

FIRST YEAR							CSC101
Week	Begins	Mon	Tues	Wed	Thurs	Fri	Topic
		Orientation week: Monday 5 to Friday 9 Feb					
1	12 Feb						Programming, Problem Solving and Computational Thinking interleaved
2	19 Feb						
3	26 Feb	TEST (lecture)					
4	5 Mar						
5	12 Mar						
6	19 Mar	TEST (lecture)		Human Rights Day			
	26 Mar	Vacation					
	2 Apr	Vacation					
7	9 Apr						Programming, Problem Solving and Computational Thinking interleaved
8	16 Apr						
9	23 Apr	TEST (lecture)				Freedom Day	
10	30 Apr		Workers' Day				
11	7 May						
12	14 May	TEST (lecture)					
13	21 May				Makeup Test		Social Issues
	28 May	Swot Week & Practical Exam					
		June Exams: Friday 1 June – Friday 22 June					
							CSC102
Week	Begins	Mon	Tues	Wed	Thurs	Fri	Topic
14	16 Jul						Programming
15	23 Jul						
16	30 Jul						
17	6 Aug	TEST (lecture)			Women's Day		Object Orientation
18	13 Aug						
19	20 Aug						
	27 Aug	Vacation					
20	3 Sep						Object Orientation
21	10 Sep					TEST (lecture)	
22	17 Sep						Problem Solving
23	24 Sep	Heritage Day					
24	1 Oct						
25	8 Oct					TEST (lecture)	
26	15 Oct				Makeup Test		
	22 Oct	Swot Week					
		November Exams: Friday 26 October – Friday 23 November					

First Year Mainstream Courses

CSc101 & CSc102

CSc101 is a semester course, which is offered in the first semester of the year. The course is written off at the end of the semester. CSc101 is the entry-level course for majoring in Computer Science. CSc102 is a follow-on course in programming, compulsory for anyone wanting to major in Computer Science in his or her degree. CSc102 is offered and examined in the second semester of the year. CSc101 and CSc102 together make up Computer Science 1.

NOTE: if you wish to continue with Information Systems, you will be required to take CSc112 in semester 2, even if you do CSc101 and CSc102.

COURSE CO-ORDINATOR

Your course co-ordinator is **Mr James Connan**, Room 108, Hamilton Building (J.Connana@ru.ac.za).

All queries and comments about the course should be addressed to your course co-ordinator.

ENTRANCE REQUIREMENTS AND SUBMINIMA

	CSc101	CSc102
Entrance Requirement	None	40% in CSc101 in the same year, or having gained credit in CSc101 previously
Minimum performance for the granting of supplementary examinations	40%	40%
Minimum performance for a non-continuing Computer Science 1 aggregation (NCR)	40%	40%
Minimum performance for continuing Computer Science 1 credit	50%	50%

NOTE: Although a 50% pass entitles a student to continue with the next Computer Science course (provided there is space), our experience has shown that students who do not achieve an overall pass of 60% or more in one course are unlikely to succeed in later courses.

It is not necessary to take a course in mathematics as a pre- or co-requisite for CSc101, BUT students who wish to major in Computer Science (i.e. take any third year courses in Computer Science) are required to take MAT 1C1 (Discrete Mathematics) or MAT 1C before they register for a third year Computer Science course.

LECTURES AND PRACTICALS

There are: 5 formal lectures per week
 Tests during the semester
 1 formal practical session per week (3 hours per session)
 Additional after-hours reading and exercises

Lectures: Monday 1 (7:45am)
 Tuesday 2 (8:40am)
 Wednesday 3 (9:35am)
 Thursday 4 (10:30am)
 Friday 5 (11:25am)

Practicals: Weekday afternoons starting at 14h00.

CSc101 lectures will be held in the CHEM MINOR LECTURE THEATRE. Practical sessions will be held in the HAMILTON LABORATORY provided there is space. You will be allocated to an afternoon practical session and tutor.

You are encouraged to discuss the problems set on practical afternoons with each other, and to build your understanding by seeking help from each other (and, of course, from your tutor). However, you are expected to hand in your OWN INDIVIDUAL SOLUTION, unless you have specifically been asked to work as part of a team. Students who don't abide by this will be dealt with severely. Please read the Plagiarism Policy.

TEXTBOOKS AND HANDOUTS

Course material is available online via RUConnected, and course handouts may be provided.

A non-refundable amount of R180-00 for CSc101 and R80 for CSc102 will be charged to your University account at the start of the course for class handouts and consumables.

COURSE OBJECTIVES AND OUTLINE: CSc101

This course presents basic problem solving techniques with an emphasis on logical, algorithmic and computational processes using the Python programming language. Students are introduced to programming concepts including: output, input, variables, types, operators and operands, debugging, iteration, modules, functions, selection, strings, lists and files.

One week of the course is devoted to describing and explaining the relevance and impact of information technology on society.

The prescribed book is "How to Think Like a Computer Scientist" by Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers. This is a free textbook that can be read online, downloaded for use on your own computer, or printed. If you would like to print this book, the CS Department will bind it for you.

The book also has an interactive edition hosted at <http://runestone.academy>. The interactive edition contains videos, animations, quizzes and even allows you to write code in the book. You will be asked to enroll in a specific course created for CSc 101 at Runestone Academy. Instructions for doing so will be provided.

COURSE OBJECTIVES AND OUTLINE: CSc102

This course further develops programming skills, and deals with algorithms, object-oriented principles and practices, and more advanced language features. Larger applications such as simple 2D games will be developed, highlighting the use of graphical user interfaces, event-driven programming, and more powerful libraries.

The prescribed book is "Think Sharply with C#" by Peter Wentworth. This is a free textbook that can also be read online, or downloaded for use on your own computer. Additional course notes will be provided as needed.

YOUR TIME COMMITMENT

The Department of Computer Science expects a CSc101 and CSc102 student to spend a minimum of 12 hours per week on Computer Science. This time should be divided up approximately as follows:

- 5 hours per week on attending lectures in Computer Science
- 4 hours per week on lecture revision, practical preparation and further reading
- 3 hours per week on practicals

IMPORTANT: It is important that you are up-to-date with the material covered in lectures when you arrive at the computer laboratory for your practical session so that you are in a position to get started on the assignment straight away. This is how you will be able to take maximum advantage of the tutorial help available at practical sessions, and to ensure that you complete the assignments set for the practical session.

ACADEMIC DEVELOPMENT PROGRAMME

The Academic Development Programme (ADP) exists to enhance student learning in that we provide focused support to students with regard to their weekly practicals and regular course content.

Any student may take advantage of the ADP, but if your lecturers or tutors believe that you have some critical gaps in your learning, you will be required to participate in the ADP. The aim of this programme is to work with you and help you to resolve those minor obstacles that may prevent you from achieving your true potential as a great programmer! If you do not wish to participate in the ADP, you will need to motivate your withdrawal in writing.

To find out more about this programme once the academic year has started, see the course page on RUConnected.

PERFORMANCE AND ASSESSMENT

DP regulations

Please see DP Regulation under Departmental Dynamics.

WE DON'T TAKE ATTENDANCE INTO CONSIDERATION IF YOUR TEST, PRACTICAL AND EXAM MARKS ARE GOOD. HOWEVER, WE RESERVE THE RIGHT TO TAKE YOUR ATTENDANCE RECORD INTO ACCOUNT FOR BORDERLINE DECISIONS.

Assessment

- For your CSc101 and CSc102 DP to be granted, you are required to maintain an average of at least 40% for your practicals and achieve an average of at least 40% for your tests.
- The examination system is based on a mark per minute in all exams.
- The assessment of students in CSc101 is based on a total of:
 - 20% semester mark (calculated from the results of practicals and test assessments)
 - 25% practical examination (laboratory exercises under examination conditions)
 - 55% written examination (one 3 hour paper)
- The assessment of students in CSc102 is based on a total of:
 - 20% semester mark (calculated from the results of practicals and test assessments)
 - 80% written examination (one 3 hour paper)
- There is NO practical examination in CSc102.

SAQA CREDIT COUNT

CS101 15 credits NQF Level 5

CS102 15 credits NQF Level 5

A prize, generously sponsored by
Open Box Software,
is offered for the top student in the course.

SECOND YEAR							CSC201
Week	Begins	Mon	Tues	Wed	Thurs	Fri	Topic
		Orientation week: Monday 5 to Friday 9 Feb					
1	12 Feb						Advanced Programming
2	19 Feb						
3	26 Feb						
4	5 Mar						
5	12 Mar						
6	19 Mar			Human Rights Day	TEST		
	26 Mar	Vacation					
	2 Apr						
7	9 Apr						Architecture
8	16 Apr						
9	23 Apr					Freedom Day	
10	30 Apr		Workers' Day		TEST		
11	7 May						C
12	14 May						
13	21 May				TEST		
	28 May	Swot Week & Practical Exam					
		June Exams: Friday 1 June – Friday 22 June					
							CSC202
Week	Begins	Mon	Tues	Wed	Thurs	Fri	Topic
14	16 Jul						Theory of Computation
15	23 Jul						
16	30 Jul						
17	6 Aug				Women's Day		
18	13 Aug				TEST		
19	20 Aug						Operating Systems
	27 Aug	Vacation					
20	3 Sep						Operating Systems
21	10 Sep						
22	17 Sep				TEST		
23	24 Sep	Heritage Day					Databases
24	1 Oct						
25	8 Oct						
26	15 Oct				TEST		
	22 Oct	Swot Week					
		November Exams: Friday 27 October – Friday 24 November					

Second Year

CSc201 & CSc202

In your first year in the Computer Science Department, you became reasonably confident and competent in designing computer programs. The second year course builds on these skills and widens your knowledge both of computer systems and programming languages.

At the end of the course, you should be able to code algorithms using the C# and C programming languages. You should be familiar with advanced and object oriented programming features, data and file structures, the theory of computation, database methods, operating systems and the background to algorithmic and low level paradigms.

The CSc201 course is offered in the first semester and examined in June. CSc202 is offered in the second semester and examined in November. These two courses may be aggregated to obtain a pass in Computer Science 2 if they are taken in the same calendar year.

COURSE CO-ORDINATOR

Your CS2 course co-ordinator is **Prof George Wells**, Room 007, Hamilton Building (G.Wells@ru.ac.za).

Queries and comments about these courses should be addressed, initially, to your course co-ordinator.

ENTRANCE REQUIREMENTS AND SUBMINIMA

	CSc201	CSc202
Entrance requirement	Minimum of 50% for both CSc101 and CSc102	Minimum of 40% in CSc201
Minimum performance for Computer Science 2 aggregation	40%	40%

LECTURES AND PRACTICALS

There are: 5 Formal lectures per week
 1 Formal practical session per week
 Additional after hours reading, exercises and essay work.

Lectures: Monday: 3 09:35
 Tuesday: 4 10:30
 Wednesday: 5 11:25
 Thursday: 1 07:45
 Friday: 2 08:40
 Practicals: Wednesday: 14:00 - 17:00

All lectures will be held in Room C11 in the GEOLOGY building. Practicals are held in the UNDERGRAD laboratories in the Hamilton Building on WEDNESDAY afternoons, unless you are notified otherwise. They begin at 14h00 SHARP and officially end at 17h00.

Students will be required to complete practical work amounting to at least 6 hours per week – three hours under formal supervision, and the rest in their own time. You are encouraged to discuss the problems set on practical afternoons with each other, and to seek help from each other (and from the tutors present). However, you are expected to hand in your OWN INDIVIDUAL SOLUTION, unless you have been specifically asked to work as part of a team. Students who copy will be dealt with severely, and could lose their DP.

In your second year of Computer Science, you are considered to be a sufficiently experienced programmer for it not to be necessary to constantly remind you to:

- a) plan your algorithm,
- b) write a well structured, well commented program.

TEXTBOOKS, HANDOUTS AND READING LISTS

CS2 text books

There is a free text book "MIPS2C" which is provided as class notes for C and Architecture.
There are NO prescribed textbooks for CSc202.

A non-refundable charge of R350-00 for CSc201 and R140-00 for CSc202 will be made on your university account for printed materials. This includes an amount for paying royalties on copyright material. Several books for additional reading will be referenced during the year, but these will be made available on campus and you will NOT be required to purchase them. You will be told which books these are and where to find them as you need them.

COURSE OBJECTIVES AND OUTLINE: CSc201

Advanced Programming

This module builds on the data structures and algorithms covered in Computer Science 1, introducing several new topics. Dynamic data structures are an important focus of the course and underlie the concepts of abstract data types. Important classes of algorithms (such as sorting and searching) are considered and used to introduce simple aspects of algorithm analysis.

Architecture

This module introduces the five classic components of a computer – input, output, memory, datapath, and control. You will learn about the language of the hardware, into which all high level languages are translated, and how the hardware executes programs written in this language. You will gain an understanding of factors that affect the performance of a computer.

C

This module introduces the syntax of the C programming language, with emphasis on low-level constructs and features that have not been encountered in C#, building on the machine-level view of the Architecture course. The course fosters understanding of how higher-level managed languages are implemented, and how to program for performance making use of your understanding of the real machine.

COURSE OBJECTIVES AND OUTLINE: CSc202

Theory of Computation

This module focuses on the more theoretical aspects of Computer Science. It covers automata (including Turing machines) and specifications of formal languages, as well as the computability of problems. It also provides insight into the complexity of algorithms, and introduces aspects of programming language grammars, which are used in the Translators course in third year.

Operating Systems

This module covers the fundamental considerations involved in the design and use of a modern operating system.

The topics include:

- Introduction to operating systems
- Processes and threads
- Memory management
- Process scheduling.
- Input / output and files

The emphasis in the course is on low-level programming in C.

Databases

The Databases module centres on the core of most modern software: data storage and retrieval. It gives a brief introduction to database concepts and the language used for database interaction – SQL – before delving into the role of databases in networked GUI applications. Students will be exposed to the PostgreSQL relational database management system and its client application pgAdmin. The module will also briefly touch on NoSQL, an alternative database paradigm that is used in scalable web-based applications and social networks.

YOUR TIME COMMITMENT

The Department of Computer Science expects a second year student to spend a minimum of 15 hours per week on Computer Science 2. This time should be divided up approximately as follows:

- 5 hours per week on attending lectures
- 4 hours per week on lecture revision and further reading
- 6 hours per week on practicals

PERFORMANCE AND ASSESSMENT

Tests

You will be notified at the start of each module which days have been set aside for tests. In addition, spot tests may be set at the discretion of the lecturer. The average test mark is subject to a 30% sub-minimum for DP requirements.

Practicals

Correctness of a program is usually worth about 50%, the rest of the marks being awarded for style, readability, ingenuity, documentation, error detection, testing procedures, and example results. Please note that in some modules, the mark for practicals will be obtained from practical tests and not from the practical work submitted. Students must maintain an average of 40% for practicals and practical tests in order to obtain a DP.

Examinations

CSc201- Examined in June

Paper 1 (Three hours)	Advanced Programming	85 marks
	Architecture	55 marks
	C	40 marks
		180 marks

CSc202- Examined in November

Paper 1 (Three hours)	Theory of Computation	70 marks
	Operating Systems	55 marks
	Databases	55 marks
		180 marks

The assessment of students in CSc201 & CSc202 is based on a total of

- 33% - semester mark, calculated from the results of assignments, practicals, and tests.
- 67% - allotted to final examination, totalling 3 hours.

NOTE: The examination system is based on a mark per minute in all exams.
There is no practical exam in second year.

NO supplementary examinations are awarded in CSc201 or CSc202.

COMPUTER SCIENCE 2 AGGREGATED CREDIT

A student who has attempted CSc201 and CSc202 in one calendar year and has failed to pass the assessment for one of the courses, but who has achieved a mark of 50% or better when both courses are added together and the average taken, may be granted an aggregated credit in Computer Science 2. A pass in Computer Science 2 requires that all DP and sub-minimum requirements in both CSc201 and CSc202 should have been met. Note that the courses may only be aggregated if they are taken in the same calendar year.

SAQA CREDIT COUNT

CS201 20 credits NQF Level 6

CS202 20 credits NQF Level 6

A prize, generously sponsored by
Janinne Franke,
is offered for the top student in the course.

THIRD YEAR							CSC302
Week	Begins	Mon	Tues	Wed	Thurs	Fri	Topic
		Orientation week: Monday 5 to Friday 9 Feb					
1	12 Feb						Functional programming
2	19 Feb						
3	26 Feb						
4	5 Mar						
5	12 Mar						
6	19 Mar			Human Rights Day			Software Design and Practices
	26 Mar	Vacation					
	2 Apr						
7	9 Apr						Software Design and Practices
8	16 Apr						
9	23 Apr					Freedom Day	Networks
10	30 Apr		Workers' Day				
11	7 May						
12	14 May						
13	21 May						
	28 May	Swot Week & Practical Exam					
		June Exams: Friday 1 June – Friday 22 June					
							CSC301
Week	Begins	Mon	Tues	Wed	Thurs	Fri	Topic
14	16 Jul						Translators
15	23 Jul						
16	30 Jul						
17	6 Aug				Women's Day		
18	13 Aug						
19	20 Aug						
	27 Aug	Vacation					
20	3 Sep						Translators
21	10 Sep						
22	17 Sep						Web Development
23	24 Sep	Heritage Day					
24	1 Oct						
25	8 Oct						
26	15 Oct						
	22 Oct	Swot Week					
		November Exams: Friday 26 October – Friday 23 November					

Third Year

CSc301 & CSc302

In your first year in the Computer Science Department, you became reasonably confident and competent in designing computer programs. CS2 built on these skills and widened your knowledge of data structures, low-level programming, theoretical computer science, and data access using languages such as C#, C and SQL.

At the end of your third year, you should have a good knowledge of the principles of compilers, networking, practical software development, and web development, and a good introductory knowledge of programming styles and functional programming.

The CSc302 course is offered in the first semester and examined in June. CSc301 is offered in the second semester and examined in November. These two courses may be aggregated to obtain a pass in Computer Science 3 if they are taken in the same calendar year.

COURSE CO-ORDINATOR

Your CS3 course co-ordinator is **Dr Yusuf Motara**, Room 025, Hamilton Building (Y.Motara@ru.ac.za).

Queries and comments about a course should be addressed, initially, to your course co-ordinator.

ENTRANCE REQUIREMENTS AND SUBMINIMA

	CSc302	CSc301
Entrance requirement	Minimum of 40% in both CSc201 and CSc202, and an aggregate pass in the second year.	Minimum of 40% in both CSc201 and CSc202, and an aggregate pass in the second year.
Ancillary requirement	A pass in MAT 1C1 (Discrete Mathematics semester course)	A pass in MAT 1C1 (Discrete Mathematics semester course)
Minimum performance for Computer Science 3 aggregation	40%	40%

LECTURES AND PRACTICALS

There are: 5 Formal lectures per week
 1 Formal practical session per week

Additional after-hours reading, small projects, tests, exercises and essay work.

Lectures:	Monday:	2	08:40
	Tuesday:	3	09:35
	Wednesday:	4	10:30
	Thursday:	5,6	11:25, 12:20
	Friday:	1	07:45
Practicals:	Thursday:		14:00 - 17:00

All lectures will be held in Room C11 in the GEOLOGY building. Practicals are held in the UNDERGRAD laboratories in the Hamilton Building on THURSDAY afternoons.

Students will be required to complete practical work amounting to at least **10 hours** per week (three hours under formal supervision, and the rest in their own time). You are encouraged to discuss the problems with each other, and to seek help from each other (and from the demonstrators present) when stuck with a problem. However, you are expected to hand in your OWN INDIVIDUAL SOLUTION, unless you have been specifically asked to work as part of a team. **Students who plagiarise will be dealt with severely, and could lose their DP.** As third year students you are reminded to always plan your algorithm and write a well-structured program. In addition you are encouraged to use one of the document formatting or word processing programs available to produce professional looking documents for essays, practical write-ups and exercises that have to be handed in for marking.

TEXTBOOKS, HANDOUTS AND READING LISTS

CSc302 text books

Kurose, J.F. and Ross, K.W., Computer Networking, Pearson, 2008.

CSc301 text books

Terry, P.D. Compiling with C# and Java, Published by Pearson, 2005.

This will be issued to you as part of your notes.

Students will also be issued with sets of comprehensive notes. A non-refundable charge of R80-00 for CSc301 and R160-00 for CSc302 will be made on your university account for such materials. This includes an amount for paying royalties on copyrighted material.

Several books for additional reading will be referenced during the year, but these will be made available on campus and students will NOT be required to purchase them. You will be told which books these are and where to find them as you need them.

COURSE OBJECTIVES AND OUTLINE

Functional Programming

This module introduces a style of programming that avoids state, mutability, inheritance, and nulls and favours purity, immutability, higher-order functions, and options. F#, a strongly-typed cross-platform multiparadigm language, will be used for practical work during this module.

Software Design and Practices

This module introduces the concept of language-agnostic programming styles and exposes students to the kind of supporting tools, practices, and workflows that are used by professional software developers.

Networks

This module provides an introduction to computer networking principles, grounding them in the practical study of the Internet and covering areas of protocol design and standardization of computer networks protocols. The module follows very closely the approach of the textbook by Kurose & Ross, "Computer Networking: A Top-Down Approach", which walks through the classical five layers of the Internet protocol stack starting from the top, the application layer.

Programming Language Compilation

This module is concerned with the theoretical and practical aspects of programming languages and their compilers. A simple stack based virtual machine (the Parva Virtual Machine) is studied and programmed at the assembler level. This is followed by a discussion of the theory behind modern high level languages, which leads to the practical aspects of writing compilers, facilitated by the use of compiler writing tools. An in-depth study is made, not only of a compiler for a simple imperative language (Parva, targeting the stack based PVM), but also of various other syntax-directed software.

Web Development

This module introduces the core technologies underpinning the front-end of current Web applications: HTML, CSS and JavaScript. Then considers PHP and a relational database as examples of technologies for the back-end. Topics include the server/client request/response loop, the HTTP protocol, mark-up languages, the Document Object Model, AJAX-style interactions and core security considerations. The emphasis of the course, based on the book by Connolly and Hoar, "Fundamentals of Web Development", is on the overall architecture of Web applications and how the various technologies help in the construction of applications that go beyond desktop applications.

YOUR TIME COMMITMENT

The Department of Computer Science expects a third year student to spend a minimum of 20 hours per week on Computer Science 3. This time should be divided up approximately as follows:

- 5 hours per week on attending lectures
- a minimum of 5 hours per week on lecture revision and further reading
- a minimum of 10 hours per week on practical work

PERFORMANCE AND ASSESSMENT

Tests

You may be notified about which days have been set aside for tests at the start of each module. In addition, spot tests may be set at the discretion of the lecturer. The average test mark is subject to a 30% sub-minimum for DP requirements.

Practicals

Correctness of a program is paramount, though marks may also be awarded or deducted for such things as style, readability, ingenuity, documentation, error detection, testing procedures, and example results. Students must maintain an average of 40% for practicals to obtain a DP.

In the Programming Language Compilation section, marks are also awarded for short weekly tests on the material of each prac.

Examinations

CSc302- Examined in June

Paper 1 (Four hours)	Functional Programming	25.8% (75 marks)
Paper 2 (Three hours)	Software Design & Practices	15.4% (60 marks)
	Networks	25.8% (90 marks)

CSc301- Examined in November

Paper 1 (Four hours)	Compilers ***	46.4% (180 marks)
Paper 2 (Two hours)	Web Development	20.6% (120 marks)

*** (The CSc301 Paper 2 exam has an unconventional format. Students are given part of the paper in advance of the exam to allow them to prepare practical solutions to demonstrate the extent of their knowledge. The venue is a computer laboratory. The content of the whole exam is a mixture of practical and theory. Further details will be available nearer the time.)

The assessment of students in CSc301 & CSc302 is based on a total of:

- 33% semester mark, calculated from the results of assignments, practicals, and tests.
- 67% allotted to final examinations.

NOTE: NO supplementary examinations are awarded in CSc301 or CSc302.

COMPUTER SCIENCE 3 AGGREGATED CREDIT

A student who has attempted CSc301 and CSc302 in one calendar year and has failed to pass the assessment for one of the courses, but who has achieved a mark of 50% or better when both courses are added together and the average taken, may be granted an aggregated credit in Computer Science 3. A pass in Computer Science 3 requires that all DP and sub-minima requirements in both CSc301 and CSc302 should have been met. Note that the courses may only be aggregated if they are taken in the same calendar year.

SAQA CREDIT COUNT

CS301 30 credits NQF Level 7
CS302 30 credits NQF Level 7

A prize, generously sponsored by
SAP Africa,
is offered for the top student in the course.