University of Pretoria Yearbook 2020

BScHons Applied Science Mechanics: Physical Asset Management (12243037)

Minimum duration of study	1 year
Total credits	128
NQF level	08

Programme information

This multidisciplinary programme exposes students to both the management as well as the technical aspects of Physical Asset Management from a theoretical perspective. Students will, however, have to choose whether they would prefer to conduct the research component of the programme in either the technical domain (register with the Department of Mechanical and Aeronautical Engineering) or in the management domain (register with the Graduate School of Technology Management).

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 relevant 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

- Any one of the following:
  - A BEng (or equivalent)
  - a three-year BSc degree (in Natural Sciences) (or equivalent) with a weighted average of at least 60%;
  - a BTech qualification in an engineering discipline awarded by a university of technology in South Africa, with a weighted average of at least 75% and no modules failed in the BTech, excluding the National Diploma;
  - a four-year engineering-based university degree not recognised by ECSA for registration as a professional engineer.
- The departmental Postgraduate Committee reserves the right to make a thorough assessment of the applicant's academic transcript and CV, and to decide if the applicant is suitable for postgraduate studies. This assessment may include an oral or written entrance examination.

Other programme-specific information

The curriculum comprises four core modules, two elective modules and a compulsory research project.

Any specific module is offered on the condition that a minimum number of students are registered for the module, as determined by the relevant head of department and the Dean.

All students must complete the module MSS 732 Research study 732.

A limited number of appropriate modules from other departments are allowed. Not all modules listed are presented each year. Please consult the postgraduate brochure found on the departmental website for further information.

Examinations and pass requirements

i. 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).
ii. 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.
iii. 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.
iv. In modules where semester or year marks are awarded, a minimum examination mark of 40% and a final mark of 50% is required.
v. 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). The degree must be completed within the prescribed study period.

Curriculum: Final year

Minimum credits: 128

MSS 732 is a compulsory module and should be selected by all students as a core module.

When selecting your elective modules, please consult the Departmental Brochure.

Core modules

Engineering technology economics 780 (IKN 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	20 contact hours per semester
Language of tuition	Module is presented in English
Department	Engineering and Technology Management
Period of presentation	Semester 1 and Semester 2

Module content

Engineering Economy assists the engineer in making a wide range of decisions. These decisions involve the fundamental elements of monetary cash flow, time, value of money, project life and the interest rate. Engineering Economy calculates the net present worth, future worth, annual equivalent worth and the internal rentability of the cash flows of the alternatives under consideration. By applying these values in different ways, the most economical alternative can be identified. Calculation of these values for a cash flow takes into account the effective interest rate, inflation and the income tax payable.

Maintenance and asset management 780 (IMC 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	20 contact hours per semester
Language of tuition	Module is presented in English
Department	Engineering and Technology Management
Period of presentation	Semester 1 and Semester 2

Module content

Every man-made component, spare part, equipment, system or infrastructure has an inherent reliability that is determined by design, construction, installation, manufacture or how it is built. This inherent reliability is influenced by both organisational and physical conditions under which, for example, an item of equipment operates. The operational reliability significantly determines the availability of the equipment. A primary objective of maintenance intervention is to eliminate the operating environment hazards, which reduce the operational reliability of equipment and consequently, the availability of equipment for use. In the event of malfunction or failure, the goal of maintenance is to restore the operational reliability and availability of an item of equipment. Irrespective of whether a maintenance activity is intervening or restorative, it needs to be properly planned, scheduled and executed towards achieving the highest levels of operational reliability and availability, whilst concurrently minimising the expenditure of time and resources. Organisational systems of work (which encompass business processes, culture, and information technology) greatly influence the planning, scheduling and execution of maintenance activities. Furthermore, knowledge of technologies embedded, as well as how various items of equipment malfunction or fail in operation, determines how well the maintenance activities are planned, scheduled and executed. The content of the module not only covers strategies, technical principles, practical processes and systems but also includes standards (e.g., CEN13306) and legislative guidelines that influence the management of maintenance in all industrial sectors. The content will also include an introduction to the ISO 5500x asset management standards.

Maintenance practice 780 (MIP 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Failure characteristics and analysis. Maintenance economics – Budgeting and cost control. Life cycle partnering and maintenance contracting. Legal aspects and case study. Performance measurement and benchmarking. Maintenance programming – Network analysis. Variability analysis. Maintenance strategy, plan, and protocol design – a new look at RCM. Maintenance tactic selection techniques. Introduction to condition-based maintenance. Tribology and contamination control presented with case studies. Maintenance Maturity Indexing and Variable Relationships development.

Reliability engineering 781 (MIR 781)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering

Period of presentation	Semester 1

Module content

Introduction to probabilistic distributions, computation of system reliability, building reliability models and optimisation of system reliability; Fault Tree Analysis; Failure Modes, Effects and Criticality Analysis (FMECA), Monte Carlo Simulation; probability-based design.

Research study 732 (MSS 732)

Module credits	32.00
Prerequisites	No prerequisites.
Contact time	12 other contact sessions per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

*This is a compulsory research module.

This module allows a student to do research on a certain topic in mechanical or aeronautical engineering, as specified by a lecturer in the Department of Mechanical and Aeronautical Engineering, on an individual basis, under the supervision of that lecturer. The study should be seen as a precursor to the master's degree research that may follow the honours degree. The total volume of work that is to be invested in this module by an average student must be 320 hours. The body of knowledge studied must be of an advanced nature, at the level of the other postgraduate modules offered by the Department. Normal requirements for assessment that include the use of an external examiner apply to this module also.

Elective modules

Project management 780 (IPK 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	20 contact hours per semester
Language of tuition	Module is presented in English
Department	Engineering and Technology Management
Period of presentation	Semester 1 and Semester 2

Module content

This module addresses basic project management concepts, principles and techniques. The module is aligned with both the U.S. Project Management Institute's Project Management Body of Knowledge (PMBoK) as well as PRINCE2 methodology developed in the UK. Scheduling of projects is a core element of project management and IPK780 covers project scheduling in somewhat more detail and at a more advanced level than the other topics.

The aim of the module is to develop the learner's ability to identify and solve problems in a way that display critical thinking and the application of quantitative methods. The module focuses on project initiation, planning, monitoring and control. Specifically the development of a project plan, different scheduling techniques, earned value, decision making and basic risk management. A deliverable of the module is a project plan (including project scope, WBS, schedule, risk management plan and cash flow) for a project in the learner's work environment.

Systems thinking and engineering 780 (ISE 780)

Module credits	16.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	20 contact hours per semester
Language of tuition	Module is presented in English
Department	Engineering and Technology Management
Period of presentation	Semester 1 and Semester 2

Module content

A company's ability to remain competitive in modern times hinges increasingly on its ability to perform systems engineering. The technology and complexity of a company's products appears to steadily increase and with it, the risks that need to be managed. This module provides specialised knowledge to apply systems engineering by understanding the tools, processes and management fundamentals.

Non-destructive testing 780 (MCT 780)

Module credits	16.00
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Probabilty, design and management in non-destructive testing (NDT). Fundamental theory of commonly used NDT methods: Ultrasonic testing, Electromagnetic testing (MT and ACFM). Radiographic testing, Penetrant testing, Eddy current testing. Other NDT technologies, including phased array UT, time-of flight diffraction. Digital (RT and Acoustic emission. Monitoring.

Vibration-based condition monitoring 781 (MEV 781)

Module credits	16.00
Prerequisites	Working knowledge of MATLAB/OCTAVE
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1

Module content

Vibration measurement: conventional and optical technique, digital signal processing in vibrations, vibration monitoring: diagnostics and prognostics, artificial intelligence in vibration monitoring, human vibration.

Condition-based maintenance 780 (MIC 780)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	21 contact hours per semester
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Theory and practical applications of condition based maintenance techniques. Pitfalls of the various condition based maintenance techniques. Acoustic emission, wear debris monitoring, oil analysis, thermography and non-destructive testing.

Maintenance logistics 782 (MIP 782)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to Logistics, RAM (Reliability, Maintainability, and Availability), Measures of Logistics, Inventory Systems,
Systems Engineering and Supportability Analysis: Systems Engineering Process, Supportability Analysis,
Aspects of Logistical Design: Logistics in the Design and Development Phase, Just-in-Time Systems, Facility Layout, Job Design and Work Measurement,
Logistics from the Development to the Retirement Phase: Logistics in the Production/Construction Phase, Logistics in the Utilisation and Support Phase,
Planning and Scheduling: Forecasting, Planning, Maintenance Scheduling, Project Management, Theory of Constraints,
Logistics Management: Quality Management, Supply Chain Management, Logistics Management.

Fossil fuel power stations 781 (MUU 781)

Module credits	16.00
Prerequisites	No prerequisites.
Contact time	13 lectures per week
Language of tuition	Module is presented in English
Department	Mechanical and Aeronautical Engineering
Period of presentation	Semester 2

Module content

This module contains a comprehensive study of all mechanical systems and processes of a fossil fuel power station. The module will include the analysis of steam cycles, combined cycle power generation, fuels and combustion, combustion mechanisms, combustion equipment and firing methods, the draught group, steam generators, steam turbines, condenser, feed water and circulating water systems, coal handling, ash handling, compressor plant, water treatment, the importance of HVAC, control and instrumentation, control philosophies and environmental considerations.

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.