

COMPUTER SCIENCE

Professor and Head of Department

GC Wells, MSc(Rhodes), PhD(Bristol), MICS, MACM

Professors

A Terzoli, Laurea in Physics (Univ of Pavia)

Associate Professor

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HE Thinyane, BA(Adelaide), BSc(Adelaide),
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Senior Lecturers

J Connan, MSc(Stell)

ML Halse, MSc(Rhodes)

Lecturers

YM Motara, MSc(Rhodes)

MJ Tsietsi, PhD(Rhodes)

Emeritus Professor

PD Terry, MSc(Rhodes), PhD(Cantab), FICS, MACM

Emeritus Associate Professor

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Visiting Professor

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Computer Science (CSC) is a six-semester subject which may be taken as a major subject for the degrees of BSc, BSc(InfSys), BSc(SofDev), BCom, BJourn, BA and BEcon.

To major in Computer Science, a candidate is required to obtain credit in the following courses: CSC101; CSC 102; CSC 2; CSC 3; MAT 102 or MAT 1C1 or MAT 1 or MAT 1C. See Rule S.23.

Candidates who aim to major in Computer Science are advised to register for the ancillary course in Discrete Mathematics (MAT 1C1) in their first or second year of study; permission will not normally be granted to repeat MAT 1C1 concurrently with CSC 301 and CSC 302.

Two, or in some cases four, Computer Science semester-credit courses are allowed as credits for other degree/diploma curricula in the Faculty of Humanities. Besides the major courses, the Department offers a semester-credit course CSC 1L Introduction to ICT and CSC112 Business Problem Solving with Computers.

The attention of students who hope to pursue careers in the field of Bioinformatics is drawn to the recommended curriculum that leads to postgraduate study in this area, in which Computer Science is a recommended co-major with Biochemistry, and for which two years of Computer Science and either Mathematics or Mathematical Statistics are prerequisites. Details of this curriculum can be found in the entry for the Department of Biochemistry, Microbiology and Biotechnology.

The attention of students who hope to pursue careers in the fields of Computing and Information Systems in general is drawn to the degree of BSc (Information Systems), in which Computer Science and Information Systems are the usual major subjects, supported by other appropriate courses from the Faculties of Science and Commerce.

Students who wish to become professional software developers or software engineers should also consider the BSc (Software Development) degree. This is a four-year Honours level qualification combining Computer Science and Information Systems, together with other supporting subjects, that prepares students for careers in software systems development.

Students interested in Web and gaming technologies should consider the CSC 303 elective (a non-major option) in addition to their majors.

The courses offered in Computer Science concentrate on the technology, engineering, project management and professional topics of computing, such as programming and application development, algorithm and system design, software engineering, operating systems and real-time computing, graphics, multimedia, artificial intelligence, networks and distributed computing, telecommunications and electronic commerce, and formal computer science theory. Management and organisational aspects of computing are handled more specifically in courses offered by the Department of Information Systems, and aspects such as computer and digital electronics and hardware are complemented by courses offered in the Department of Physics and Electronics. In all courses students are required to perform practical work on the computer, the marks of which count

towards the final assessment. See the Departmental Web Page <http://www.ru.ac.za/computerscience> for further details, particularly on the contents of courses.

First-year level courses in Computer Science

There are four discrete first-year courses in Computer Science, each contributing a semester-credit towards a degree.

CSC 101 is offered in the first semester only, and leads on to CSC 102 in the second semester. This is the conventional first year combination, which prepares students for further study in the subject. Credit may be obtained in each of CSC 101 and CSC 102 separately and, in addition, an aggregate mark of at least 50% will be deemed to be equivalent to a two-credit course CSC1, provided that a candidate obtains the required subminimum in each component. However, students who wish to major in Computer Science must obtain credit in both CSC 101 and CSC 102. Students admitted to the Science, Commerce or Humanities Extended Studies Programmes, or who have little or no experience of computers, are required at the discretion of the Dean and Head of Department to complete CSC 1S/1C/1H before registering for CSC 101.

CSC 1L1 is offered in the first semester, and is intended as a terminal course.

CSC 112 is offered in the second semester and is the prerequisite for Information Systems 201. CSC 1S/1C/1H are single semester-credit courses, but offered over a whole year, under the auspices of the Science, Commerce and Humanities Extended Studies Programmes. Entry is normally restricted exclusively to first-year students accepted into those programmes; the course may be required as a prerequisite to CSC 101 for students who lack the necessary background to register directly for CSC 101. Students who have followed an Extended Studies Programme may obtain credit in both CSC 1S and CSC 101. Supplementary examinations may be recommended in each of these courses, provided that a candidate achieves a minimum standard specified by the Department.

CSC 1L1: Introduction to ICT

CSC 1L1 is intended as a non-continuing course for students who require computing principles and

skills to support their activities in other disciplines. It is intended to be taken by students who have no previous experience with computers.

Topics include an introduction to the fundamental concepts and applications of hardware, computing environments, editing and word processing, spreadsheets, databases, other software packages, networks, the Internet, social issues, and the logic of problem solving. Practical reports and class tests collectively comprise the class mark, which forms part of the final mark.

CSC 112: Business Problem Solving with Computers

CSC 112 is the first course for students who intend to continue to INF 201, and is offered in the second semester. The course introduces students to a modern computing environment, and teaches skills that enable the application of computers to typical business problems. These skills include internet-based skills for web page creation and knowledge discovery, as well as problem solving and knowledge retrieval skills using tools such as spreadsheets and databases. Business problem solving is supported by an introduction to logic and algorithm design, and is contextualised by an overview of the place of IT in a typical organization.

CSC101: Problem Solving and Introductory Programming

This course presents basic problem solving techniques with an emphasis on logical, algorithmic and computational processes. Students are introduced to programming in both the style of computation as calculation, via a console interface, and computation as interaction, via event-driven programming using a Graphical User Interface. Language features are introduced as needed to support the problem solving and algorithmic skills. One week of the course is devoted to describing and explaining the relevance and impact of information technology on society.

CSC102: Intermediate Programming

Candidates are required to obtain credit in CSC101 before they may register for 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.

CSC 1S/1H/1C: Computer Skills

Introduction to some of the concepts of hardware; software; operating systems; computer logic; problem solving; editing and word processing; graphical user interfaces; spreadsheets; data bases; presentations; networks.

Second-year level courses in Computer Science

There are two second-year courses in Computer Science. CSC 201 is held in the first semester and CSC 202 in the second semester. Credit may be obtained in each course separately and, in addition, an aggregate mark of at least 50% will be deemed to be equivalent to a two-credit course CSC 2, provided that a candidate obtains the required sub-minimum in each component. No supplementary examinations will be offered for either course. Practical reports and class tests collectively comprise the class mark, which forms part of the final mark.

Credit in Computer Science 1 (CSC 101 and CSC 102) is required before a student may register for second year courses. Adequate performance in CSC 201 is required before a student may register for CSC 202.

The second year of Computer Science is devoted to foundational computing and system design concepts.

CSC 201

Machine organization and low-level programming; advanced data structures and data abstraction; object oriented principles; advanced programming concepts. The practical work covers low and high-level imperative programming and design principles.

CSC 202

Theoretical foundations of computing; database theory and query languages; human computer interaction (HCI). The practical work covers the use of software engineering techniques, HCI and database design and query.

Third-year level courses in Computer Science

There are three third-year courses in Computer Science. CSC 302 and CSC 303 are normally held in the first semester and CSC 301 in the second semester, but the department reserves the right to

offer them in either semester, according to timetable constraints. Credit may be obtained in each course separately and, in addition, an aggregate mark of at least 50% for CSC 301 and CSC 302 will be deemed to be equivalent to a two-credit course CSC 3, provided that a candidate obtains the required sub-minimum in each component.

A major in Computer Science requires credit for CSC 301 and CSC 302, or an aggregate credit for CSC 3. No supplementary examinations will be offered for any third-year course. Practical reports and class tests collectively comprise the class mark, which forms part of the final mark.

Credit in Computer Science (CSC 2) and in Discrete Mathematics (MAT 1C1) or MAT 1C is required before a student may register for CSC 301 or CSC 302. Credit in CSC 201 is required before a student may register for CSC 303. The student should also be in his/her third year of study.

The third-year of Computer Science is devoted to systems programming and systems analysis and digital lifestyle technologies.

CSC 301

Web and internet technologies, and associated security issues; theory and implementation of computer languages; formal aspects of Computer Science. Practical work reinforces these aspects of application development and systems programming, and includes exercises that involve the creation and maintenance of large systems.

CSC 302

Data communications and computer networks; functional programming; the theory and practice of operating systems.

CSC 303

Data Analytics, Programming Styles, Parallel Patterns, and Machine Learning.

Fourth-year level courses in Computer Science CSC 4

A fourth-year level course in Computer Science is taken by students following the BSc(Software Development) curriculum, together with Information Systems 4.

The course consists of six modules covering a

range of Software Engineering topics, including formal methods, unit-testing and IS management, as well as electives from the Computer Science and Information Systems Honours modules, dependent on staff availability. There may be a practical internship module. In addition, there may be written essays and a series of seminars throughout the year, which covers a range of general topics in Software Engineering. Students are also required to undertake a software development project.

Computer Science Honours

The course consists of a selection of six topics and a large project. To this selection is added a compulsory module in project management and corporate communications, and a portfolio of practical assignments.

The course work comprises the advanced treatment of an approved selection from the following list of topics (not all topics are offered in every calendar year): Distributed multimedia; Java programming for multimedia; image processing; networks and data communications; distributed and parallel processing; security and cryptology; audio networking; computer based education; artificial intelligence; human computer interfaces; telecommunications; advanced computer architecture; microcomputer hardware

and interfacing; operating system design; systems analysis and design methodologies; functional programming; real-time programming; data abstraction; modelling; formal aspects of computer science; software and hardware engineering in low resource settings; general purpose parallel computing using GPUs; bioinformatics. At the discretion of the Head of Department, the course may include topics from Electronics, Information Systems, Pure and Applied Mathematics, Mathematical Statistics, or any other topics approved by the Head of Department.

Master's and Doctoral degrees

Suitably qualified students are encouraged to proceed to the research degrees of MSc and PhD under the direction of the staff of the Department. Requirements for the MSc and PhD degrees are given in the General Rules. Current areas of specialisation are distributed multimedia; graphics and virtual reality; audio networking; data communications; computer security; distributed processing. A specialised coursework MSc specialising in Information Security is also offered. More information on research can be found on the web site of the Centre of Excellence in Distributed Multimedia, housed within the Computer Science Department: <http://www.coe.ru.ac.za>.