



# University of Pretoria Yearbook 2023

## BSc (Physics) (02133203)

**Department** Physics

**Minimum duration of study** 3 years

**Total credits** 430

**NQF level** 07

### Programme information

Those students registered for the BSc (Physics) programme and who have opted to select any of the dual major fields of study offered within this programme must take note of the following:

- Their [Academic Record](#) will list all the modules that they have completed towards a second major field of study (based on final year modules completed).
- Their [Degree certificate](#) will only print the officially approved programme name:

Bachelor of Science  
Physics

### Admission requirements

#### Important information for all prospective students for 2023

The admission requirements below apply to all who apply for admission to the University of Pretoria with a **National Senior Certificate (NSC) and Independent Examination Board (IEB) qualifications**. [Click here](#) for this Faculty Brochure.

#### Minimum requirements

##### Achievement level

##### English Home

##### Language or

##### English First

##### Additional

##### Language

NSC/IEB

5

##### Mathematics

NSC/IEB

5

##### Physical Sciences

NSC/IEB

5

##### APS

**34**

Life Orientation is excluded when calculating the APS.

You will be considered for final admission to degree studies if space allows, and if you have a National Senior Certificate (NSC) or equivalent qualification with admission to bachelor's degree studies, and comply with the minimum subject requirements as well as the APS requirements of your chosen programme.

**Applicants with qualifications other than the abovementioned** should refer to the Brochure:

Undergraduate Programme Information 2023: Qualifications other than the NSC and IEB, available at [click here](#).

International students: [Click here](#).



## Transferring students

A transferring student is a student who, at the time of applying at the University of Pretoria (UP) is/was a registered student at another tertiary institution. A transferring student will be considered for admission based on NSC or equivalent qualification and previous academic performance. Students who have been dismissed from other institutions due to poor academic performance will not be considered for admission to UP.

**Closing dates:** Same as above.

## Returning students

A returning student is a student who, at the time of application for a degree programme is/was a registered student at UP, and wants to transfer to another degree at UP. A returning student will be considered for admission based on NSC or equivalent qualification and previous academic performance.

### Note:

- Students who have been excluded/dismissed from a faculty due to poor academic performance may be considered for admission to another programme at UP, as per faculty-specific requirements.
- Only ONE transfer between UP faculties and TWO transfers within a faculty will be allowed.
- Admission of returning students will always depend on the faculty concerned and the availability of space in the programmes for which they apply.

## Closing date for applications from returning students

Unless capacity allows for an extension of the closing date, applications from returning students must be submitted before the end of August via your UP Student Centre.

Candidates who do not comply with the minimum admission requirements for BSc (Physics), may be considered for admission to the BSc – Extended programme – Physical Sciences, which requires an additional year of study.

### BSc - Extended Programme - Physical Sciences

#### Minimum requirements

#### Achievement level

#### English Home

#### Language or

#### English First

#### Additional

#### Language

NSC/IEB

4

#### Mathematics

NSC/IEB

4

#### Physical Sciences

NSC/IEB

4

**APS**

**28**

### Note:

\*The BSc – Extended programmes are not available for students who meet all the requirements for the corresponding mainstream programme.

\*Please note that only students who apply in their final NSC or equivalent qualification year will be considered for admission into any of the BSc – Extended programmes. Students who are upgrading or taking a gap year will not be considered.

## Other programme-specific information

### 1.1 Requirements for specific modules

A candidate who:

- a. does not qualify for STK 110, must enrol for STK 113 and STK 123;
- b. registers for Mathematical Statistics (WST) and Statistics (STK) modules must take note that WST and STK modules, except for STK 281, may not be taken simultaneously in a programme; a student must take one and only one of the following options:
  - WST 111, WST 121, WST 212, WST 211, WST 221, WST 311, WST 312, WST 322, WST 321, and STK 353  
or
  - WST 111, WST 121, WST 212, WST 211, WST 221, WST 311, WST 312, WST 322, STK 320, STK 353.  
or
  - STK 110, STK 122, STK 210, STK 220, WST 212, STK 310, STK 320, STK 353.
- c. registers for a module presented by another faculty must take note of the timetable clashes, prerequisites for that module, subminimum required in examination papers, supplementary examinations, etc.

## 1.2 Fundamental modules

- a. It is compulsory for all new first-year students to satisfactorily complete the Academic orientation (UPO 102) and to take Academic information management modules (AIM 111 and AIM 121) and Language and study skills (LST 110). Please see curricula for details.
- b. Students who intend to apply for admission to MBChB or BChD in the second semester, when places become available in those programmes, may be permitted to register for up to 80 module credits and 4 core modules in the first semester during the first year provided that they obtained a final mark of no less than 70% for Grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

## Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

### General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senate Appeals Committee.
- Any decision taken by the Senate Appeals Committee is final.



## General 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 (HEQF) 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.*



## Curriculum: Year 1

### Minimum credits: 142

Fundamental = 14

Core = 64

Elective = 64

### Additional information:

Students must select elective modules with a total number of at least 64 credits according to the following streams. (Deviations allowed with permission from the head of department):

- **Mathematics as second major:** Due to the modules prescribed for the BSc (Physics) module, taking mathematics as a second major in 3<sup>rd</sup> year is possible for all options. Please select one of the options below.
- **Second major in applied mathematics or mathematical statistics:** WTW 115, WTW 152, WTW 162, WTW 123, WST 111, WST 121 (64 credits)
- **Second major in chemistry or applied mathematics:** CMY 117, CMY 127, WTW 162, WTW 123, WTW 115, WTW 152 (64 credits)
- **Second major in chemistry or mathematical statistics:** CMY 117, CMY 127, WST 111, WST 121 (64 credits)
- **Second major in chemistry or geology:** CMY 117, CMY 127, GLY 155, GLY 163 (64 credits)
- **Second major in chemistry or meteorology:** WKD 155 (16, S1), BME 120 (16, S2), GMC 110 (10, S2), [one of SCI 154 (16, S1), WST 111 (16, S1) or CMY 117 (16, S1)] and [one of WTW 123 (8, S2), WTW 162 (8, S2), CMY 127(16, S2, prerequisite CMY 117)] (32 + 34 (or 42) = 66 (or 74) credits).
- **Second major in chemistry with interest in biophysics:** CMY 117, CMY 127, MLB 111, GTS 161, BOT 161 (64 credits)
- **Second major in chemistry with interest in astronomy:** CMY 117, CMY 127, WTW 162, WTW 123, SCI 154 (64 credits)
- **Second major in applied mathematics with an interest in astronomy:** WTW 115, WTW 152, WTW 162, WTW 123, SCI 154, COS 132 (64 credits) note: semesters unbalanced – Year credits: S1:80, S2:48
- **Computational physics:** WTW 123, COS 132, COS 110, COS 122, COS 151 (64 credits note: semesters unbalanced – Year credits: S1:56, S2: 72)

## Fundamental modules

[Academic information management 111](#) (AIM 111) - Credits: 4.00

[Academic information management 121](#) (AIM 121) - Credits: 4.00

[Language and study skills 110](#) (LST 110) - Credits: 6.00

[Academic orientation 102](#) (UPO 102) - Credits: 0.00

## Core modules

[First course in physics 114](#) (PHY 114) - Credits: 16.00

[First course in physics 124](#) (PHY 124) - Credits: 16.00

[Calculus 114](#) (WTW 114) - Credits: 16.00

[Mathematics 124](#) (WTW 124) - Credits: 16.00

## Elective modules

[Biometry 120](#) (BME 120) - Credits: 16.00

[Plants and society 161](#) (BOT 161) - Credits: 8.00

[General chemistry 117](#) (CMY 117) - Credits: 16.00



General chemistry 127 (CMY 127) - Credits: 16.00  
Program design: Introduction 110 (COS 110) - Credits: 16.00  
Operating systems 122 (COS 122) - Credits: 16.00  
Imperative programming 132 (COS 132) - Credits: 16.00  
Introduction to computer science 151 (COS 151) - Credits: 8.00  
Introduction to geology 155 (GLY 155) - Credits: 16.00  
Earth history 163 (GLY 163) - Credits: 16.00  
Cartography 110 (GMC 110) - Credits: 10.00  
Introductory genetics 161 (GTS 161) - Credits: 8.00  
Molecular and cell biology 111 (MLB 111) - Credits: 16.00  
Exploring the universe 154 (SCI 154) - Credits: 16.00  
Atmospheric structure and processes 155 (WKD 155) - Credits: 16.00  
Mathematical statistics 111 (WST 111) - Credits: 16.00  
Mathematical statistics 121 (WST 121) - Credits: 16.00  
Discrete structures 115 (WTW 115) - Credits: 8.00  
Numerical analysis 123 (WTW 123) - Credits: 8.00  
Mathematical modelling 152 (WTW 152) - Credits: 8.00  
Dynamical processes 162 (WTW 162) - Credits: 8.00



## Curriculum: Year 2

### Minimum credits: 144

Core = 96

Elective = 48

### Additional information:

Students must select elective modules with a total number of at least 48 credits according to the following streams (deviations allowed with permission from the head of department):

- **Mathematics as second major:** Due to the modules prescribed for the BSc (Physics) module, taking mathematics as a second major in 3<sup>rd</sup> year is possible for all options.
- **Second major applied mathematics:** WTW 286 (12, S1), WTW 221 (12, S2) and PHY 210 (24, S2) (48 credits). WTW 285 (12, S2) may be taken additionally.
- **Second major statistics:** WST 211, WST 221 (48 credits)
- **Second major in chemistry:** CMY 282, CMY 283, CMY 284, CMY 285 (48 credits).
- **Second major in geology:** GLY 253, GLY 255, GLY 263 (48 credits).
- **Second major in meteorology:** WKD 261 (12, Q3), WKD 254 (12, S2), ENV 201 (14, Q2), WKD 263 (14, S1), WKD 265 (12, Q4) (28 + 36 = 64 credits). Note: due to the excess credits in the second year it is recommended that students doing a second major in meteorology enrol for ENV 201 in their third year of study.
- **Interest in astronomy:** PHY 210, WTW 221, WTW 286 (48 credits) **note: semester unbalanced:** Year credits S1: 60, S2: 84)
- **Interest in computational physics:** COS 210, COS 212, COS 226, COS 284 (56 credits) **note:** 24 + 32 = 56 credits = excess of 8 credits in second semester.

### Core modules

[Waves, thermodynamics and modern physics 255](#) (PHY 255) - Credits: 24.00

[General physics 263](#) (PHY 263) - Credits: 24.00

[Linear algebra 211](#) (WTW 211) - Credits: 12.00

[Calculus 218](#) (WTW 218) - Credits: 12.00

[Analysis 220](#) (WTW 220) - Credits: 12.00

[Vector analysis 248](#) (WTW 248) - Credits: 12.00

### Elective modules

[Physical chemistry 282](#) (CMY 282) - Credits: 12.00

[Analytical chemistry 283](#) (CMY 283) - Credits: 12.00

[Organic chemistry 284](#) (CMY 284) - Credits: 12.00

[Inorganic chemistry 285](#) (CMY 285) - Credits: 12.00

[Theoretical computer science 210](#) (COS 210) - Credits: 8.00

[Data structures and algorithms 212](#) (COS 212) - Credits: 16.00

[Concurrent systems 226](#) (COS 226) - Credits: 16.00

[Computer organisation and architecture 284](#) (COS 284) - Credits: 16.00

[Environmental sciences 201](#) (ENV 201) - Credits: 14.00

[Process geomorphology 252](#) (GGY 252) - Credits: 12.00

[Geomorphology of the built environment 265](#) (GGY 265) - Credits: 12.00

[Geographic data analysis 220](#) (GIS 220) - Credits: 14.00

[Sedimentology 253](#) (GLY 253) - Credits: 12.00



Fundamental and applied mineralogy 255 (GLY 255) - Credits: 12.00  
Remote sensing 220 (GMA 220) - Credits: 14.00  
Astronomy for physicists 210 (PHY 210) - Credits: 24.00  
Programming in meteorology 254 (WKD 254) - Credits: 12.00  
Physical meteorology 261 (WKD 261) - Credits: 12.00  
Introduction to dynamic meteorology 263 (WKD 263) - Credits: 14.00  
Satellite meteorology 265 (WKD 265) - Credits: 12.00  
Mathematical statistics 211 (WST 211) - Credits: 24.00  
Mathematical statistics 221 (WST 221) - Credits: 24.00  
Linear algebra 221 (WTW 221) - Credits: 12.00  
Techniques of analysis 224 (WTW 224) - Credits: 12.00  
Differential equations 256 (WTW 256) - Credits: 8.00  
Numerical methods 263 (WTW 263) - Credits: 8.00  
Discrete structures 285 (WTW 285) - Credits: 12.00  
Differential equations 286 (WTW 286) - Credits: 12.00





## Curriculum: Final year

### Minimum credits: 144

Core = 72

Elective = 72

### Additional information:

Students who want to register PHY 353 and PHY 363 must make sure, before registration, that a suitable project and supervisor has been confirmed with the head of department.

Students must select elective modules with a total number of at least 72 credits from the following streams (deviations allowed with permission from the head of department):

- **Mathematics as second major:** WTW 310, WTW 320, WTW 381 and WTW 389 (72 credits).
- **Applied Mathematics as second major:** At least four of WTW 310, WTW 382, WTW 383, 386 and WTW 387 (72 of 90 credits).
- **Mathematical statistics as second major:** WST 311, WST 312, WST 321, STK 353 (79 credits) Unbalanced: 36 + 43
- **Chemistry as second major:** CMY 382, CMY 383, CMY 384, CMY 385 (72 credits).
- **Geology as second major:** GLY 365, GLY 366 and GLY 367 (72 credits)
- **Meteorology as second major:** WKD 352, WKD 361, WKD 315, WKD 316 (72 credits). Note: due to the excess credits in the second year it is recommended that students doing a second major in physics enrol for ENV 201 in their third year of study.
- **Astronomy, astrophysics and high energy physics:** PHY 300, PHY 310, WTW 383 (72 credits)
- **Interest in computational physics:** COS 314, COS 344, COS 333, COS 330 (72 credits).

### Core modules

Electronics, electromagnetism and quantum mechanics 356 (PHY 356) - Credits: 36.00

Statistical mechanics, solid state physics and modelling 364 (PHY 364) - Credits: 36.00

### Elective modules

Physical chemistry 382 (CMY 382) - Credits: 18.00

Analytical chemistry 383 (CMY 383) - Credits: 18.00

Organic chemistry 384 (CMY 384) - Credits: 18.00

Inorganic chemistry 385 (CMY 385) - Credits: 18.00

Artificial intelligence 314 (COS 314) - Credits: 18.00

Computer security and ethics 330 (COS 330) - Credits: 18.00

Programming languages 333 (COS 333) - Credits: 18.00

Computer graphics 344 (COS 344) - Credits: 18.00

Structural geology 365 (GLY 365) - Credits: 18.00

Groundwater 366 (GLY 366) - Credits: 18.00

Economic geology 367 (GLY 367) - Credits: 36.00

Observational astronomy 300 (PHY 300) - Credits: 36.00

Particle and astroparticle physics 310 (PHY 310) - Credits: 18.00

Physics project 353 (PHY 353) - Credits: 12.00

Physics project 363 (PHY 363) - Credits: 12.00

The science of data analytics 353 (STK 353) - Credits: 25.00

Mid-latitude and polar meteorology 315 (WKD 315) - Credits: 18.00



---

[Tropical meteorology 316 \(WKD 316\)](#) - Credits: 18.00  
[Synoptic-scale circulation dynamics and vorticity in mid-latitudes 352 \(WKD 352\)](#) - Credits: 18.00  
[Quasi-geostrophic analysis 361 \(WKD 361\)](#) - Credits: 18.00  
[Multivariate analysis 311 \(WST 311\)](#) - Credits: 18.00  
[Stochastic processes 312 \(WST 312\)](#) - Credits: 18.00  
[Time-series analysis 321 \(WST 321\)](#) - Credits: 18.00  
[Analysis 310 \(WTW 310\)](#) - Credits: 18.00  
[Complex analysis 320 \(WTW 320\)](#) - Credits: 18.00  
[Algebra 381 \(WTW 381\)](#) - Credits: 18.00  
[Dynamical systems 382 \(WTW 382\)](#) - Credits: 18.00  
[Numerical analysis 383 \(WTW 383\)](#) - Credits: 18.00  
[Partial differential equations 386 \(WTW 386\)](#) - Credits: 18.00  
[Continuum mechanics 387 \(WTW 387\)](#) - Credits: 18.00  
[Geometry 389 \(WTW 389\)](#) - Credits: 18.00

---

#### **Regulations and rules**

The regulations and rules for the degrees published here are subject to change and may be amended after the publication of this information.

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.

#### **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 (HEQF) 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.