

# NATIONAL DIPLOMA: ENGINEERING: INDUSTRIAL

## (Extended curriculum programme with foundation provision)

### Qualification code: NDEIF0 - NQF Level 6

Campus where offered: Pretoria Campus (day classes)  
 Last year of new intake: 2018  
 Teach-out (phase-out) date: 31 December 2024

Students registered for this qualification should complete their studies according to the teach-out date prescribed for the qualification, subject to the stipulations of Regulation 3.1.11 and 3.1.13 in the Students' Rules and Regulations.

Information on phased-out programmes can be obtained from the TUT website, [www.tut.ac.za](http://www.tut.ac.za).

Key to asterisks:

\* Information does not correspond to information on approved AA72.

(Deviations approved by the Senate in April 2010 and September 2015.)

## CURRICULUM

Consult the 2018 Faculty Prospectus for the full contents of the qualification.

### FIRST YEAR

Students who repeat a subject must register for a different subject code. Even though the credits are published as 0,000, the correct credit will reflect on the academic record once the subject is passed.

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FPCA01	Computer-Aided Draughting (Extended) I	(0,083)	
FPCAIR1	Computer-Aided Draughting (Extended) I (for repeaters)	(0,000)	
FPEGN01	Engineering Communication (Extended) I	(0,008)	
FPEGNR1	Engineering Communication (Extended) I (for repeaters)	(0,000)	
FPETT01	Electrotechnology (Extended) I	(0,083)	
FPETTR1	Electrotechnology (Extended) I (for repeaters)	(0,000)	
FPMAT04	Mathematics (Extended) I	(0,083)	
FPMATR4	Mathematics (Extended) I (for repeaters)	(0,000)	
FPMDR01	Mechanical Engineering Drawing (Extended) I	(0,083)	
FPMDRR1	Mechanical Engineering Drawing (Extended) I (for repeaters)	(0,000)	
FPMHC01	Mechanics (Extended) I	(0,083)	
FPMHCR1	Mechanics (Extended) I (for repeaters)	(0,000)	
FPMME01	Mechanical Manufacturing Engineering (Extended) I	(0,083)	
FPMMER1	Mechanical Manufacturing Engineering (Extended) I (for repeaters)	(0,000)	
TOTAL CREDITS FOR THE FIRST YEAR:		<b>0,506</b>	

### SECOND YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
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#### FIRST SEMESTER

After completion of all the extended subjects (see paragraph f in the remarks).

EWK121T	Engineering Work Study I	(0,083)	
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MAT271B	Mathematics II	(0,083)
MFR201T	Manufacturing Relations II	(0,083)
MME201T	Mechanical Manufacturing Engineering II	(0,083)
PEI111T	Production Engineering: Industrial I	(0,083)
QTQ101T	Qualitative Techniques I	(0,083)

TOTAL CREDITS FOR THE SEMESTER: 0,498

### SECOND SEMESTER

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 (Extended) I Production Engineering: Industrial I
QAS201T	Quality Assurance II	(0,083)	Qualitative Techniques I

TOTAL CREDITS FOR THE SEMESTER: 0,498

TOTAL CREDITS FOR THE SECOND YEAR: **0,996**

### THIRD YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
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#### FIRST SEMESTER

ATM301B	Automation III	(0,083)	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 (Extended) I Mechanics (Extended) 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: 0,498

#### SECOND SEMESTER

EXP1IEN	Work-Integrated Learning I*	(0,500)
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TOTAL CREDITS FOR THE SEMESTER: 0,500

TOTAL CREDITS FOR THE THIRD YEAR: **0,998**



## FOURTH YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
<b>FIRST SEMESTER</b>			
EXP2IEN	Work-Integrated Learning II*	(0,500)	Work-Integrated Learning I
TOTAL CREDITS FOR THE SEMESTER:		0,500	
TOTAL CREDITS FOR THE FOURTH YEAR:		<b>0,500</b>	
TOTAL CREDITS FOR THE QUALIFICATION:		<b>3,000</b>	

### SUBJECT 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. At time of publication, 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 (EXTENDED) I (FPCA101, FPCAIR1) CONTINUOUS ASSESSMENT**  
*(Subject custodian: Department of Mechanical and Mechatronics Engineering)*  
Students will be introduced to operating systems (Windows environment), basic word-processing skills (MS-Word), spreadsheets (MS-Excel), presentations tools (PowerPoint), communications, connectivity, the internet and the Web, computer-aided draughting (CAD), various software packages and compound drawings. (Total tuition time: ± 136 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 (EXTENDED) I (FPETT01, FPETTR1) 1 X 3-HOUR PAPER**  
*(Subject custodian: Department of Electrical Engineering)*  
Atom theory, electricity, magnetism and electromagnetism, inductors, capacitors, RLC networks. 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: ± 140 hours)

**ENGINEERING COMMUNICATION (EXTENDED) I (FPEGN01, FPEGNR1) CONTINUOUS ASSESSMENT**  
*(Subject custodian: Department of Applied Languages)*  
Speaking and communication skills, listening skills, reading for academic understanding, academic vocabulary, learning strategies and information gathering, writing, business and life skills. Communication theory, non-verbal communication (body language). Oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence. (Total tuition time: ± 136 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 (EXTENDED) I (FPMAT04, FPMATR4)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mathematics and Statistics)**

Basic algebra, functions, exponents and logarithm, differential calculus, trigonometry, geometry. Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 120 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****CONTINUOUS ASSESSMENT****(EXTENDED) I (FPMDR01, FPMDRR1)****(Subject custodian: Department of Mechanical and Mechatronics Engineering)**

Lettering, line work and freehand sketches, geometric construction, fasteners, dimensioning, methods of projection, sectioning, interpenetration curves and pipe developments, conversions: imperial to metric, terms and abbreviations used in engineering drawing, piping diagrams. Letter and number notation. Line notation. Handling of apparatus. Measurement notation. Geometrical construction. Orthographic projections. Isometric projections. Arcs of penetration and development. Detailed working drawings. Composite drawings. (Total tuition time: ± 120 hours)

**MECHANICAL MANUFACTURING ENGINEERING****1 X 3-HOUR PAPER****(EXTENDED) I (FPMME01, FPMMER1)****(Subject custodian: Department of Mechanical and Mechatronics Engineering)**

Introduction to engineering (chemical, metallurgical, civil, surveying, electrical, clinical, digital technology, high-frequency technology, power engineering, process instrumentation, mechanical, industrial, mechatronics), factory safety, measurements, engineering materials, projects. 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: ± 136 hours)

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

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

**MECHANICS (EXTENDED) I (FPMHC01, FPMHCR1)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical and Mechatronics Engineering)**

Module 1: measurements, mechanics, motion in one-dimension kinematics, laws of motion dynamics, kinetic theory of matter and properties of matter. Module 2: atoms, molecules and ions, chemical formulas and equations, the periodic table, chemical bonding, nomenclature of inorganic compounds, phases of matter, solutions, the rate of chemical reactions, equilibrium in chemical reactions, acids and bases, oxidation, reduction and electrochemical cells. Motion in one dimension. Uniform motion. Instantaneous velocity. Motion with constant acceleration. Free fall. Instantaneous acceleration, scalars, vectors, coordinate systems and vector components, vector algebra, force, Newton's first law, Newton's second law, Newton's third law, ropes and pulleys, motion in a circle. Impulse and momentum. Energy. Work. Fluids and elasticity. Thermodynamics. (Total tuition time: ± 180 hours)

**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)

