

## NATIONAL DIPLOMA: ENGINEERING: INDUSTRIAL

Qualification code: NDEI03 - NQF Level 6

Campus where offered: Pretoria Campus

### Important notification to new applicants:

Students who intend to enrol for this qualification for the first time in 2017 or thereafter, should note that it will not be possible to continue with any Baccalaureus Technologiae as from 2020, since it is being replaced by qualifications aligned with the newly-implemented Higher Education Qualification Sub-Framework. Potential students are advised to consult the University's website for any new qualifications which might not be published in this Prospectus.

### REMARKS

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

• **FOR APPLICANTS WHO OBTAINED A SENIOR CERTIFICATE BEFORE 2008:**

**Admission requirement(s):**

A Senior Certificate or an equivalent qualification, with a D symbol (50 – 59%) at Higher Grade or a C symbol (60 – 69%) at Standard Grade for English, and C symbols (60 – 69%) at Higher Grade or B symbols (70 – 79%) at Standard Grade for Mathematics and Physical Science.

Applicants with D symbols (50 – 59%) at Higher Grade or C symbols (60 – 69%) at Standard Grade for English and Mathematics and an E symbol (40 – 49%) at Higher Grade or a D symbol (50 – 59%) at Standard Grade for Physical Science will be considered for admission to the extended programme only.

**Selection criteria:**

To be considered for the National Diploma, applicants must have an Admission Point Score (APS) of at least 28. Applicants with a score of 20 to 27 will be considered for the extended programme only.

**Assessment procedure:**

All applications received by the published due dates (as indicated on page 3) will be ranked according to the APS achieved. After consideration of the Departmental Student Enrolment Plan (SEP), only the highest ranked applicants will be accepted to fill the available places. A waiting list consisting of the remainder of the applicants will provide an opportunity for applicants to fill places created by accepted students failing to meet the enrolment dates.

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

**Admission requirement(s):**

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

Applicants with a 4 for English, 4 for Mathematics and 3 for Physical Sciences will be considered for admission to the extended programme only.

Applicants who do not meet the above criteria for Mathematics and/or Physical Sciences for admission to the National Diploma or National Diploma (extended), may enrol for Mathematics N3/N4 and/or Engineering Sciences N3/N4 or Mathematics and/or Engineering Sciences, as presented as part of the National Certificate Vocational (NCV) at NQF Level 4, at any Technical and Vocational Education and Training (TVET) College. If these subjects are successfully passed at a performance level of at least 60% (for the National Diploma), or 50% (National Diploma - extended), they may re-apply for admission to the qualification at the University.



**Selection criteria:**

To be considered for the National Diploma, applicants must have an Admission Point Score (APS) of at least 28. Applicants with a score of 20 to 27 will be considered for the extended programme only.

**Assessment procedure:**

All applications received by the published due dates (as indicated on page 3) will be ranked according to the APS achieved. After consideration of the Departmental Student Enrolment Plan (SEP), only the highest ranked applicants will be accepted to fill the available places. A waiting list consisting of the remainder of the applicants will provide an opportunity for applicants to fill places created by accepted students failing to meet the enrolment dates.

- **FOR APPLICANTS WHO OBTAINED A QUALIFICATION FROM TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) COLLEGES (PREVIOUSLY KNOWN AS FET COLLEGES):**

**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 or a diploma endorsement issued by the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least 50% (APS of 4) for English and Mathematics, and at least 60% (APS of 5) for Physical Sciences/Applied Engineering Technology and any two other vocational subjects.

**Selection criteria:**

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least 23.

**Applicants with a National N Certificate as published in Nated 191: N3 (NQF Level 4) and N4/N5/N6 (NQF Level 5):**

A National Senior Certificate or a National N Certificate as published in Nated 191: N3 (NQF Level 4) and N4/N5/N6 (NQF Level 5) issued by the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least 50% (APS of 4) for English and 60% (APS of 5) for Mathematics N3 and Engineering Sciences N3.

Applicants will be exempted from certain subjects on the grounds of N4/N5/N6 subjects passed (a minimum of 50% of the qualification's subjects). Exemption will be granted from equivalent engineering subjects (including Mathematics and Engineering Sciences) passed with at least 60% (APS of 5).

**Applicants with a National N Diploma (NQF Level 6):**

Applicants with a National N Diploma (Nated 191: N6 with a Trade Certificate) issued by the Council for Quality Assurance in General and Further Education and Training (Umalusi), who obtained at least 60% for all subjects completed for N4/N5/N6 certificates at NQF Level 5 (including Mathematics and Engineering Sciences), will be –

- exempted from certain S1/S2 subjects on the grounds of N4/N5/N6 subjects passed (a maximum of 50% of the qualification's subjects); and
- exempted from Work-Integrated Learning I on the submission of a Trade Certificate at NQF Level 4.

- b. *Minimum duration:*  
Three years.

- c. *Presentation:*  
Day and block-mode classes. Classes and assessments may take place on Friday afternoons and/or Saturdays. Block-mode classes are only offered to designated groups (students employed by the Department of Defence with extensive work experience).

- d. *Intake for the qualification:*  
January and July.



- e. *Exclusion and readmission:*  
See Chapter 2 of Students' Rules and Regulations.
- f. *Recognition of Prior Learning (RPL), equivalence and status:*  
See Chapter 30 of Students' Rules and Regulations.
- g. *Accreditation by professional body:*  
This qualification has been accredited by the Engineering Council of South Africa (ECSA).
- h. *Work-Integrated Learning I and II:*  
Students may enrol for only one subject during any of the Work-Integrated Learning periods, provided that the Work-Integrated Learning provider agrees to such an arrangement in writing. If the subject is the last and only outstanding subject and the student has written the final exam within the past two years, the student may apply for an exit examination. See Chapter 5 of the Students' Rules and Regulations for more information.
- i. *Practicals:*  
It is compulsory for students to attend the practical classes. Students must pass the practical component of a subject to be admitted to the examination.
- j. *Waiving of prerequisite subjects:*  
Prerequisites will only be waived in highly exceptional cases, based on a motivation by the Head of the Department and approved by the Executive Dean (prerequisite subjects published in Report 151 are excluded).
- k. *Subject credits:*  
Subject credits are shown in brackets after each subject.

Key to asterisks:

- \* Information does not correspond to information in Report 151.  
(Deviations approved by the Senate in August 2005, May 2008 and April 2010.)

## CURRICULUM

### FIRST YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
<b>FIRST SEMESTER</b>			
CAI101T	Computer-Aided Draughting I*	(0,047)*	
EGN101T	Engineering Communication I*	(0,042)	
ETT101T	Electrotechnology I	(0,083)	
MAT171T	Mathematics I	(0,083)	
MDR101B	Mechanical Engineering Drawing I	(0,083)	
MHC101T	Mechanics I	(0,083)	
MME101T	Mechanical Manufacturing Engineering I	(0,083)	
TOTAL CREDITS FOR THE SEMESTER:		0,504	
<b>SECOND SEMESTER</b>			
EWK121T	Engineering Work Study I	(0,083)	Engineering Communication I Mathematics I Mechanical Manufacturing Engineering I Mechanics I
MAT271B	Mathematics II	(0,083)	Mathematics I
MFR201T	Manufacturing Relations II	(0,083)	Engineering Communication I



MME201T	Mechanical Manufacturing Engineering II	(0,083)	Computer-Aided Draughting I Mechanical Engineering Drawing I Mechanical Manufacturing Engineering I
PEI111T	Production Engineering: Industrial I	(0,083)	
QTQ101T	Qualitative Techniques I	(0,083)	Mathematics I
TOTAL CREDITS FOR THE SEMESTER:		0,498	
TOTAL CREDITS FOR THE FIRST YEAR:		<b>1,002</b>	

## SECOND YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
<b>FIRST SEMESTER</b>			
CSG201T	Costing II	(0,083)	
EWK221T	Engineering Work Study II	(0,083)	Engineering Work Study I
FLM201T	Facility Layout and Materials Handling II	(0,083)	Engineering Work Study I Production Engineering: Industrial I
MAT351T	Mathematics III	(0,083)	Mathematics II
PEI211T	Production Engineering: Industrial II	(0,083)	Mechanical Manufacturing Engineering I Production Engineering: Industrial I
QAS201T	Quality Assurance II	(0,083)	Qualitative Techniques I
TOTAL CREDITS FOR THE SEMESTER:		0,498	
<b>SECOND SEMESTER</b>			
ATM301B	Automation III	(0,085)*	Mechanical Manufacturing Engineering II
EWK321T	Engineering Work Study III	(0,083)	Engineering Work Study II
IAC321T	Industrial Accounting III	(0,083)	Costing II
IED201T	Industrial Engineering Systems Design II*	(0,083)	Engineering Communication I Mechanics I
ILE301T	Industrial Leadership III	(0,083)	Manufacturing Relations II
ORS321T	Operational Research III	(0,083)	Production Engineering: Industrial II
TOTAL CREDITS FOR THE SEMESTER:		0,500	
TOTAL CREDITS FOR THE SECOND YEAR:		<b>0,998</b>	

## THIRD YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
<b>FIRST SEMESTER</b>			
EXP1IEN	Work-Integrated Learning I	(0,500)	
TOTAL CREDITS FOR THE SEMESTER:		0,500	



## SECOND SEMESTER

EXP2IEN	Work-Integrated Learning II	(0,500)	Work-Integrated Learning I
TOTAL CREDITS FOR THE SEMESTER:		0,500	
TOTAL CREDITS FOR THE THIRD YEAR:		1,000	
TOTAL CREDITS FOR THE QUALIFICATION:		3,000	

### SUBJECT/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 subject. On 13 October 2017, the syllabus content was defined as follows:

#### A

##### **AUTOMATION III (ATM301B)**

1 X 3-HOUR PAPER

*(Subject custodian: Department of Industrial Engineering)*

Challenges in the Manufacturing Environment. Automation concept. Control systems. Numerical control systems. Robotics systems. Material handling systems. Flexible manufacturing systems. Pneumatics. Electro-pneumatics. (Total tuition time: ± 68 hours)

#### C

##### **COMPUTER-AIDED DRAUGHTING I (CAI101T)**

CONTINUOUS ASSESSMENT

*(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)*

Introduction to computer-aided design (CAD), various software application packages, component and assembly modeling. Students operate CAD software in order to produce three-dimensional models, providing a basis for more advanced CAD applications and compound drawings. (Total tuition time: ± 80 hours)

##### **COSTING II (CSG201T)**

1 X 3-HOUR PAPER

*(Subject custodian: Department of Managerial Accounting and Finance)*

Basic methods and a group of selected techniques of cost accounting for application in the business environment. The subject consists of two modules. (Total tuition time: ± 68 hours)

#### E

##### **ELECTROTECHNOLOGY I (ETT101T)**

1 X 3-HOUR PAPER

*(Subject custodian: Department of Electrical Engineering)*

The correct use of SI units and their applications. Construction and care of batteries. WS theory and different measuring instruments. The influence of magnetic lines, the application and use of magnetic fields, inductance and the factors that influence it. Capacitors and their functioning. (Total tuition time: ± 70 hours)

##### **ENGINEERING COMMUNICATION I (EGN101T)**

CONTINUOUS ASSESSMENT

*(Subject custodian: Department of Applied Languages)*

Communication theory, non-verbal communication (body language). Oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence. (Total tuition time: ± 68 hours)

##### **ENGINEERING WORK STUDY I (EWK121T)**

1 X 3-HOUR PAPER

*(Subject custodian: Department of Industrial Engineering)*

Introduction to work study. Productivity and work study. Choice of method study techniques. Use of method study techniques. Work measurement (time studies). Human factors (and work study work). Ergonomics (an introduction). Working conditions and work environment. Jigs and clamps (an introduction). Computer applications. (Total tuition time: ± 68 hours)



**ENGINEERING WORK STUDY II (EWK221T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Industrial Engineering)**

Work measurement (advanced). Predetermined time systems. Standard data. Activity sampling. Analytical and comparative estimation. Ergonomics (advanced). Work study applied in the administration function. Work improvement (advanced). (Total tuition time: ± 68 hours)

**ENGINEERING WORK STUDY III (EWK321T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Industrial Engineering)**

Performance improvement programs. Productivity improvement, Objective Matrix, South African Excellence Model. Systems analyses and design for management. (Total tuition time: ± 68 hours)

**F**

**FACILITY LAYOUT AND MATERIALS HANDLING II (FLM201T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Industrial Engineering)**

Introduction. Strategic facilities planning. Product. Process and schedule design. Activity relationships and space requirements. Personnel requirements. Handling of materials. Facility layout. Computer-supported layout. Receiving and shipping. Storage and warehousing. Manufacturing. Office planning. Facility services. Non-manufacturing applications. Evaluating and selecting a facilities plan. Preparing and selling the facilities plan. Implementing and maintaining the facilities plan. (Total tuition time: ± 68 hours)

**I**

**INDUSTRIAL ACCOUNTING III (IAC321T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Accounting)**

Introduction to financial management. Financial analysis, planning and control. Working capital management. Investment decisions. Computer applications. (Total tuition time: ± 68 hours)

**INDUSTRIAL ENGINEERING SYSTEMS DESIGN II (IED201T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Industrial Engineering)**

Introduction to systems engineering, the systems design process from conceptual to detail design, models for economic evaluations, design for operational feasibility with emphasis on reliability and maintainability. (Total tuition time: ± 68 hours)

**INDUSTRIAL LEADERSHIP III (ILE301T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Management and Entrepreneurship)**

Leaders and management. Management planning, organising, leading and control. (Total tuition time: ± 68 hours)

**M**

**MANUFACTURING RELATIONS II (MFR201T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of People Management and Development)**

Introduction to human behaviour. Introduction to human resources management. Job evaluation, human resources planning and recruitment. Selection and induction. Individual and organisational development. Performance management. Compensation, integration, maintenance, retirement. (Total tuition time: ± 68 hours)

**MATHEMATICS I (MAT171T) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Mathematics and Statistics)**

Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 60 hours)

**MATHEMATICS II (MAT271B) 1 X 3-HOUR PAPER**

**(Subject custodian: Department of Mathematics and Statistics)**

Revision of differentiation. Differentiation of functions with more than one variable. Further integration. Numerical methods. First-order ordinary differential equations. Matrices (Gauss elimination). (Total tuition time: ± 60 hours)



**MATHEMATICS III (MAT351T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mathematics and Statistics)**

First-order differential equations. Higher-order differential equations. Basic mathematical modelling. Laplace transforms. Systems of differential equations. Numerical solutions of differential equations. Fourier Series. (Total tuition time: ± 70 hours)

**MECHANICAL ENGINEERING DRAWING I (MDR101B)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Printing, freehand sketches. Construction of scales, ellipse, square screw thread. Isometric drawing. Oblique drawings. Development of pipes. Curve of interpenetration of T-ends and pipe connections. Projections of prisms and pyramids. Drawing language; for example, of machining symbols. First-angle and third-angle orthographic projection drawings of single objects, assembly drawings and detail drawings. (Total tuition time: ± 68 hours)

**MECHANICAL MANUFACTURING ENGINEERING I (MME101T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Safety and safety legislation. Identification and application of various types of steel. Heat treatment of steel. Hand and machine tools. Metal cutting and machining. Alloy metals. Casting processes. Welding. (Total tuition time: ± 68 hours)

**MECHANICAL MANUFACTURING ENGINEERING II (MME201T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Measurement. Operative practical testing. Quality and dimensional control. Gauging and measurement. Measuring instruments. Comparators. Surface measurement. (Total tuition time: ± 68 hours)

**MECHANICS I (MHC101T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Moments, centroids, kinematics, forces and Newton's laws, momentum and impulse, work and energy, circular motion, statics. (Total tuition time: not available)

**O****OPERATIONAL RESEARCH III (ORS321T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Industrial Engineering)**

Fundamentals of decision theory. Decision trees and utility theory. Marginal analysis and normal distribution. Game theory. Linear programming: graphic methods. Linear programming: the simplex method. Linear programming: sensitivity analysis, duality. Linear programming: applications. Transportation and assignment. Integer programming, goal programming and the branch and bound method. Dynamic programming. Simulation. Markov analysis. (Total tuition time: ± 90 hours)

**P****PRODUCTION ENGINEERING: INDUSTRIAL I (PEI111T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Industrial Engineering)**

Introduction to production management. Production management in perspective. The nature of operating systems and operations management. Product service design. Facility planning and layout. Capacity management. (Total tuition time: ± 68 hours)

**PRODUCTION ENGINEERING: INDUSTRIAL II (PEI211T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Industrial Engineering)**

Forecasting. Aggregate planning tactics. Just-in-time systems and purchasing management. Inventory management. Material requirements planning. Operations scheduling. (Total tuition time: ± 68 hours)

**Q****QUALITATIVE TECHNIQUES I (QTQ101T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mathematics and Statistics)**

Introduction to statistics. Descriptive statistics: graphical representation of data, measurements of central position, measures of dispersion. Basic probability concepts. Probability distributions. Sampling and sampling distributions. Confidence intervals. Hypothesis testing: one sample and two sample. Means, percentages (proportions), variances. Linear regressions and correlation. Hypothesis testing – Chi-square. Analysis of variance. Non-parametric. (Total tuition time: ± 68 hours)



**QUALITY ASSURANCE II (QAS201T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Industrial Engineering)**

Essentials of a quality management system. Statistical process control: introduction to quality improvement. The quality life cycle, introduction to statistical process control, basic statistical calculations, analyses and interpretation of control charts, control of attribute control charts, design of experiments, principles of statistical design and analysis, experiments. (Total tuition time: ± 90 hours)

**W****WORK-INTEGRATED LEARNING I (EXP1IEN)****WORK-INTEGRATED LEARNING****(Subject custodian: Department of Industrial Engineering)**

Workshop factors: labour machine technology (types and uses), workshop planning and control, inventory control and storage, drawing office practice (design and interpretation), maintenance. Industrial engineering aspects: method study, time studies, labour standards, distribution line analysis, labour schedules. (Total tuition time: six months)

**WORK-INTEGRATED LEARNING II (EXP2IEN)****WORK-INTEGRATED LEARNING****(Subject custodian: Department of Industrial Engineering)**

Work study. Quality assurance. Production. Systems. Facility layout and materials handling. The following fields could be covered: material-handling analysis, equipment specifications, selection and evaluation, mechanisation and automation, plant layout (analysis and renewal), office layout and planning, productivity (equipment utilisation studies and capacity analysis), form design and control, industrial systems analysis and design. (Total tuition time: six months)

