

# BACHELOR OF GEOMATICS

Qualification code: BPGM20 – NQF Level 7 (386 credits)

SAQA ID: 112138, CHE NUMBER: H/H16/E113/CAN

Campus where offered:

Pretoria Campus

## REMARKS

a. *Admission requirement(s) and selection criteria:*

• **APPLICANTS WITH A SENIOR CERTIFICATE OBTAINED BEFORE 2008:**

**Admission requirement(s):**

A Senior Certificate with a matriculation endorsement or an equivalent qualification, with a B symbol at Standard Grade or C symbols at Higher Grade for English, Mathematics and Physical Science.

**Selection criteria:**

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **28**.

• **APPLICANTS WITH A NATIONAL SENIOR CERTIFICATE OBTAINED IN OR AFTER 2008:**

**Admission requirement(s):**

A National Senior Certificate or an equivalent qualification, with a bachelor's degree endorsement, or an equivalent qualification, with an achievement level of at least 4 for English (home language or first additional language), 5 for Mathematics or Technical Mathematics, and 5 for Physical Sciences or Technical Sciences.

**Selection criteria:**

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **28** (excluding Life Orientation).

• **APPLICANTS WITH A NATIONAL CERTIFICATE (VOCATIONAL) AT NQF LEVEL 4:**

**Admission requirement(s):**

A National Certificate (Vocational) at NQF Level 4, with a bachelor's degree endorsement, issued by the Council for Quality Assurance in General and Further Education and Training (Umalusi) with at least a 50% (APS of 4) for English, 50% for Life Orientation (excluded for APS calculation), and 60% (APS of 5) Mathematics and Science, and 60% (APS of 5) for any other three compulsory vocational subjects.

**Selection criteria:**

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **28** (excluding Life Orientation).

• **APPLICANTS WITH A NATIONAL N CERTIFICATE/NATIONAL SENIOR CERTIFICATE AS PUBLISHED IN REPORT 191: N3 (NQF LEVEL 4):**

**Admission requirement(s):**

A National Senior Certificate or a National N Certificate with languages as published in Report 191: N3 (NQF Level 4) issued by both the Department of Higher Education and Training (DHET) and the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least 50% for English, Mathematics N3, Engineering Sciences N3 and any other two additional subjects.

**Selection criteria:**

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **28**.



**Recommended subject(s):**

None.

- **APPLICANTS WITH A N6 CERTIFICATE IN A RELATED ENGINEERING FIELD AS PUBLISHED IN REPORT 191: N6:**

**Admission requirement(s):**

A N6 Certificate in a related Engineering field as published in Report 191: N6 issued by both the Department of Higher Education and Training (DHET) and the Council for Quality Assurance in General and Further Education and Training (Umalusi), with an average of at least 60% for the qualification, and successful completion of an English Language Proficiency Assessment (done by the University).

**Recommended subject(s):**

None.

- **APPLICANTS WITH QUALIFICATIONS ON THE HIGHER EDUCATION QUALIFICATION SUB-FRAMEWORK (HEQSF) OFFERED BY UNIVERSITIES OF TECHNOLOGY:**

The applicant will be considered for admission to the programme, if any of the following qualifications has been completed:

- Diploma in Geomatics (NQF Level 6 - 280 credits): with an average of at least 65% for the qualification.
- National Diploma: Surveying (NQF Level 6 - 3,000 credits): with an average of at least 60% for the qualification.

*b. Assessment Procedure:*

No further assessment will be done (except for candidates with a N4 Certificate). Applicants who achieve the minimum APS will be considered until the programme complement is full. All completed applications received within the published due dates will be ranked. After consideration of the Departmental Student Enrolment Plan, only the top ranking applicants will be selected. Once a programme is full, a waiting list will be in place to provide an opportunity for applicants to fill places of those who did not register on time. Applicants will be informed of their status per official letter from the Office of the Registrar, alternatively, they can check their application status on the TUT website, [www.tut.ac.za](http://www.tut.ac.za).

*c. Recognition of Prior Learning (RPL), equivalence and status:*

See Chapter 30 of Students' Rules and Regulations.

*d. Intake for the qualification:*

January only.

*e. Minimum duration:*

Three years.

*f. Presentation:*

Day classes. Working students with a National Diploma may be permitted to register for certain modules on a block-mode basis.

*g. Exclusion and readmission:*

See Chapter 2 of Students' Rules and Regulations.

**Key to asterisks:**

- \* Modules may be offered in block mode to working students. Full details on the offering is available from the department.



## CURRICULUM

### FIRST YEAR

CODE	MODULE	NQF-L	CREDIT
COS105X	Communication Skills	(5)	(6)
EGP105X	Engineering Surveying Fundamentals	(5)	(28)
EMA105B	Engineering Mathematics I	(5)	(28)
GOA105X	Geomatics Computer Applications*	(5)	(19)
INL125C	Information Literacy (block module)	(5)	(1)
LFS125X	Life Skills (block module)	(5)	(2)

#### FIRST SEMESTER

GEG115X	Geography	(5)	(6)
SEP115B	Physics	(5)	(10)

#### SECOND SEMESTER

CSD115X	Computer Survey Drawing	(5)	(12)
GOP115X	Geodesy and Map Projection I*	(5)	(12)
MEC115X	Mechanics*	(5)	(10)

TOTAL CREDITS FOR THE FIRST YEAR: **134**

### SECOND YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
APG206B	Photogrammetry I	(6)	(24)	
CSL206B	Adjustment Computations and Statistical Analysis*	(6)	(24)	Engineering Mathematics I Engineering Surveying Fundamentals I
EMA206B	Engineering Mathematics II*	(6)	(14)	Engineering Mathematics I
ESR206B	Engineering Surveying I*	(6)	(28)	Engineering Surveying Fundamentals I
GIT206B	Geographic Information Technology I*	(6)	(24)	Geomatics Computer Applications

#### SECOND SEMESTER

CDS216B	Cadastral Systems	(6)	(12)
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TOTAL CREDITS FOR THE SECOND YEAR: **126**

### THIRD YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
ESR307B	Engineering Surveying II*	(7)	(24)	Engineering Surveying I
RSS307B	Remote Sensing I*	(7)	(24)	Photogrammetry I

#### FIRST SEMESTER

APG317B	Photogrammetry II*	(7)	(12)	Photogrammetry I
GOP317B	Geodesy and Map Projections II*	(7)	(18)	



PRS317B	Project Management: Surveying*	(7)	(12)	
<b>SECOND SEMESTER</b>				
ESP317B	Engineering Surveying Project*	(7)	(12)	Engineering Surveying II Adjustment Computations and Statistical Analysis
ESP317R	Engineering Surveying Project* (re-registration) (first-semester module)	(7)	(0)	
GIT317B	Geographic Information Technology II*	(7)	(12)	Geographic Information Technology I
RUP317B	Rural and Urban Planning*	(7)	(12)	
TOTAL CREDITS FOR THE THIRD YEAR:			<b>126</b>	
TOTAL CREDITS FOR THE QUALIFICATION:			<b>386</b>	

## MODULE INFORMATION (OVERVIEW OF SYLLABUS)

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular module. On 01 October 2019, the syllabus content was defined as follows:

### A

#### **ADJUSTMENT COMPUTATIONS AND STATISTICAL ANALYSIS (CSL206B) 1 X 3-HOUR PAPER**

*(Module custodian: Department of Geomatics)*

Introduction to Adjustment Computations, Statistical Analysis, Random Error theory and probability. Confidence Intervals. Statistical Testing. Regression. Analysis and Correlation. Matrix Algebra. Propagation of random Errors in indirectly measured quantities. Error Propagation in angle and distance measurements. Traverse Surveys. Elevation Determination. Weights of Observations. Principles of Least Squares. Network Adjustment. Coordinate Transformations. Analysis of Adjustment. (Total tuition time: ± 240 hours)

### C

#### **CADASTRAL SYSTEMS (CDS216B) 1 X 3-HOUR PAPER**

*(Module custodian: Department of Geomatics)*

Introduction to property law and tenure legislation. Registration of Geomaticians and the requirements by the Geomatics profession. Cadastral Surveying in practice. (Total tuition time: ± 120 hours)

#### **COMMUNICATION SKILLS (COS105X) 1 X 2-HOUR PAPER**

*(Module custodian: Department of Applied Languages)*

To identify and apply basic competencies related to communicating in a technical or engineering environment. These competencies include presenting technical information to a variety of audiences, preparing technical reports, participating constructively in formal meetings and preparing a variety of business and technical documents. (Total tuition time: ± 40 hours)

#### **COMPUTER SURVEY DRAWING (CSD115X) CONTINUOUS ASSESSMENT**

*(Module custodian: Department of Geomatics)*

Introduction to Drawing. Engineering Drawing Standards. Projections and Elevations. Manual Drafting and engineering surveying drawings. Cadastral and Topographical Mapping. Digital Design of Drawings. Introduction to Model maker. Introduction to Surpac. Digitizing Cadastral Plans. (Total tuition time: ± 120 hours)



**E****ENGINEERING MATHEMATICS I (EMA105B)****2 X 2-HOUR PAPERS***(Module custodian: Department of Mathematics and Statistics)*

Trigonometry, geometry, functions, complex numbers, vector algebra, matrices and transformations, single-variable differentiation and integration, partial differentiation, multiple-variable intervals, introduction to differential equations. (Total tuition time: not available)

**ENGINEERING MATHEMATICS II (EMA206B)****1 X 3-HOUR PAPER***(Module custodian: Department of Mathematics and Statistics)*

Mathematical modelling, first-order ordinary differential equations (ODEs), higher-order ODEs, Laplace transforms, systems of ODE's, numerical solutions of ODEs, Sturm-Liouville problems, partial differential equations. (Total tuition time: not available)

**ENGINEERING SURVEYING I (ESR206B)****1 X 3-HOUR PAPER***(Module custodian: Department of Geomatics)*

Instrument errors and adjustments including personal errors; Curves; Traversing; Triangulation; Spatial data; Deformation of structures; Precise Levelling. (Total tuition time: ± 280 hours)

**ENGINEERING SURVEYING II (ESR307B)****1 X 3-HOUR PAPER***(Module custodian: Department of Geomatics)*

Compute Geometric Designs for Horizontal curves. Compute Geometric Designs for Horizontal curves (Simple curve). Compute Geometric Designs for Horizontal curves (Compound curve). Compute Geometric Designs for Horizontal curves (Reverse curve). Compute Geometric Designs for Vertical curves. Compute Geometric Designs for Transition curve. Test personal errors, Adjust/Correct instrument errors. Precise levelling. Deformation measurements. Triangulation. Application and Problem solving. Traversing. Bowditch Method, Tan Method. Scale and Swing Method. (Total tuition time: ± 280 hours)

**ENGINEERING SURVEYING FUNDAMENTALS (EGP105X)****1 X 3-HOUR PAPER***(Module custodian: Department of Geomatics)*

Surveying Principles. Testing and Adjustment of levelling instrument, Levelling rise and fall, Levelling Long Section (HI Method). Levelling Cross Section. South African Co-ordinate System. Joins and Polars. Distance Correction. Traverse. (Total tuition time: ± 280 hours)

**ENGINEERING SURVEYING PROJECT (ESP317B/R)****PROJECT ASSESSMENT***(Module custodian: Department of Geomatics)*

Instrument errors and adjustments including personal errors; Curves; Traversing; Triangulation; Spatial data; Deformation of structures; Precise Levelling. (Total tuition time: ± 280 hours)

**G****GEODESY AND MAP PROJECTION I (GOP115X)****1 X 3-HOUR PAPER***(Module custodian: Department of Geomatics)*

Geographical Coordinates. Spherical trigonometry. Shape of the Earth. Geoid. mathematical representations of the Earth. (including datum's and reference ellipsoids). Map projections. Including mathematical models and projection characteristics). Two- and three-dimensional coordinate systems. SA Survey co-ordinate system and UTM system. Re-projections. transformations. (Total tuition time: ± 120 hours)

**GEODESY AND MAP PROJECTIONS II (GOP317B)****1 X 3-HOUR PAPER***(Module custodian: Department of Geomatics)*

Spherical Astronomy. Two Dimensional coordinate transformation. Coordinate systems and three dimensional rotations. Terrestrial versus geodetic coordinate systems. Geodetic principles. Principles of GPS. Gravimetry and gravity field of the earth. (Total tuition time: ± 180 hours)

**GEOGRAPHIC INFORMATION TECHNOLOGY I (GIT206B)****1 X 3-HOUR PAPER***(Module custodian: Department of Geomatics)*

Maps and Map Design. Cartometry. GIS Concepts. GIS Data Collection. GIS Database/Geodatabase. Fundamentals of Spatial Analysis. GIS Applications. Visualisation and representation of geo-spatial information. (Total tuition time: not available)



**GEOGRAPHIC INFORMATION TECHNOLOGY II (GIT317B)****1 X 3-HOUR PAPER****(Module custodian: Department of Geomatics)**

Programming for Spatial Data Processing. UML for GIS Applications. Distributed Systems. Advanced Spatial Analysis. (Total tuition time: not available)

**GEOGRAPHY (GEG115X)****1 X 3-HOUR PAPER****(Module custodian: Department of Geomatics)**

Physical Geography. Human Geography. Disaster Management and Climate Change. Tourism. Understanding Maps. (Total tuition time: ± 60 hours)

**GEOMATICS COMPUTER APPLICATIONS (GOA105X)****CONTINUOUS ASSESSMENT****(Module custodian: Department of Geomatics)**

Computer Hardware. Software. Introduction to Microsoft Office Suite. Data Communication. Virus and Antivirus. Internet Applications. Microsoft Excel for Surveying Computations. Design of web applications. Flowcharts of Algorithms. Programming for Geomatics Problem Solving. Databases. Entity Relationship Modelling. Microsoft Access for Database Design. SURPAC for Surveying Computations. (Total tuition time: ± 190 hours)

**I****INFORMATION LITERACY (INL125C)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Library and Information Services)**

Introduction of information literacy. Development of a search strategy and application of a search string to search engines and academic databases. Evaluation of information sources. Ethical and legal use of information. (Total tuition time: ± 10 hours)

**L****LIFE SKILLS (LFS125X)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Student Development and Support)**

Academic, personal and socio-emotional skills development for students in higher education. Personal and social dimensions address: Effective planning and self-management (goal setting and time management); Adjusting to university life (student life, diversity and change); Intra- and interpersonal skills development (conflict management, self-esteem, relationship management); Effective living (healthy living, HIV education, substance abuse). Academic dimension addresses: Academic skills for university (e.g. critical thinking, creativity, managing assignments and assessments). (Total tuition time: ± 20 hours)

**M****MECHANICS (MEC115X)****1 X 3-HOUR PAPER****(Module custodian: Department of Mechanical and Mechatronics Engineering)**

To equip the student with a fundamental understanding of mechanics and how to apply these to a design problem. (Total tuition time: not available)

**P****PHOTOGRAMMETRY I (APG206B)****1 X 3-HOUR PAPER****(Module custodian: Department of Geomatics)**

Aerial Imaging principles(image types, photogrammetry cameras, scanners and work stations); Flight planning, drone surveys and laser scanning technologies, close range imaging; Relative and absolute orientations principles, image resection, bundle adjustment; Rectification of aerial photographs, surface interpolation techniques; camera calibration methods; Homogeneous coordinates and vanishing points in Photogrammetry. (Total tuition time: ± 240 hours)

**PHOTOGRAMMETRY II (APG317B)****1 X 3-HOUR PAPER****(Module custodian: Department of Geomatics)**

Mathematical concepts in photogrammetry, aero triangulation. Photogrammetric Resection, Intersection and Triangulation. The Least Squares adjustment. Collinearity condition. Coordinate Transformations. Aero Triangulation, 3D modelling, Point cloud processing, scripting for photogrammetry. (Total tuition time: ± 240 hours)



**PHYSICS (SEP115B)****1 X 2-HOUR PAPER****(Module custodian: Department of Physics)**

Fluids, heat and thermodynamics, waves and sound, electric and magnetic fields and forces, electromagnetic waves and light. (Total tuition time: ± 100 hours)

**PROJECT MANAGEMENT: SURVEYING (PRS317B)****PROJECT ASSESSMENT****(Module custodian: Department of Geomatics)**

Outline project management. Project management and organisation. Project feasibility and scheduling. Project selection. Acquiring project resources and outline using teams and disposing project information appropriately. Demonstrate knowledge in project management philosophy. Evaluate project control and closure. Prepare project plans. Define project risk management. Review project objectives for timely project completion. Determine impacts of the HIV/AIDS pandemic. Identify good ethical and professional conduct. (Total tuition time: ± 120 hours)

**R****REMOTE SENSING I (RSS307B)****1 X 3-HOUR PAPER****(Module custodian: Department of Geomatics)**

Elementary image processing. Sensor calibration. Deriving object information from Remote Sensing data. Digital image classification. Laser Scanning Remote Sensing. Advanced Remote Sensing data manipulation. (Total tuition time: ± 240 hours)

**RURAL AND URBAN PLANNING (RUP317B)****1 X 3-HOUR PAPER****(Module custodian: Department of Geomatics)**

History of Rural and Urban Planning. Land tenure in Rural South Africa. Town and Regional Planning Law and Practices. Land use Planning and Zoning. Township Design. Metropolitan Region Interventions. Global City Regions. (Total tuition time: ± 120 hours)

