Materials Engineering 2	
MATE1412 Materials Engineering 1	Either MATE3411 Fundamentals of Engineering Materials or MATE4413 Non-metallic Materials	<i>and 6 points of approved electives, of which the following are recommended:</i> MECH4414 Fundamentals of Engineering Fabrication and Metalworking Processes or MECH3405 Structural Integrity
	MECH2403 Thermofluids	
* In order to complete this major, students should choose these Mathematics and Statistics units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units		

MECHATRONICS (MJ-EMCTE)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	CITS3241 Robotics
MATH1020 Calculus, Statistics and Probability*	MATH2020 Multivariable Calculus and Linear Algebra*	CITS4240 Computer Vision
PHYS1101 Physics	The remaining units not completed from the following:	ELEC2300 Circuits and Electronic Systems
GENG1001 Engineering: Introduction to Engineering Mechanics	ELEC1301 Digital Systems 1A	MCTX2420 Mechatronics Systems
GENG1002 Engineering: Introduction to Electrical and Electronic Engineering	MECH1401 Engineering Dynamics	Or, if one or more of the units above has already been taken, then the following units to replace the units already taken:
One of the following:	MECH2401 Engineering Design	MCTX3421 Control and Mechatronics
ELEC1301 Digital Systems 1A	MECH2402 Manufacturing	ELEC2302 Electromagnetics and Electromechanics
MECH1401 Engineering Dynamics		ELEC2303 Embedded Systems
* In order to complete this major, students should choose these Mathematics and Statistics units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units		

OCEANOGRAPHY (MJ-EOCEN)

Year 1	Year 2	Year 3
MATH1010 Calculus and Linear Algebra*	MATH2209 Calculus and Probability*	ENVE3601 Environmental Fluid Mechanics
MATH1020 Calculus, Statistics and Probability*	MATH2020 Multivariable Calculus and Linear Algebra*	SCIE3304 Field Techniques in Environmental and Marine Science
BIOL1130 Concepts in Biology	Three of the following units:	
ENVE2601 Data Collection and Analysis	SCIE2204 Introduction to Marine Science	ENVE4603 Environmental Engineering Design and Management
ENVE1601 Environmental Systems Engineering		
and one of the following units:	ENVE4614 Oceanographic Engineering	
EART1105 Earth and Environment: Dynamic Planet	SCIE3607 Biological Oceanography	
PHYS1131 Introductory Physics	ENVE3602 Environmental Engineering and Design Management	
GENG1001 Engineering: Introduction to Engineering Mechanics	ENVE2601 Environmental Fluid Mechanics (MUST DO PRIOR TO ENVE3601)	
* In order to complete this major, students should choose these Mathematics and Statistics units as part of their 12 Points Level 1 and 12 Points Level 2 Mathematics and Statistics units		

A Second Major from elsewhere in the University

Students also have the opportunity to take their second major from any of the majors offered within the University.

There is a list of pre-approved majors from other parts of the University below. Students who wish to take a major that is not listed below **must first** get the approval of the Associate Dean (Students) (see the contact details for the Faculty Office in the Introduction section).

Students must also ensure that they are able to complete the required pre-requisites for the units that comprise the major. Where students are concerned, they should seek advice **from the Faculty that offers the major**. A list of faculty contacts is available at:

http://handbooks.uwa.edu.au/undergraduate/general_info/contact_details/Faculties

Each major below is listed with a link to the appropriate rules for that major. Students must comply with these rules in order to get the major, and students cannot generally count a unit towards more than one major.

Pre-approved majors from elsewhere in the University

UWA Business School

- **Financial Accounting (MJ-FINAC)** (*Please note: students **will not** be eligible for a professional qualification in accounting by completing this major*)
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/FinancialAccountingMajor>
- **Economics (MJ-ECONS)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division2/Majors/EconomicsMajor>
- **Economic History (MJ-ECHTY)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division2/Majors/EconomicHistoryMajor>
- **Finance (Corporate) (MJ-FINCP)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/CorporateFinanceMajor>
- **Finance (Investment) (MJ-FINIV)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/InvestmentFinanceMajor>
- **Finance (Quantitative) (MJ-FINQT)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/QuantitativeFinanceMajor>
- **Human Resource Management (MJ-HRSMT)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/HRManagementMajor>
- **Employment Relations (Commerce) (MJ-EMPCO)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/IndustrialRelationsMajor>
- **International Business Economics (MJ-INTBE)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division2/Majors/InternationalBusinessEconomicsMajor>
- **Management (MJ-MGMNT)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/ManagementMajor>
- **Managerial Accounting (MJ-MGACC)** (*Please note: students **will not** be eligible for a professional qualification in accounting by completing this major*)
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/ManagerialAccountingMajor>

- **Marketing (MJ-MRKTG)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division4/Majors/MarketingMajor>
- **Money and Banking (MJ-MONBK)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division2/Majors/MoneyandBankingMajor>
- **Quantitative Economics (MJ-ECQNT)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/biz/Part2/Division2/Majors/QuantitativeEconomicsMajor>

Faculty of Arts, Humanities and Social Sciences

- **Asian Studies (MJ-ASSTD)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/AsianStudies>
- **Chinese (MJ-CHNSE)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/AsianStudies>
- **French (MJ-FRNCH)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/EuropeanLanguages>
- **German (MJ-GRMAN)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/EuropeanLanguages>
- **Indonesian (MJ-INDON)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/AsianStudies>
- **Italian (MJ-ITALN)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/EuropeanLanguages>
- **Japanese (MJ-JAPAN)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/AsianStudies>
- **Linguistics (MJ-LINGO)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/LinguisticsMajor>
- **Philosophy (MJ-PHILY)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/ahss/Part2/Division2/Majors/PhilosophyMajor>

Faculty of Life and Physical Sciences

- **Biochemistry (MJ-BIOCH)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/sciences/part2/division6/biochemistry>
- **Physics (MJ-PHYSC)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/sciences/part2/division6/physics>
- **Psychological Studies (MJ-PSYT)**
Rules available at:
<http://rules.handbooks.uwa.edu.au/rules/sciences/part2/division6/psychologicalstudies>

Elective Units

Students are able to choose units from the following sources, provided that they have the required pre-requisites for the units **and** they have completed the requirements of both majors in the BCM and the BCM required units:

- Units from Computer Science (for details see pages 5 to 7)
- Units from Mathematics and Statistics (for details see pages 8 to 12)
- Any other unit offered in the University – students can find the details of units offered by other faculties at <http://units.handbooks.uwa.edu.au/units>.