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# University of Pretoria Yearbook 2019

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## BEngHons Industrial Engineering (12240012)

**Minimum duration of study** 1 year

**Total credits** 128

### Programme information

The curriculum is determined in consultation with the relevant heads of departments. A student is required to pass modules to the value of at least 128 credits.

The degree is awarded on the basis of examinations only.

### Admission requirements

Subject to the stipulations of the General Regulations, Reg. G.1.3 and G.54, a BEng degree or equivalent qualification is required for admission.

### Other programme-specific information

An appropriate bouquet of 8 modules must be selected in consultation with the relevant head of department to comply with the requirements for one of the following domains of specialisation:

- Resource Optimisation (RO)
- Supply Chain Engineering (SCE)
- Business Process Management (BPM)

Industrial Engineers are not allowed more than 2 appropriate modules from other departments.

Non-Industrial Engineers are not allowed more than 1 appropriate module from other departments.

A maximum of 3 approved modules may be selected from other departments

### Examinations and pass requirements

- The examination in each module for which a student is registered, takes place during the normal examination period after the conclusion of lectures (i.e. October/November or May/June).
- A student registered for the honours degree must complete his or her studies within two years (full-time), or within three years (part-time) after first registration for the degree: Provided that the Dean, on recommendation of the relevant head of department, may approve a stipulated limited extension of this period.
- A student must obtain at least 50% in an examination for each module where no semester or year mark is required. A module may only be repeated once.
- In modules where semester or year marks are awarded, a minimum examination mark of 40% and a final mark of 50% is required.
- No supplementary or special examinations are granted at postgraduate level.



## Pass with distinction

A student passes with distinction if he or she obtains a weighted average of at least 75% in the first 128 credits for which he or she has registered (excluding modules which were discontinued timeously). The degree is not awarded with distinction if a student fails any one module (excluding modules which were discontinued timeously).



## Curriculum: Final year

**Minimum credits: 128**

BCS 780 is a compulsory module.

### Core modules

#### Enterprise engineering and research methods 781 (BBA 781)

<b>Module credits</b>	32.00
<b>Prerequisites</b>	Information Systems Design (BID 320) or similar course
<b>Contact time</b>	36 contact hours per semester
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Industrial and Systems Engineering
<b>Period of presentation</b>	Semester 1

#### Module content

Enterprise Engineering can be defined as the body of knowledge, principles, and practices to design an enterprise. Due to their complexity and the continuously changing environment, enterprises need new approaches, tools and techniques to deliver innovative products and services to new markets in competitive environments. This module offers an introduction to the engineering design process applied to the enterprise as a system, and present existing approaches for designing, aligning and governing the enterprise. Within the design paradigm, the module also offers research methods (e.g. design research and action research) that are relevant for doing research within the enterprise engineering discipline.

The module covers:

- Background on systems thinking
- Systems design and systems engineering
- Prominent approaches for creating an enterprise engineering capability (e.g. Zachman, The Open Group, Dietz/Hoogervorst).
- Mechanisms and practices associated with different phases of enterprise design (e.g. enterprise modelling, languages, road maps, maturity assessment etc.)
- Research methods and techniques to validate and extend the EE knowledge base
- Case studies
- Change management

#### Industrial and systems engineering research 780 (BCS 780)

<b>Module credits</b>	32.00
<b>Prerequisites</b>	Any one of the following modules: BAR 780,BBA 781,BGH 780,BLK 781,BOZ 780,BPZ 782,BUY 780,BVK 780
<b>Contact time</b>	36 contact hours per semester
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Industrial and Systems Engineering



**Period of presentation** Semester 1 or Semester 2

### Module content

\*This is a compulsory research module.

The module affords an individual student the opportunity of studying a designated area of coherent advanced knowledge under the tutorship of a senior staff member of the Department of Industrial and Systems Engineering. Eligibility, topic and scope of the intended project must be determined in consultation with the proposed supervisor.

## Design and analysis of experiments 780 (BDE 780)

**Module credits** 16.00

**Prerequisites** No prerequisites.

**Contact time** 24 contact hours

**Language of tuition** Module is presented in English

**Department** Industrial and Systems Engineering

**Period of presentation** Semester 1 or Semester 2

### Module content

The design of an experiment may be defined as 'the logical construction of an experiment in which the degree of uncertainty with which the inferences are drawn may be well defined'. The module deals with the following:

- Principles of experimental design (Randomisation, Replication and Blocking (local control))
- One-Factor-Two-level Factorial Designs
- One-Factor-Multi-level Factorial Designs
- Completely Randomised Design (CRD) and introduction to ANOVA
- Randomised Complete Block Design (RBD)
- Latin Square Design (LSD)
- Balanced Incomplete Block Design (BIBD)
- Factorial Experiments (2nd and 3rd factorial experiments)
- Blocking and Confounding in Factorial designs
- Overview of Factorial Designs

## Supply chain processes 781 (BLK 781)

**Module credits** 16.00

**Prerequisites** No prerequisites.

**Contact time** 24 contact hours

**Language of tuition** Module is presented in English

**Department** Industrial and Systems Engineering

**Period of presentation** Semester 1 or Semester 2



## Module content

A key objective of supply chain management is to develop competitiveness and achieve a market advantage through the implementation of cross-functional processes as the mechanism to coordinate internal and external activities.

The course aims to create an understanding of the importance of integrating key supply chain business processes and to develop the ability to analyse and implement such processes across functional and corporate silos. Standardised process definitions and practices, including strategic and operational sub-processes and key performance measurements, are considered.

Course outline:

- Customer Relationship Management Process
- Supplier Relationship Management Process
- Customer Service Management Process
- Demand Management Process
- Order fulfilment Process
- Manufacturing Flow Management (Planning and Control) Process
- Product Development and Commercialisation Process
- Returns Management Process
- Assessment of Supply Chain Management (SCM) Processes
- Implementing and Sustaining SCM Processes
- Supply Chain Mapping Approaches
- Supply Chain Performance Measurement

## Operations research 780 (BOZ 780)

**Module credits** 32.00

**Prerequisites** BAN 313 or BAN 780

**Contact time** 36 contact hours per semester

**Language of tuition** Module is presented in English

**Department** Industrial and Systems Engineering

**Period of presentation** Semester 1 or Semester 2

### Module content

Building on undergraduate modules in Operations Research, the module aims to extend the mathematical programming and optimisation capabilities by introducing uncertainty. Many decision makers are confronted with complex environments in which data is not known with certainty, or in which the decision constraints are uncertain. For cases where one knows the shape, or can assume that the uncertainty follows a known probabilistic distribution, stochastic programming can be used. In the module both chance-constrained programming and fixed recourse are introduced. Fuzzy optimisation is introduced for cases where the shape and/or distribution of the uncertainty are not known. The module also addresses the uncertainty when a decision maker is confronted with multiple, competing objectives.

## Manufacturing planning systems 782 (BPZ 782)

**Module credits** 32.00



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<b>Prerequisites</b>	Operations Management and Operations Research (advisable but not mandatorily required)
<b>Contact time</b>	36 contact hours per semester
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Industrial and Systems Engineering
<b>Period of presentation</b>	Semester 1 or Semester 2

### Module content

Review of MPC, Agile Manufacturing Processes, Models of MPC

**Section 1:** Review of MPC Theories and Framework

**Section 2:** Research Framework for Problems in Manufacturing Systems

1. Mathematical Model based Problems and their techniques

2. Estimation and Hypothesis based Problems and their techniques

**Section 3:** Introduction to MPC Problems and sample Models

1. Forecasting models

2. Aggregate planning models

3. Lot sizing and disaggregation models

4. Finite Scheduling models

5. Lean Manufacturing Models

6. Basic Distribution and Replenishment Models

7. Basic Supply Chain Structural Analysis and Performance Models

**Section 4:** Agile Panning Problems and Techniques

1. Multi-Level Master Scheduling Techniques

2. Constraint Scheduling – (TOC theory, applications and optimisation)

3. Lean Manufacturing Implementation (from Flow Lean to Process Kaizen )

4. Introduction to CONWIP ideology

5. Introduction to Demand Driven MRP

## Reliability engineering 780 (BTH 780)

<b>Module credits</b>	16.00
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	24 contact hours
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Industrial and Systems Engineering
<b>Period of presentation</b>	Semester 1 or Semester 2



## Module content

To make students conversant with the concepts, tools and techniques of reliability engineering.

Capita selecta from:

- Introduction to Reliability Engineering
- Reliability Mathematics
- Probability Plotting
- Reliability Prediction for Design
- Reliability Testing
- Reliability Growth
- Maintainability
- Reliability Management

## Supply chain design 780 (BVK 780)

**Module credits** 16.00

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

**Language of tuition** Module is presented in English

**Department** Industrial and Systems Engineering

**Period of presentation** Semester 2

## Module content

Strategic design of supply chain networks, inventory management and supply chain integration. Framework for strategic alliances and third party logistics. Analysis and application of alternative supply chain reference models as the basis for modelling, analysis and improvement.

Course outline:

- Supply Chain Network Design
- Strategic Management of Inventory
- Supply Chain Integration
- Strategic Alliances
- Coordinated Product and Supply Chain Design
- Supply Chain Modelling (SCOR, VRM)

The information published here is subject to change and may be amended after the publication of this information. The [General Regulations \(G Regulations\)](#) apply to all faculties of the University of Pretoria. It is expected of students to familiarise themselves well with these regulations as well as with the information contained in the [General Rules](#) section. Ignorance concerning these regulations and rules will not be accepted as an excuse for any transgression.