

### **6.6.3.3 MSc in Machine Learning and Artificial Intelligence**

#### **Programme Code**

14371 – 887 (180)

#### **Programme Description**

This one-year structured postgraduate programme is aimed at students with a strong mathematical and computational background. It will equip you with a foundation of machine learning and artificial intelligence fundamentals, as well as a suite of sophisticated techniques and concepts at the research forefront of these fields.

#### **Specific Admission Requirements**

In order to register for the programme, one of the following qualifications is required:

- An honours degree in Applied Mathematics, Computer Science, Mathematics, or Mathematical Statistics;
- A four-year bachelor's degree in Electrical Engineering;
- A qualification deemed equivalent to the above, in a field closely linked to machine learning.

You will also be expected to have existing and demonstrable proficiency in Python or an equivalent programming language, be comfortable with numerical linear algebra and multivariable calculus, and possess basic knowledge of probability theory and statistics.

Final approval for admission rests with the departmental academic committee in collaboration with the programme coordinator, who also take into account the infrastructure and capacity of the Department.

#### **Closing Date for Applications**

Apply online at <https://student.sun.ac.za> by 31 October of the previous year.

#### **Duration of Programme**

The programme extends over one academic year full-time, or two academic years part-time, beginning in January and ending in December.

#### **Programme Structure**

The programme consists of three separate blocks: compulsory core modules, elective modules and a research project. Every block bears 60 credits, bringing the programme total to 180 credits. The modules in a particular block may not all run in parallel over the entire block; scheduling will depend on intermodular content development and the availability of lecturers.

## Programme Content

The programme will equip you with specialist knowledge and skills to the level where you will be able to critically evaluate the suitability of existing theories and techniques for a specific application. The modules (with their associated assignments) and the research project will also develop your abilities to design, select and apply technically advanced methods, techniques and theories to complex practical and theoretical machine-learning and artificial intelligence problems.

### Compulsory Modules

Subject Number	Module Code	Credits	Module Name	Semester
14398	814	15	Applied Machine Learning at Scale	1 or 2
14396	813	15	Foundations of Deep Learning	1 or 2
14394	811	15	Mathematics for Machine Learning	1 or 2
14395	812	15	Probabilistic Modelling and Reasoning	1 or 2
14399	885	60	Research Project (Machine Learning)	1 or 2

plus

### Elective Modules

Choose 6 modules to the value of 60 credits. Not all of these modules will necessarily be offered every year.

Subject Number	Module Code	Credits	Module Name	Semester
14404	820	10	Advanced Probabilistic Modelling	1 or 2
14409	825	10	Advanced Topics in Artificial Intelligence	1 or 2
14408	824	10	Advanced Topics in Machine Learning	1 or 2
14407	823	10	Artificial Intelligence and the Brain	1 or 2
62847	842	10	Computer Vision	1 or 2
14406	822	10	Monte Carlo Methods	1 or 2
14401	817	10	Natural Language Processing	1 or 2
14405	821	10	Optimisation for Machine Learning	1 or 2
14402	818	10	Reinforcement Learning and Planning	1 or 2
14403	819	10	Sequence Modelling	1 or 2

### Assessment and Examination

- All the modules (except for the research project) will be assessed by means of flexible assessment. This entails a combination of practical assignments and summative assessments.
- All summative assessments will be moderated internally and at least 40% of the final mark will be moderated externally.
- The 60-credit research project will be examined by the supervisor and an independent examiner. A moderator will review the recommendations by the examiner and the supervisor and, if necessary, also examine the project. Either the examiner or the moderator must be external and appointed by the Science Faculty Board.
- To pass the programme, you must obtain at least 50% for the research project and at least 50% for each module.

# Postgraduate programmes

For more information on the Faculty's postgraduate programmes, consult the University's Postgraduate Prospectus or the departmental websites.

## 1. Summary of postgraduate programmes

The undergraduate programmes offered in the Faculty of Science lead to postgraduate programmes in the Faculty of Science, or postgraduate programmes offered by other faculties.

For more information regarding postgraduate programmes offered by other faculties, please consult the relevant Faculty Yearbook part.

Postgraduate Programmes	Faculty of Science
BScHons (Biological Sciences)	Biochemistry; Biodiversity and Ecology; Microbiology; Physiological Sciences
BScHons (Physical Sciences)	Chemistry; Earth Sciences; Physics; Polymer Science; Theoretical Physics
BScHons (Mathematical Sciences)	Applied Mathematics; Computer Science; Mathematics
BScHons (Interdisciplinary)	Bioinformatics and Computational Biology
MSc (Biological Sciences)	Biochemistry; Botany; Exercise Science; Microbiology; Physiological Sciences; Zoology
MSc (Physical Sciences)	Chemistry; Earth Sciences; Polymer Science; Physics; Physical and Mathematical Analysis
MSc (Mathematical Sciences)	Applied Mathematics; Computer Science; Mathematics
Structured MSc	MSc in Machine Learning and Artificial Intelligence
MSc (Interdisciplinary)	Bioinformatics and Computational Biology
PhD	Applied Mathematics; Biochemistry; Bioinformatics and Computational Biology; Botany; Chemistry; Computer Science; Earth Sciences; Mathematics; Microbiology; Physical and Mathematical Analysis; Physics; Physiological Sciences; Polymer Science; Zoology
DSc	Applied Mathematics; Biochemistry; Botany; Chemistry; Computer Science; Geology; Mathematics; Microbiology; Physics; Physiological Sciences; Polymer Science; Zoology

## 2. General information on the postgraduate programmes

### 2.1 BScHons degree

2.1.1 The degree BScHons can be awarded to you if you –

2.1.1.1 have obtained a bachelor's degree approved by Senate for this purpose and upon written application, were admitted to the BScHons programme; and

2.1.1.2 have been registered as a student at the University for at least one year (after obtaining the bachelor's degree), have passed the prescribed written examination and successfully completed an oral examination.

2.1.2 The BScHons programme is taken in one of the majors of the BSc according to the provisions of the BSc programme. Students, who followed a BSc programme that does not lead to a BScHons programme, may be accepted to a BScHons programme provided that the BScHons programme can only begin after an examination in the required subject or subjects was successfully completed.

- 2.1.3 An average final mark of at least 60% in the major or prescribed modules in the final year of study is required for admission to a BScHons programme in the major in question. If you do not comply with this requirement, you may only be accepted to a BScHons programme if a recommendation has been made by the department concerned and with the special approval of the Faculty Committee of the Faculty of Science.
- 2.1.4 Specific provisions concerning BScHons programmes in specific subjects are given under the module content of the applicable subjects.
- 2.1.5 BScHons students are not allowed to take any additional third-year subject that includes practical work in the first year of the BScHons. However, if the BScHons programme concerned does not require practical work, you can, depending on the approval of the Faculty Board, be allowed to take an additional third-year subject.

## 2.2 MSc degree

- 2.2.1 The MSc degree can be awarded to you if you –
  - 2.2.1.1 have obtained an honours degree approved by Senate for this purpose and upon written application, have been admitted to the proposed MSc programme; and
  - 2.2.1.2 have followed an approved programme of research or advanced study of at least one year after obtaining the BScHons degree) at this University or at any other place approved by Senate; and
  - 2.2.1.3 have submitted a satisfactory thesis or assignment, depending on the requirements of the department concerned, and have completed an oral examination.
- 2.2.2 Specific provisions concerning MSc programmes in specific subjects are given in the module content of the subjects concerned.
- 2.2.3 MSc students are not allowed to take any additional third-year subject that includes practical work in the first year of the MSc. However, if the MSc programme concerned does not require practical work, you can, depending on the approval of the Faculty Board, be allowed to take an additional third-year subject.
- 2.2.4 After three years of full-time MSc studies, you must reapply for continuation of studies.

**Take note:** For the regulations regarding attendance, examiners, thesis requirements, submission and binding of theses, etcetera, consult the Section "Postgraduate Qualifications" in Part 1 (General Rules) of the University's Yearbook.

## 2.3 PhD degree

- 2.3.1 The PhD degree can be awarded to you if you –
  - 2.3.1.1 have obtained a Master's degree approved by Senate for this purpose, or have achieved a level of competence in a particular field of study that Senate considers suitable for the purpose, and upon written application been accepted by Senate to the PhD programme; and
  - 2.3.1.2 have followed an approved programme of research and possible supplementary study, which may include a period of research at another place approved by Senate, for at least two years after obtaining the above-mentioned Master's degree or after gaining the above-mentioned level of competence; and
  - 2.3.1.3 have submitted a satisfactory dissertation; and
  - 2.3.1.4 have completed an oral examination.
- 2.3.2 After four years of full-time PhD studies, you must reapply for continuation of studies.

**Take note:** For the regulations regarding attendance, examiners, dissertation requirements, submission and binding of dissertations, etcetera, consult the Section "Postgraduate Qualifications" in Part 1 (General Rules) of the University's Yearbook.

## 2.4 DSc degree

- 2.4.1 As a candidate for the DSc degree you must –
  - 2.4.1.1 have conducted advanced, original research or creative work, to the satisfaction of the University, in the field of the natural sciences;
  - 2.4.1.2 have submitted original work(s) of a high standard that has already been published, on a central theme, making a substantial contribution of high quality, in the view of Senate, to the enrichment of knowledge in the field of the natural sciences; and
  - 2.4.1.3 have completed an oral examination to the satisfaction of the University.
- 2.4.2 If you already hold a PhD degree from the Faculty of Science or any other qualification that Senate considers an equivalent, you must –
  - 2.4.2.1 have been registered at this University for the DSc degree for at least one academic year before the degree can be awarded to you and at least five years must have passed after

- obtaining the PhD degree, or another degree or qualification that is considered to be equally acceptable, before being awarded the DSc degree; and
- 2.4.2.2 have notified the Registrar in writing of the intention to be a candidate for the degree at least one year before presenting yourself for the degree and provided the title(s) and scope of the proposed work(s). Once Senate accepts the application, a supervisor and examiners will be appointed.
- 2.4.3 If you hold an MSc degree from the Faculty of Science or any other qualification that the Senate considers an equivalent, you must –
- 2.4.3.1 have been registered at this University for the DSc degree for at least three academic years before the degree can be awarded to you and at least seven years must have passed after obtaining the MSc degree, or another degree that is considered an equivalent, before being awarded the DSc degree; and
- 2.4.3.2 have notified the Registrar in writing of the intention to be a candidate for the degree at least three years before presenting yourself as a candidate and provided the title(s) and scope of the proposed work(s). Once Senate accepts the application, a supervisor and examiners will be appointed.
- 2.4.4 You must submit one copy of the work(s) that you want to present per examiner before 1 September (if you want to graduate in December), or before 1 December of the previous year (if you want to graduate in March) at the University office. The copies must be accompanied by a written statement that it is your original work and that the work has not been submitted to this or any other university for the purpose of obtaining any degree. If a substantial part of the submitted work was published under your name and that of another author, you must submit satisfactory testimony detailing which part of the work was done by you. Furthermore, you must mention who started the work, under whose supervision the work was done, who did the work, processed and submitted it to paper, and, if applicable, what part of the work was submitted to any university for the purposes of obtaining a degree.

### 3. Provisions regarding enrolment for, and the conversion of, programmes

#### 3.1 Periods of enrolment for master's and doctoral studies

**Table**

Programme	The year of enrolment					
	1	2	3	4	5	6
MSc full-time	M	N	F	X	-	-
PhD full-time	M	M	N	F	X	-

The Faculty does not offer part-time postgraduate studies, but in exceptional cases, a student can motivate for extension of studies based on personal circumstances. In these approved cases, the student will only be allowed to extend the studies to N+2 years (X). See table above.

#### Legend

<b>M</b>	Minimum enrolment period
<b>N</b>	Normal maximum enrolment period
<b>F</b>	Final concessional year (May register without having to apply for readmission)
<b>X</b>	Enrolment only if readmission has been approved by the Faculty Board or, for PhD, the Senate (Allowed in exceptional circumstances)
<b>-</b>	Further registration not allowed

**Take note:** In the case of a conversion from master's to doctoral studies, the first registration for the PhD is considered the start of the enrolment. (See Section "Conversion from Master's to Doctorate" at 5 below.)

#### 3.2 Continued enrolment during the maximum period of enrolment

You must register as a student every year for the full duration of your studies, until you are awarded the degree, except if the Faculty Board approves an interruption of your studies (see Section "Interruption of studies" below). You must make sufficient progress in your studies each year to be permitted to register again. If your progress is insufficient, the relevant departmental chairperson may recommend to the Faculty Board that the Board prevent you from continuing your postgraduate studies.

### 3.3 Continued enrolment after the maximum period of enrolment

After the normal maximum enrolment period (status F), you may only re-register as a postgraduate student if a departmental panel recommends approving your application to continue (status X). Such approval will only be granted more than once in exceptional circumstances.

## 4. Interruption of master's or doctoral studies

### 4.1 Acceptable reasons for interruption of studies

All requests for the interruption of your studies must be supported by appropriate supporting documents, such as a letter of appointment, work assignment, medical certificate(s), financial statement(s), affidavit, etcetera. The following possible reasons for the interruption of master's or doctoral studies serve as acceptable guidelines when dealing with these requests:

- 4.1.1 Work situation;
- 4.1.2 Medical reasons;
- 4.1.3 Financial reasons; or
- 4.1.4 Highly special personal circumstances if thoroughly and convincingly supported.

### 4.2 Procedure to apply for permission to interrupt studies

- 4.2.1 Any applications for permission to interrupt master's or doctoral studies must reach the faculty administrator on or before 30 April of the year concerned. No applications will be considered after 30 April of the academic year concerned.
- 4.2.2 Permission to interrupt studies will be considered on the recommendation of the supervisor and the head of the department concerned.
- 4.2.3 Applications that are approved according to the internal procedure of each faculty must be entered in the next report of communication of the Faculty Board to Senate.
- 4.2.4 Permission to interrupt studies will be approved for a period of at least one year.
- 4.2.5 Approval to interrupt master's studies is normally given only once and for a period of only one year.
- 4.2.6 Approval to interrupt doctoral studies is normally given only twice for a period of one year each or given only once for a period of two years during the duration of the studies.

## 5. Conversion from master's to doctoral studies

In deserving cases, and with regard to your best interests as a student, the Faculty Board can consider and recommend that your registration for the MSc degree (which includes a thesis) be converted to registration for the PhD degree, provided that –

- 5.1 you have shown exceptional progress with conducted research after at least one year's study. The application for conversion must be done within 18 months of registration for the MSc and is limited to exceptional students who can be assessed on tangible outputs. Also see point 4.4 below;
- 5.2 in the course of the work done for your MSc study new and original insights have emerged that deserve further research at a doctoral level. The conversion of the study requires more than simply increasing the volume of data and also more than adding techniques to address the questions that were formulated at the start of the MSc. There must be clear evidence of a conceptual expansion or intellectual leap from the MSc;
- 5.3 the work done for the master's study exceeds the conventional MSc study in terms of scope and cannot reasonably be separated into an MSc component and a PhD component;
- 5.4 the outputs, which can be incremental, may include:
  - 5.4.1 excellent progress as evident from the six-month evaluations and/or an annual report;
  - 5.4.2 conference participation (either oral or poster presentations);
  - 5.4.3 peer-reviewed publications in journals of high quality (including those in review/in press); and
  - 5.4.4 some other acceptable form of peer evaluation;
- 5.5 the proposal for the conversion of MSc to PhD studies is initiated by the supervisor. The supervisor must provide a motivation for the request and propose an upgrade panel. The request is then sent to the departmental head for approval;
  - 5.5.1 if the request is supported by the departmental head, it is sent to the Vice-dean: Research for approval of the request and the upgrade panel.

5.5.2 The department can then proceed with the upgrade process which consist of the following steps:

- (i) You must compile a report of the progress you have made with the master's study (progress reports may be used),
- (ii) You must submit a written PhD research proposal that justifies the expansion of the philosophical or conceptual component of the study,
- (iii) You will be required to defend the research proposal in an oral presentation,
- (iv) The panel will draft a final report with a clear recommendation for upgrade or not.

The final form with the panel report and necessary documentation is submitted to the Faculty Committee for consideration, and the report of the upgrade panel and recommendation is then presented to the Faculty Board.

5.6 you must be registered for at least three years in the instance of an MSc after an honours degree before the PhD degree can be awarded. At least one of those years you must be registered for the PhD degree;

5.7 in cases where written examinations are required for the master's study in question, you must have taken and passed all examinations before the PhD degree is awarded to you; and

5.8 tuition fees will not be adjusted retrospectively after the conversion.

### Disclaimer:

The content above comes from the 2025 Science Yearbook. Make sure to consult the full **Science** to see this extract in context and to check if there have been any changes. Take special note of additional information in the yearbook under section *1. Summary of postgraduate programmes.*