University of Pretoria Yearbook 2025

BScHons in Meteorology (02240074)

Department	Geography, Geoinformatics and Meteorology
Minimum duration of study	1 year
Total credits	135
NQF level	08

Admission requirements

1. Bachelor of Science in Meteorology degree
   or
   Relevant Bachelor of Science degree
2. Physics passed at first-year level
3. Mathematics passed at second-year level
4. Passed the following modules (or equivalent thereof):
   a. WKD 155 Atmospheric structure and processes
   b. WKD 261 Physical meteorology
   c. GMA 220 Remote sensing
   d. WKD 263 Introduction to dynamic meteorology
   e. WKD 352 Atmospheric verticity and divergence
   f. WKD 361 Quasi geostrophic analysis
   g. WKD 366 Fundamentals of weather forecasting
   h. WTW 114 Calculus*
   i. WTW 124 Calculus*
   j. WTW 218 Calculus*
   k. WTW 248 Vector analysis*
   l. PHY 114 and 124 Physics
5. A weighted average of at least 60% in relevant modules at final-year level
6. Students who completed Bachelor of Science undergraduate Special should receive a weighted average of 60% for the prescribed modules

Note:

1. An admission examination may be required
2. Additional modules may be required in order to reach the desired level of competency

Curriculum: Final year

Minimum credits: 135

Fundamental credits: 10
Core credits: 95
Elective credits : 30

Additional information:
Appropriate honours modules from the other disciplines in the Department or Faculty may be taken on approval by the Honours coordinator or Head of Department.

Fundamental modules

Research methods 725 (WKD 725)

Module credits	10.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	14 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 1

Module content

The module introduces students to planning, research design, scientific reading, writing and presentation as required for meteorological research.

Core modules

Seasonal and climate modelling 703 (WKD 703)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Fundamentals of seasonal forecasting. The El Niño/Southern Oscillation. Empirical orthogonal functions. Canonical 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 dacadal climate anomalies.

Numerical modelling: applications 704 (WKD 704)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Initial atmospheric state, observation network, data assimilation, initialization, parameterisation, 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.

Radar and mesoscale meteorology 721 (WKD 721)

Module credits	15.00
NQF Level	08
Prerequisites	WKD 265, 315 and 316
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Basic principles and characteristics of weather radar including doppler and dual-polarization radars. Weather radar equation. Interpretation of radar reflectivity and velocity data. Introduction to mesoscale meteorology. Surface mesoscale features, atmospheric instability and severe storm classification. Analysis of convective storms and associated hazards.

Climate change 724 (WKD 724)

Module credits	15.00
NQF Level	08

Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Concepts related to climate and climate change. Definitions, classification and factors influencing climate. Causes and impacts of climate change. Perceptions of climate change and climate change communication. Basic principles of climate modelling.

Research project 763 (WKD 763)

Module credits	35.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

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.

Elective modules

Statistics for biological sciences 780 (BME 780)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 Block weeks
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

The principles of experimental design as required for the selection of an appropriate research design. Identification of the design limitations and the impact thereof on the research hypotheses and the statistical methods. Identification and application of the appropriate statistical methods needed. Interpreting of statistical results and translating these results to the biological context.

Basis in environmental health 772 (EHM 772)

Module credits	5.00
NQF Level	08
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	School of Health Systems and Public Health
Period of presentation	Year

Environmental assessments 785 (ENV 785)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Health Sciences
Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

The aim of this module is to understand the principles and processes behind environmental assessments. The module will give an overview of the history of assessments, compare assessment processes internationally, evaluate the strengths and weaknesses of different approaches, provide an overview of the South African regulatory context and the environmental authorisation process.

Introduction to environmental and occupational health 775 (EOH 775)

Module credits	10.00
NQF Level	08
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	School of Health Systems and Public Health
Period of presentation	Year

Selected theme 701 (GGY 701)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

A self-study module on an aspect or aspects of geographical or environmental science selected in consultation with the head of the department from: (a) themes not covered in existing options; or (b) educational subjects.

Geographical and environmental principles 710 (GGY 710)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

The module provides a critical review of the structures and paradigms in which the geographical and environmental sciences are practised. Particular reference is made to the development and impact of paradigms and the interdependence of systems within space and time.

Applied geomorphology 718 (GGY 718)

Module credits	15.00
NQF Level	08
Prerequisites	GGY 361 or GGY 363 or equivalent. Students who do not need this module as a core module are required to consult with the module coordinator prior to registration on the capacity in this module for extra attendees.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content
This module focuses on processes and applications of geomorphology. Topics that may be studied include: soil erosion and conservation, weathering, geomorphic response to environmental change, slope processes and geomorphological hazards. The module includes practical fieldwork and field assessments.

Urban geography 780 (GGY 780)

Module credits	15.00
NQF Level	08
Prerequisites	GGY 301 or equivalent.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content
The main themes of the module include: overview of global urbanisation theories and processes; urban morphology and change; the administrative structure and functions of African cities and; the quality of urban life in the developing world.

Environmental change 789 (GGY 789)

Module credits	15.00
NQF Level	08
Service modules	Faculty of Health Sciences
Prerequisites	Limited to BScHons students. Students who do not need this module as a core module are required to consult with the module coordinator prior to registration on the capacity in this module for extra attendees.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content
Study themes include past environmental change, causes and consequences of human-induced environmental change and South Africa and climate change.

Advanced geospatial data 705 (GIS 705)

Module credits	15.00
NQF Level	08
Prerequisites	GIS 310 or equivalent
Contact time	28 contact hours per semester

Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Advanced topics in geospatial data management, such as data quality, data acquisition and management, standards, spatial data infrastructure (SDI) and legislation.

Special topics 707 (GIS 707)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

A special topic in Geoinformatics linked to research specialisation in the department and/or visiting lecturers. For example, research trends and advances in a specific topic or field of specialisation in Geoinformatics.The module is presented in the form of guided advanced readings, seminars and/or discussion sessions.

Advanced GIS 708 (GIS 708)

Module credits	15.00
NQF Level	08
Prerequisites	GIS 310 or equivalent.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Advanced topics in GIS application, such as principal component analysis, multi-criteria evaluation and other geospatial analysis methods, and their application relating to the UN Sustainable Development Goals.

Geospatial data and services 709 (GIS 709)

Module credits	15.00
NQF Level	08
Prerequisites	(INF 164, INF 214, GIS 311) or equivalent.

Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Advanced topics in spatial databases, such as computational geometry, spatial data indexing and query processing, and using the web and mobile technologies for accessing, delivering and presenting geospatial data and services.

Advanced remote sensing 705 (GMA 705)

Module credits	15.00
NQF Level	08
Prerequisites	GMA 320 or equivalent. Students who do not need this module as a core module are required to consult with the module coordinator prior to registration on the capacity in this module for extra attendees.
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

The aim of the module is to provide knowledge and understanding of image analysis and information extraction methods in remote sensing. The emphasis is on equipping students with knowledge and skills necessary to process imagery to extract diverse biophysical and geospatial information. The course gives insight into the possibilities and limitations of the application of modern remote sensing/image acquisition systems for Earth and atmosphere research purposes at different levels of detail.

Dynamic meteorology 706 (WKD 706)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Atmospheric oscillations: Linear perturbation theory (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. Programming in metereology.

Boundary layer meteorology 719 (WKD 719)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

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.

Advanced weather forecasting 722 (WKD 722)

Module credits	15.00
NQF Level	08
Prerequisites	WKD 721
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Use physical and dynamical reasoning to explain the formation, evolution, and characteristics of synoptic-scale weather systems in the sub-tropics, and assess the limitations of theories and conceptual models concerning these weather systems. Use real-time or historic data, including satellite and radar data, to prepare analyses and basic forecasts. Communicate user-specific weather forecasts.

Atmospheric composition and air quality 723 (WKD 723)

Module credits	15.00
NQF Level	08
Prerequisites	BScHons Meteorology students or GIS 310 (or equivalent)
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content
Tropospheric atmospheric composition in southern Africa, with a particular focus on air quality. Specific topics are: air pollution and atmospheric chemistry; linkages between meteorology and air pollution; impacts of air pollution on health and ecosystems; links of atmospheric composition to biogeochemical processes. Modelling and measuring atmospheric composition. Linkages between air pollution and climate change.

Cloud dynamics 781 (WKD 781)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	28 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content
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.

General Academic Regulations and Student Rules
The General Academic Regulations (G Regulations) and General Student Rules apply to all faculties and registered students of the University, as well as all prospective students who have accepted an offer of a place at the University of Pretoria. On registering for a programme, the student bears the responsibility of ensuring that they familiarise themselves with the General Academic Regulations applicable to their registration, as well as the relevant faculty-specific and programme-specific regulations and information as stipulated in the relevant yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression, or basis for an exception to any of the aforementioned regulations. The G Regulations are updated annually and may be amended after the publication of this information.

Regulations, degree requirements and information
The faculty regulations, information on and requirements for the degrees published here are subject to change and may be amended after the publication of this information.

University of Pretoria Programme Qualification Mix (PQM) verification project
The higher education sector has undergone an extensive alignment to the Higher Education Qualification Sub-Framework (HEQSF) across all institutions in South Africa. In order to comply with the HEQSF, all institutions are legally required to participate in a national initiative led by regulatory bodies such as the Department of Higher Education and Training (DHET), the Council on Higher Education (CHE), and the South African Qualifications

Authority (SAQA). The University of Pretoria is presently engaged in an ongoing effort to align its qualifications and programmes with the HEQSF criteria. Current and prospective students should take note that changes to UP qualification and programme names, may occur as a result of the HEQSF initiative. Students are advised to contact their faculties if they have any questions.