



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

DEPARTMENT OF GEOGRAPHY, GEOINFORMATICS AND METEOROLOGY

BScHons Meteorology

2022

This information brochure is a guide only. For the latest on the chosen degree please visit the UP website at www.up.ac.za.

1. METEOROLOGY

Meteorology is the study of atmospheric phenomena. This covers the physics, chemistry, and dynamics of the atmosphere, but extends to include many direct effects of the atmosphere on the earth's surface, the oceans, and life in general. Weather and climate are fundamental in people's lives; everyday activities like farming, travel, and construction are highly affected by it but severe weather events may cause loss of life and widespread destruction to infrastructure that is worth hundreds of millions of Rands. In the long term, changes in the climate system may even determine whether humankind survives or not.

Our graduates aim to have a complete understanding of atmospheric processes, which enables accurate prediction of atmospheric conditions at several different time scales. These include nowcasting on a short time scale (minutes to hours ahead) to seasonal and climate prediction on the longer time scales. Meteorologists are employed by institutions involved in the study, interpretation, and prediction of weather and phenomena relating to the climate. As the climate changes, and we understand the damages from extreme weather events better, other large industries like manufacturing, logistics, insurance, and engineering increasingly use the services of meteorologists in impact assessments.

2. JOB OPPORTUNITIES

A BSc in Meteorology provides promising career opportunities along with the chance to understand and solve social and environmental issues that help contribute to society at large. Professional meteorologists work as weather forecasters, researchers, climatologists, and lecturers. Meteorologists are employed by institutions involved in the study, interpretation, and prediction of weather and phenomena relating to the climate. The South African Weather Service (SAWS), the Council for Scientific and Industrial Research (CSIR), some universities, agricultural institutions, municipalities, and industries employ meteorologists who mainly practise as specialists. Graduates from our programme can work in the following capacities:

- **Researchers:** All aspects of weather and climate are researched to improve our understanding of atmospheric phenomena. Atmospheric modellers use supercomputers to simplify and solve complex flow dynamic equations of the atmosphere. Air quality and the effect of air pollution on society is constantly monitored, and the impact of climate change receives increasing attention.
- **Weather forecasters:** They analyse data and predict the weather by using models run on supercomputers. Weather forecasts are issued on different time scales, from very short-range forecasting to forecasts that are valid for months ahead, as well as seasonal forecasts. Some private positions, such as presenting the weather forecast on television, are available.
- **Climatologists:** They manage important data sets that contain large volumes of information gathered by SAWS and other organisations.
- **Meteorologists:** They work as consultants in the private sector and at universities to provide specialised research services.
- **Academic positions:** These are available at some South African universities for candidates who have completed a master's or doctoral degree in Meteorology. Academics ensure that the training of meteorologists meets international standards.

3. ACCREDITATION

A BScHons Meteorology degree is required to become a professional meteorologist and this degree complies fully with the Basic Instruction Manual for Meteorologist as prescribed by the World Meteorology Organisation.

4. APPLICATION, SELECTION AND ADMISSION REQUIREMENTS

Admission into BScHons Meteorology is a BSc in Meteorology or equivalent BSc degree that meets the prerequisites of the Honours modules. Prospective students may be required to do additional modules to enable them to reach the desired level of study.

A prospective student must have an average of 60% or more in the major relevant subjects in the final year of the bachelor's degree. Selection takes place before admission and the number of places is limited. Acceptance is conditional on the final marks attained for the undergraduate bachelor's degree. The prospective student's academic record is evaluated, and one of four selection outcomes is possible:

1. Accepted to BScHons Meteorology.
2. Accepted to BScHons Meteorology on the condition that several prescribed modules are completed successfully for non-degree purposes simultaneously with the Honours programme.
3. Not accepted to BScHons Meteorology. Accepted to BSc Natural Sciences Undergraduate Special. The student must successfully complete several prescribed undergraduate modules in a bridging year. **Note that undergraduate lectures and practicals are presented during the day on the Hatfield campus.** If the student achieves an average of 65% in these modules, he/she may re-apply for BScHons Meteorology in the following year. Note that the bridging modules cannot be completed over more than one year.
4. Not accepted. The applicant does not comply with the admission requirements.

The following subjects should have been completed successfully for acceptance into BScHons Meteorology:

- WKD 155 Atmospheric structure and processes
- WKD 254 Programming in meteorology
- WKD 261 Physical meteorology
- GMA 220 Remote Sensing
- WKD 351 Atmospheric balance laws
- WKD 352 Atmospheric vorticity and divergence
- WKD 361 Quasi-geostrophic analysis
- WKD 366 Fundamentals of weather forecasting
- WTW 256 Differential Equations*
- WTW 258 Calculus*
- WTW 263 Numerical methods*
- PHY 114 and 124

*** or an equivalent qualification as approved by the head of the department**

Online application is available on www.up.ac.za, click on 'Study > Apply' in the top menu.

**If you are a South African citizen, applications for BScHons Meteorology close on 30 September.
If you are a foreign national, applications for BScHons Meteorology close on 31 August.**

The first meeting for Honours students is usually towards the end of January. The final date will be announced early in January via email by the Honours coordinator. Lectures usually commence a week after the first meeting.

The Honours program is designed for full-time study. If you are working, it is advisable to do the program over two years. A final admission requirement for international students concerns proof of English language proficiency. Requirements are stipulated below:

- a) Proof that tertiary studies were in English, OR
- b) Completion of a TOEFL test (www.ets.org/toefl). (A score of HIGH or GOOD is considered to be adequate for postgraduate research), OR
- c) Completion of an IELTS academic test (www.ielts.org). (A score of 7.5 or higher is considered to be adequate for postgraduate research).

5. MODULES AND CREDITS

The timetable is announced at the beginning of the year. All of the course work will be conducted at the University of Pretoria. Classes are usually scheduled during the week between 08:00 and 17:00. The timetable varies from year to year, depending on staff availability and student numbers. The lecturer in the different modules will supply more detail.

Code	Module Name	Credits	Period
Core modules (compulsory):			
WKD 704	Numerical modelling: Applications 704	12	S1
WKD 706	Dynamic meteorology 706	16	S1 or S2
WKD 707	Radar meteorology 707	12	S1 or S2
WKD 731	Overview of tropical and mid-latitude meteorology 731	12	S1 or S2
WKD 733	Satellite meteorology 733	12	S1 or S2
WKD 763	Research project 763	35	Y
Elective modules:			
WKD 703	Seasonal climate modeling 703	12	S1 or S2
WKD 719	Boundary layer meteorology 719	12	S1 or S2
WKD 734	Mesoscale Meteorology 734	12	S1 or S2
WKD 736	Selected Themes 736	12	S1 or S2
WKD 781	Cloud dynamics 781	12	S1 or S2

Special events will be arranged from time to time that you will be required to attend.

Minimum credits: 135

For detailed module descriptions, please consult the University's website *Study > Yearbooks*. Select *Faculty of Natural and Agricultural Sciences* on the left, click on *Honours* and then *BScHons Meteorology* on the right.

6. MODULE DESCRIPTIONS

WKD 703, Seasonal and climate modelling

Fundamentals of Seasonal Forecasting. The El Niño/Southern Oscillation. Empirical Orthogonal Functions. Canon Correlation Analysis. Empirical Forecast Models practical. Sea-Surface Temperature Models. Fully coupled and two-tiered general circulation modelling. Dynamical and empherical downscaling techniques. Significance Testing using Monte Carlo techniques. Modelling pitfalls. User application forecasting. Projections of decadal and multi-decadal climate anomalies.

WKD 704, Numerical modelling: Applications 704

Initial atmospheric state, observation network, data assimilation, initialization, parameterization, post-processing. Ensemble methods, probability forecasting, forecast verification. Global circulation models, limited-area and mesoscale models, variable resolution models, dispersion models. Seamless prediction. Practical applications.

WKD 706, Dynamic meteorology 706

Atmospheric Oscillations: Linear Perturbation Theory (sound waves, shallow water gravity waves, inertia gravity waves, Rossby waves). Baroclinic Instability. Two-layer model. Energetics of Baroclinic waves. Zonally averaged circulation. Angular Momentum Budget. Lorenz energy cycle. Scaling of tropical motions. Programming in meteorology.

WKD 707, Radar meteorology 707

Basic principles and characteristics of the weather radar. The influence of the atmosphere on the propagation of Electro-Magnetic waves. Weather radar equation. The influence of attenuation on observations. The measurement of precipitation with a radar. Doppler Radar. Convective storm analysis with radar.

WKD 719, Boundary layer meteorology 719

Introduction to, and the importance of the boundary layer. Structure of the boundary layer. Transfer of heat (molecular and turbulent). Impacts of the turbulent nature of the boundary layer on the dynamics of atmospheric

motions. Closure and boundary layer parameterisation. Applications to air pollution dispersion.

WKD 731, Overview of tropical and mid-latitude meteorology 731

An overview of the weather and climate of the tropics and the mid-latitudes. Air masses. Instability and cloud formation. Weather systems of the tropics and mid-latitudes. Analysis of weather systems by utilising remote sensed data.

WKD 733, Satellite meteorology 733

Overview of the basic principles of satellite imagery. Types of meteorological satellites. Basic principles of radiation. The different images available, their resolution, and the advantages and limitations of each image. Image interpretation.

WKD 734, Mesoscale meteorology 734

An introduction to mesoscale meteorology. Surface mesoscale features, instability, severe storm classification and thunderstorms, flooding and flash flooding events.

WKD 736, Selected themes 736

A module on an aspect or aspects of meteorology not covered in the existing options with special emphasis in Cloud microphysics and Basic concepts of numerical modelling.

WKD 763, Research projects 763

Introduction to the philosophy of scientific research. Hypothesis testing. Reporting of scientific research. Identification of an appropriate research project. Compilation of a research proposal. Literature survey. Acquisition and manipulation of information. Introduction to innovative strategy and research management. Preparation of a research report (or paper). Presentation of research findings.

WKD 781, Cloud dynamics 781

Scaling and interpretation of equations of motion for mesoscale processes. The role of stability and other trigger actions on initial cloud formation and the evolution of clouds. Shallow and deep convective processes. Tropical and mid-latitude cloud generation processes and characteristics. Cloud splitting. Parameterisation of radiation and heat in atmospheric models. Microphysics parameterisations in numerical models.

7. FEES, FUNDING AND BURSARIES OPPORTUNITIES

For information about fees and funding (including scholarships and bursaries, visit the UP website, www.up.ac.za, click 'Study' menu, then 'Fees and Funding'. Also visit the South African Weather Service's website to check for bursary adverts (www.weathersa.co.za). Click on 'Careers', then 'Bursaries'. **Closing date of the South African Weather Service and CSIR bursaries are usually towards the end of October and July, respectively.**

8. INFORMATION FOR INTERNATIONAL STUDENTS

The first step for international students is to have their existing academic qualifications evaluated by the South African Qualifications Authority (www.saqa.org.za). It is essential to attach the SAQA certificate to your online application.

Additional information for international students is available on the UP website, www.up.ac.za, click on 'Study' in the top menu, then on 'International Students'.

9. FREQUENTLY ASKED QUESTIONS

The weighted average for my final year was below 60%, will I still be considered for the BScHons Meteorology programme?

The weighted average on a transcript is calculated for all the modules completed in that year. For admission to BScHons Meteorology, a prospective student must have an average of 60% or more in the major relevant subjects in the final year of the bachelor's degree.

I am currently completing my final year undergraduate studies, therefore the weighted average for my final year modules is not yet available. Can I still apply for next year?

Yes. Please provide your semester marks when you apply. The selection panel will consider those marks and if

applicable, you will be accepted on the condition that your final weighted average is 60% or more.

I completed my B.Tech, will I be considered for the BScHons Meteorology programme?

Unfortunately, the admission to any Honours degree in the Faculty of Natural and Agricultural Sciences requires that you hold a BSc degree. You may consider applying for the BScHons Meteorology programme to get into the bridging programme. Alternatively, you could apply for the BSc Meteorology degree. The BSc Meteorology and BScHons Meteorology comply with the basic Instruction Manual for Meteorology as prescribed by the World Meteorology Organization.

I completed my BA degree, will I be considered for the BScHons Meteorology programme?

Unfortunately, the admission to any Honours degree in the Faculty of Natural and Agricultural Sciences requires that you hold a BSc degree. You could apply for the BSc Meteorology degree. The BSc Meteorology and BScHons Meteorology comply with the basic Instruction Manual for Meteorology as prescribed by the World Meteorology Organization.

I completed a BSc degree in a related field (not meteorology) and received a weighted average of above 60%. Will I qualify for the BScHons Meteorology programme immediately?

Your selection for the programme will depend on the meteorology-related modules that you completed during your undergraduate degree. The undergraduate modules must meet the admission requirements for the Honours modules listed in Section 5. Remember to attach your full transcripts and yearbook when you apply. The selection panel will then review your transcripts and determine if you meet the admission requirements or if you need to complete additional modules. Refer to Section 4.

How do I know whether the undergraduate modules that I completed meet the admission requirements for the Honours modules?

The prerequisite modules for Honours modules are listed in Section 6. Search for the code of a prerequisite module in the yearbook at <http://www.up.ac.za/yearbooks/home> to find its description. Compare this to the modules that you completed. However, the final decision lies with the selection panel.

10. CONTACT DETAILS

Please e-mail any enquiries to:

Dr Liesl Dyson (coordinator), liesl.dyson@up.ac.za

Website: <https://www.up.ac.za/ggm>, click on 'Study' > 'Our Programmes'.