University of Pretoria Yearbook 2022

BScHons *Meteorology* (02240074)

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

Admission requirements

1. BSc (Meteorology) degree **or** relevant BSc degree
2. Physics passed at first-year level
3. Mathematics passed at second-year level
4. Passed the following modules (or equivalents thereof):

a. WKD 155 Atmospheric structure and processes
b. WKD 261 Physical meteorology
c. GMA 220 Remote sensing
d. WKD 263 Introduction to dynamical meteorology
e. WKD 352 Atmospheric vorticity 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

1. A weighted average of at least 60% in relevant final-year modules
2. An admission examination may be required

Note: Additional modules may be required in order to reach the desired level of competency

Curriculum: Final year

Minimum credits: 135

Core credits: 99

Elective credits: 36

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.

Core modules

Numerical modelling: applications 704 (WKD 704)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
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.

Dynamic meteorology 706 (WKD 706)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 practical 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

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.

Radar meteorology 707 (WKD 707)

Module credits	12.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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

Basic principles and characteristics of the weather radar. The influence of the atmosphere on the propogation of electro-magnetic waves. Weather radar equation. The influence of attenuation on observations. The measurement of precipation with a radar. Doppler Radar. Convective storm analysis with radar.

Overview of tropical and mid-latitude meteorology 731 (WKD 731)

Module credits	12.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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

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.

Satellite meteorology 733 (WKD 733)

Module credits	12.00
NQF Level	08
Contact time	1 discussion class per week, 1 lecture 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

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.

Research project 763 (WKD 763)

Module credits	35.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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.

Natural woodland and forests: Ecology and management 700 (BOT 700)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences

Period of presentation	Semester 2

Module content

Definitions of woodlands and forests and vegetation and forest resources in southern Africa; Classification of forest and woodland in southern Africa; Woodland dynamics including disturbance, recruitment, growth and mortality, recovery after disturbance; Ecosystem services (microclimate and nutrient cycling, carbon sequestration etc); Sustainable forest resource management (resource assessment, socio-economic assessment e.g. wood and non-forest products, participatory resource management processes); Forest health; Monitoring of resource-use impacts and adaptive management; Development of a framework for sustainable conservation and use of non-timber forest products; Climate change and resilience. Forest disease and pathology.

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 System and Public Health
Period of presentation	Year

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 System and Public Health
Period of presentation	Year

Advanced remote sensing 705 (GMA 705)

Module credits	15.00
NQF Level	08
Prerequisites	GMA 320 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

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.

Environmental management and risk assessment 716 (GTX 716)

Module credits	20.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	2 practicals per week (3 weeks), 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Principles of integrated environmental management; environmental impact assessment; environmental management systems (ISO 14000 series); water resource management; environmental legislation; site investigation guidelines; natural hazard risk assessment; seismicity; project management and professional business practice.Geological models and software.

Seasonal and climate modelling 703 (WKD 703)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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

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.

Boundary layer meteorology 719 (WKD 719)

Module credits	15.00

NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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

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.

Mesoscale meteorology 734 (WKD 734)

Module credits	12.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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

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

Selected themes 736 (WKD 736)

Module credits	12.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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

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 numberical modelling.

Cloud dynamics 781 (WKD 781)

Module credits	15.00
NQF Level	08
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture 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

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.