



University of Pretoria Yearbook 2017

BScHons Applied Science Industrial Systems (12243002)

Duration of study 1 year

Total credits 128

Programme information

The BScHons (Applied Science) degree is conferred by the following academic departments:

- Chemical Engineering
- Civil Engineering
- Industrial and Systems Engineering
- Materials Science and Metallurgical Engineering
- Mechanical and Aeronautical Engineering
- Mining Engineering

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the head of department and the Dean. Students must consult the relevant head of department in order to compile a meaningful programme, as well as on the syllabi of the modules. The relevant departmental postgraduate brochures must also be consulted.

Admission requirements

An appropriate bachelor's degree, a BTech degree or equivalent qualification.

Other programme-specific information

The modules CPB 410, CBI 410 and CSS 420 do not form part of the postgraduate block presentations. Individual arrangements have to be made with the relevant lecturer regarding attendance of lectures, study material, tests and assignments.



Curriculum: Final year

Minimum credits: 128

Core modules

Industrial analysis 780 (BAN 780)

Module credits 16.00

Service modules Faculty of Natural and Agricultural Sciences

Prerequisites Not for Industrial Engineering students

Contact time 24 contact hours per semester

Language of tuition Module is presented in English

Academic organisation Industrial and Systems Eng

Period of presentation Semester 1 or Semester 2

Module content

- Monte Carlo Simulation
- Continuous Simulation
- System Dynamics
- Multi-objective Decision-making
- Operations Research
- Decision Analysis
- Discrete Simulation

Quality management 780 (BGH 780)

Module credits 16.00

Prerequisites No prerequisites.

Contact time 24 contact hours

Language of tuition Module is presented in English

Academic organisation Industrial and Systems Eng

Period of presentation Semester 1 or Semester 2



Module content

Professionally, engineers are confronted with issues related to product quality and performance or organisational excellence. The intention of this course is to provide an overview of the domain of modern quality management and to equip the student with theory, methodologies and tools and techniques to improve and achieve product quality and performance excellence.

The course covers the following topics;

- Contextualisation: The History, Guru's, Principles, Industrial setting and the Domain of Quality Management
- Practices of improving and achieving product quality: Role in Industrial Engineering, On-line and Off-line Quality Control Practices
- Frameworks of improving organisational excellence: National Quality Awards, ISO 9000 and other frameworks
- Practices of improving performance excellence: Quality and Competitive advantage, Customer and Supplier relationships, People Empowerment and Motivation, Quality Leadership and Organisational change.

Operations research 780 (BOZ 780)

Module credits	32.00
Prerequisites	BAN 313 or BAN 780
Contact time	48 Contact hours
Language of tuition	Module is presented in English
Academic organisation	Industrial and Systems Eng
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.

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
Academic organisation	Industrial and Systems Eng
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)

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
Academic organisation	Industrial and Systems Eng
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

Industrial and systems engineering research 780 (BCS 780)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	48 Contact hours
Language of tuition	Module is presented in English
Academic organisation	Industrial and Systems Eng
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.

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

Academic organisation Industrial and Systems Eng

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

Manufacturing planning systems 782 (BPZ 782)

Module credits 32.00

Prerequisites Operations Management and Operations Research (advisable but not mandatorily required)

Contact time 48 contact hours per semester



Language of tuition Module is presented in English

Academic organisation Industrial and Systems Eng

Period of presentation 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

Solution algorithms in operations research 780 (BAR 780)

Module credits 32.00

Prerequisites BAN 313 or BAN 780

Contact time 48 Contact hours

Language of tuition Module is presented in English

Academic organisation Industrial and Systems Eng

Period of presentation Semester 1 or Semester 2

Module content

When developing decision-support models using optimisation, the computational burden is often so great that exact optimal solutions are not attainable, or not efficiently found, especially in combinatorial and discrete optimisation problems. Often approximate solutions are adequate and can provide superior solutions to the current state-of-practice decision approaches. The module introduces a selection of heuristics and metaheuristics applied to a variety of problems frequently faced by Industrial Engineers. The module also introduces a methodology to test and validate heuristics to ensure robust and reliable application.

Enterprise engineering and research methods 781 (BBA 781)

Module credits 32.00



Prerequisites	Information Systems Design (BID 320) or similar course
Contact time	48 Contact hours
Language of tuition	Module is presented in English
Academic organisation	Industrial and Systems Eng
Period of presentation	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

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.