Qualification Details

NB! The following information is valid for 2019

Bachelor of Science (Computer Science)

- All qualifications are also subject to the General Rules for Qualifications
- Links to view module details can be found under the **Modules** tab.

Curriculum for 2019

BACHELOR OF SCIENCE (QUALIFICATION CODES: 20000/20050, 20020/20040, 20025/20055, 20023/20053, 20026/20056, 20024/20054, 20003/20030, 20099/20090, 20022 & 20021/20051 – A1)

APPLICABLE RULES

- Unless Senate decides otherwise the degree shall be obtained by completing modules with a total credit value of at least 368 (360 credits for students who have passed all the modules WRFV101/WRSC111; WRFV102; WRAV101 and WRAV102 comprising the first year of Computer Science and Information Systems) of which
  - at least 120 credits are on 3rd year level and at least 240 credits on 2nd year or a higher level;
  - at least 338 credits are from the list of approved subjects below.
- Two major subjects are required to qualify for the BSc. To obtain credits for a major subject the student must obtain 30 credits for the first year, 40 for the second year and 60 for the third year in that major subject. In those subjects that have no first year, a major will consist of 40 credits at second year and 60 credits at third-year level. A maximum of 30 credits from another Faculty may be selected.
- Exit-level major modules are those third-year modules which make up the major subjects referred to in the previous bullet.
- The exit-level modules in HMS modules as offered in Curriculum 20003 are HMS359, 332, 333, 334 and 335.

Approved Subjects (Exit-level Majors)
Applied Mathematics
Biochemistry
Botany
Chemistry
Computer Science/Computer Science and Information Systems
Geology
Geography
Mathematics
Microbiology
Physics
Physiology
Statistics
Zoology

- **Computer literacy:** All BSc students must pass at least WRSC101 (8 credits) if registered for Applied Mathematics 1 or WRFC101 (8 credits) (or equivalent) or have passed an appropriate competency test or have received automatic exemption for WRFC101/WRFC141 based on Grade 12 CAT marks.
- Unless Senate decides otherwise, a candidate who has failed a particular module three times shall not be allowed to re-register for that module.
- Where modules have substantially overlapping outcomes, credit shall not be given for more than one of those modules.
- Candidates registered for a degree in Statistics may not accumulate more than 40 credits from second year modules and 60 credits from third year modules presented by the Department of Statistics.
- Candidates registered for a degree in Geography may not accumulate more than 60 credits from third year modules presented in the Department of Geosciences.
- **Maximum credits offered for the BSc**: Unless the Dean decides otherwise, students may not exceed modules to a value of more than 380 credits.

PROMOTION

- A candidate shall be allowed to register for modules on the second-year level only if he/she has passed first-year level modules in an approved programme with a total of at least 72 credits.
- A candidate shall be allowed to register for modules on the third-year level only if he/she has passed modules in an approved programme with a total of at least 181 credits of which at least 60 are on second-year level.
- Notwithstanding points 1 and 2 above, students who have not completed 128 credits at first-year level, must register for the balance of the 128 first-year credits before they may concurrently register for any second-year level credits. In the same way students who have not completed 120 credits at second-year level, must register for the balance of the 120 second-year credits before they may concurrently register for any third-year credits. In the case of timetable clashes between higher and lower year level modules the student must complete the lower level modules first.

DURATION
The programme shall extend over a minimum of three years of full-time study.

PASS ON LINKED MODULES
1.6.12.2 Passing of linked modules
It is acknowledged that certain modules, while being stand-alone modules for which individual credit may be obtained in terms of Rule 1.6.12.1 in the General Prospectus, are nevertheless intrinsically linked to one or more other modules. Such linkages must be confirmed by specific faculty rules which must adhere to the following general rules:
1.6.12.2.1 In the case where learning in the subsequent module builds cumulatively on the learning in the previous module, the previous module may be passed if the weighted average mark for the two modules is at least 50%, provided that the subsequent module must have been passed on its own and that a minimum final mark of at least 40%, as well as a subminimum mark of at least 40% for the examination, must have been obtained for the first module.
1.6.12.2.2 In the case where the content of two or more modules form an integrated whole, these modules may be passed if the weighted average mark of these modules is at least 50%, provided that a minimum final mark of at least 40%, as well as a subminimum mark of at least 40% for the examination, must be obtained for each individual module. **Modules may only be passed on link in the same academic year.**

Departments that offer Pass on Link modules are:			
Biochemistry	Chemistry	Microbiology	Physics
BC251, BC252	CHG101, CHI101, CHO101	BM211, BM212	FBB101, FBB102
BC321, BC322	CHG1X1, CHG1X2, CHI1X1, CHO1X1	BM331, BM332	FF101, FBB111, FBB112, FBB121
	CHA201, CHI201, CHO201, CHP203		F101, F102
	CHI303, CHO303, CHP303		F210, F212

CHOICE OF MODULES
Unless Senate decides otherwise, an approved curriculum shall consist of modules satisfying the requirements of the applicable rules above and be such that there are no lecture or examination timetable clashes at any stage and all prerequisites for subsequent modules are satisfied.

Specific prerequisites for certain modules
Candidates must comply with the sub-minimum requirements for modules set out in the Syllabus sections of the General Prospectus.

Summerstrand South Campus: All modules for the BSc degree will be offered on the Summerstrand South Campus.

Specific rules for Bachelor of Science (Computer Science)

BACHELOR OF SCIENCE (COMPUTER SCIENCE): FULL-TIME (QUALIFICATION CODE: 20053 – A1) (NQF LEVEL: 7, TOTAL NQF CREDITS FOR QUALIFICATION: 368)

This programme has been approved in terms of the new Higher Education Quality Sub-Framework (HEQSF).

With majors chosen from Applied Mathematics, Computer Science, Mathematics, Mathematical Statistics and Physics.

The following curriculum is a recommended programme for the BSc degree in the Faculty of Science. Other subject combinations are possible but not necessarily sensible. Discuss any other subject combinations with the relevant Heads of Department.

APPLICABLE RULES
Please refer to General Faculty Rules.

PASS ON LINKED MODULES
1.6.12.2 Passing of linked modules
It is acknowledged that certain modules, while being stand-alone modules for which individual credit may be obtained in terms of Rule 1.6.12.1 in the General Prospectus, are nevertheless intrinsically linked to one or more other modules. Such linkages must be confirmed by specific faculty rules which must adhere to the following general rules:
1.6.12.2.1 In the case where learning in the subsequent module builds cumulatively on the learning in the previous module, the previous module may be passed if the weighted average mark for the two modules is at least 50%, provided that the subsequent module must have been passed on its own and that a minimum final mark of at least 40%, as well as a subminimum mark of at least 40% for the examination, must have been obtained for the first module.
1.6.12.2.2 In the case where the content of two or more modules form an integrated whole, these modules may be passed if the weighted average mark of these modules is at least 50%, provided that a minimum final mark of at least 40%, as well as a subminimum mark of at least 40% for the examination, must be obtained for each individual module. **Modules may only be passed on link in the same academic year.**

Departments that offer Pass on Link modules are:			
Biochemistry	Chemistry	Microbiology	Physics
BCV201, BCV202	CHGV101, CHIV100, CHOV102	BMV201, BMV202	FBBV101, FBBV102
BCV301, BCV302	CHGV1X1, CHGV1X2, CHIV1X1, CHOV1X2	BMV301, BMV302	FVV101, FVV102
	CHAV201, CHIV201, CHOV202, CHPV200		FFV1X1, FBBV1X1, FBBV1X2,FBBVX12
	CHIV300, CHOV300, CHPV300		FVV201, FVV202

DURATION
The programme shall extend over a minimum of three years of full-time study.

CURRICULUM

		Presented	Module Code	Credit Value
First Year				
	Compulsory modules:			
	Mathematics I			
	Mathematics 1A	Semester 1	MATT101	16
	Mathematics 1b	Semester 2	MATT102	16
	Select three of the following groups:			
A	**Applied Mathematics I**			
	Graph Theory	Semester 1	MAPV101	8
	Mathematical Modelling	Semester 1	MAPV111	8
	Mechanics	Semester 2	MAPV102	8
	Numerical Methods I	Semester 2	MAPV112	8
B	**Computer Science I (if Applied Mathematics selected)**			
	Programming Fundamentals 1.1	Semester 1	WRAV101	8
	Programming Fundamentals 1.2	Semester 2	WRAV102	8
	Computing Fundamentals for Scientists 1.1	Semester 1	WRSC111	8
	Computing Fundamentals 1.2	Semester 2	WRFV102	8
C	**Computer Science I**			
	Programming Fundamentals 1.1	Semester 1	WRAV101	8
	Programming Fundamentals 1.2	Semester 2	WRAV102	8
	Computing Fundamentals 1.1	Semester 1	WRFV101	8
	Computing Fundamentals 1.2	Semester 2	WRFV102	8
D	**Physics I**			
	Mechanics and Thermodynamics	Semester 1	FVV101	15
	Electricity, Magnetism and Optics	Semester 2	FVV102	15
E	**Statistics I**			
	Probability and Distribution Theory	Semester 1	STAS101	15
	Introduction to Statistical Inference	Semester 2	STAS102	15
	Credits First Year			**124/126**
		Presented	**ModuleC ode**	**Credit Value**
Second Year				
	Select three of the following groups corresponding to the modules selected in the first year:			
A	**Computer Science II**			
	The following modules are **compulsory for Computer Science majors:**			
	Data Structures and Algorithms 2.1	Semester 1	WRAV201	8
	Data Structures and Algorithms 2.2	Semester 2	WRAV202	8
	Computer Architecture 2.1	Semester 1	WRCV201	6
	Computer Architecture 2.2	Semester 2	WRCV202	6
	Information Systems 2.1	Semester 1	WRIV201	6
	Information Systems 2.2	Semester 2	WRIV202	6
	The following additional modules are available as **optional electives,** and are of primary interest to Computer Science non-majors:			
	Web Systems 2.1	Semester 1	WRWV201	8
	Web Systems 2.2	Semester 2	WRWV202	8
B	**Applied Mathematics II**			
	Differential Equations	Semester 1	MAPV201	10
	Numerical Methods 2	Semester 1	MAPV211	10
	Transform Theory	Semester 2	MAPV202	10
	Linear Optimisation	Semester 2	MAPV222	10
C	**Mathematics II**			
	Multivariable and Vector Calculus	Semester 1	MATT201	20
	Linear Algebra	Semester 2	MATT212	10
	Real Analysis	Semester 2	MATT202	10
D	**Physics II**			
	Optics, AC Theory and Thermodynamics	Semester 1	FVV201	20
	Mechanics, Modern and Nuclear Physics	Semester 2	FVV202	20
E	**Statistics II**			
	Theory of Distribution	Semester 1	STAS201	20
	Regression Analysis and Advanced Regression Topics	Semester 2	STAS202	20
	Credits Second Year			**120/130**
		Presented	**Module Code**	**Credit Value**
Third Year				
	Select two of the following majors corresponding to the modules selected in the previous year:			
A	**Computer Science III ♦**			
	The following modules are **compulsory for Computer Science majors:**			
	Advanced Programming 3.1	Semester 1	WRPV301	10
	Advanced Programming 3.2	Semester 2	WRPV302	11
	Advanced Data Structures	Semester 1	WRAV301	10
	Languages and Automata Theory	Semester 2	WRLV302	10
	Database Systems 3	Semester 1	WRDV301	7
	User Interface Design	Semester 2	WUIV302	7
	Project	Year	WRRV301	9
	The following additional modules are available as **optional electives:**			
	Multimedia Systems 3.1	Semester 1	WRMV301	10
	Multimedia Systems 3.2	Semester 2	WRMV302	10
B	**Applied Mathematics III ♦**			
	Partial Differential Equations	Semester 1	MAPV301	15
	Finite Difference Methods	Semester 1	MAPV311	15
	Non-linear Optimisation	Semester 2	MAPV302	15
	Dynamical Systems	Semester 2	MAPV312	15
C	**Mathematics III ♦**			
	Real Analysis	Semester 1	MATT301	15
	Advanced Linear Algebra	Semester 1	MATT311	15
	Modern Algebra	Semester 2	MATT302	15
	Complex Functions	Semester 2	MATT312	15
D	**Physics III ♦**			
	Electrodynamics and Quantum Mechanics	Semester 1	FVV301	30
	Crystallography and Solid State Physics	Semester 2	FVV302	30
E	**Statistics III ♦**			
	Statistical Inference	Semester 1	STAS301	24
	Special Topics in Statistics	Semester 1	STAS321	6
	Time Series Analysis	Semester 2	STAS312	10
	Theory of Linear Modules	Semester 2	STAS322	10
	Operations Research	Semester 2	STAS342	10
	Credits Third Year			**124**
	Total Credits			**368**

♦ Major modules (please refer to the General Prospectus).

Choosing the combination:	
Year 1:	Applied Mathematics 1, Computer Science 1, Mathematics 1 and Mathematical Statistics 1.
Year 2:	Applied Mathematics 2, Mathematics 2 and Mathematical Statistics 2.
Year 3:	Applied Mathematics 3 and Mathematical Statistics 3 leads to a career in **Industrial Mathematics** which is the problem-driven blend of Mathematics and Statistics that uses mathematical technologies to solve industrial problems. Industrial mathematics is an independent field which studies all mathematical methods that are directly relevant to industry.
	Industrial Mathematicians apply their talents to: • Optimise and manage factory production. • Design and test products. • Ensure quality control and customer service procedure. • Strategic planning. • Risk management. • Perform statistical analyses.
Choosing the combination:	
Year 1:	Applied Mathematics 1, Computer Science 1, Mathematics1 and (Mathematical Statistics 1 or Physics 1).
Year 2:	Applied Mathematics 2, Computer Science 2, Mathematics 2.
Year 3:	Applied Mathematics 3 and Computer Science 3 leads to a career in **Computational Mathematics.** Computational Mathematics is an innovative, multidisciplinary program whose focus lies in the intersection of mathematics and computer science. Graduates of the program will be able to deploy effectively a wide range of mathematical and computational techniques to solve problems in science and commerce; to develop, enhance and maintain the relevant software tools; and to communicate results of complex modules and simulations to end-users.
	Computational mathematicians study: • Parallel processes and parallel algorithms. • Numerical analysis and complexity. • Artificial intelligence and neural networks. • Optimization and non-linear programming. • Numerical solutions to PDE's and large scale computations. • Mathematical problems too complex for paper/pencil solutions. • Coding and Cryptography. • Computational geometry.
Choosing the combination:	
Year 1:	Applied Mathematics 1, Mathematics 1, Mathematical Statistics1**,** Physics and Computer Fundamentals.
Year 2:	Applied Mathematics 2, Physics 2 and the modules MATH202, 203 and STAT201.
Year 3:	Applied Mathematics 3 and Physics 3 leads to a career in **Computational Physics. Computational physics** is the study and implementation of numerical algorithms in order to solve problems in physics for which a quantitative theory already exists. Physicists often have a very precise mathematical theory describing how a system will behave. Physics problems are in general very difficult to solve exactly. Even apparently simple problems, such as calculating the wave function of an electron orbiting an atom in a strong electric field, may require great effort to formulate a practical algorithm (if one can be found).In addition, the computational cost of solving quantum mechanical problems is generally exponential in the size of the system (see computational complexity theory).Seeing as a typical macroscopic solid has of the order of 10^{23} constituent particles, it may be somewhat of an understatement to say this is a bit of a problem.
	Applications of computational physics Computational methods are widely used in solid state physics, fluid mechanics and image analysis in electron microscopy, amongst others. Computational physics borrows a number of ideas from computational chemistry – for example, the density functional theory used by computational physicists to calculate properties of solids is basically the same as that used by chemists to calculate the properties of molecules.
Choosing the combination:	
Year 1:	Applied Mathematics 1, Computer Science 1, Mathematics 1 and Physics 1.
Year 2:	Physics 2, Computer Science 2 (and 40 credits from Applied Mathematics 2 and Mathematics 2).
Year 3:	Computer Science 3 or (Computer Science 3 and Physics 3) provides for a combination of the problem-solving skills and analytical thinking developed through Physics and Computer Science which is an interface between science, technology and engineering and business. This combination provides a powerful platform for entering a variety of businesses, banks, the government and the military as well as various postgraduate programmes. Graduates in physics and computer science can, and do, excel in a diverse range of situations and occupation.
Choosing the combination:	
Year 1:	Applied Mathematics 1, Computer Science 1, Mathematics 1 and Physics 1.
Year 2:	Computer Science 2, Mathematics 2 (and 40 credits from Applied Mathematics 2 and Physics 2).
Year 3:	Computer Science 3 and Mathematics 3 provides for a combination of the problem-solving skills, analytical thinking, programming design and application development. This program provides a powerful platform for entering a variety of employment opportunities in business. It can also lead to various postgraduate programmes.

Tel: +27 (0) 41 504 1111
Fax: +27 (0) 41 504 2574 / 2731
Email: info@mandela.ac.za
PO Box 77000, Nelson Mandela University
Port Elizabeth, 6031, South Africa