

## **SHORT DESCRIPTION OF MODULES: Honours in Engineering and Technology Management (ETM)**

### **Asset Management IBB 780 (16 credits)**

"Asset Management" may be defined as a life cycle process for creating, establishing, maintaining, operating, rehabilitating and divesting an asset in an optimal or balanced manner to satisfy the constraints imposed by economy, ergonomics, technical integrity and business performance. Within this definition, physical assets include equipment, infrastructure, and people. The 'holistic' view implied here recognises the wider range of disciplines required for strategic decisions and tactical management of physical assets. Strategy and tactics depend on the asset, whereas people processes underpin the effective management of an asset.

The overall objective for the physical Asset Management module is to provide an integrated understanding of the complimentary disciplines applicable to the management of engineered assets. The module will emphasise the synergy between specialist and cross-disciplinary skills and their respective roles with respect to the management of physical assets. The overall outcome for the learner will be awareness of the collaboration required and application of cross-disciplinary skills in technical, engineering, finance logistics, human communication, and other functions to achieve effective management of physical asset

The ISO 55000 standard (under development) defines an Asset as "something that has potential or actual value to an organisation". The value will vary between different organisations and their stakeholders. Value can be tangible or intangible, financial or non-financial. Asset Management is defined as "the set of coordinated activities that an organisation uses to realise value from assets in the delivery of its outcomes or objectives." Realisation of value requires the achievement of a balance of costs, risks and benefits, often over different timescales. The overall objective of this module is to apply the basic principles of planning, organisation, leading and control to the management of assets, in particular engineering assets. This includes aspects such as support, operation, performance evaluation and continual improvement. Current standards (e.g. ISO 55000), guidelines (e.g. PAS-55) and other government documents on asset management are also addressed in this module.

### **Engineering Techno Economics IKN 780 (16 credits)**

A research term paper will be prepared. 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 rate of return 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.

### **Technology and innovation management (INV 780) (16 credits)**

A research term paper will be prepared. In an increasingly competitive and fast changing business world the management of technological innovation is a key function of organisations that want to prosper. It is therefore important that engineers, scientists and managers understand the fundamental principles of technology and innovation. This module addresses aspects such as the

activities and tools of technology management and the processes and dynamics of innovation as important contributors to the creation of new knowledge, products and processes.

### **Maintenance Management IMC 780 (16 credits)**

A research term paper will be prepared. The ageing of production assets, process plants, assembly plants, power generation systems and mining machinery, as well as the increasing cost of maintenance has prompted many organisations to view the management of the maintenance process as a higher priority. Neglecting maintenance will cause rapid deterioration of assets and have a negative impact on the company's bottom line. The management of maintenance requires a professional approach due to the complexity of the resources, modern technology and processes involved. The main focus of this module is to establish a holistic focus on the maintenance process, and to enable students to analyse the improvements required using first principles, and other related techniques. A major outcome is the development of a maintenance configuration.

### **Operations Management IVV 781 (16 credits)**

A research term paper will be prepared. Operations management develops the ability of students to think about the transformation processes in organisations in a global way. The emphasis is on learning how to improve operating systems significantly through maximising throughput and minimising costs. The understanding of operating systems is developed from a flow- as well as an effect-cause-effect perspective.

### **Project Management IPK 780 (16 credits)**

A research term paper will be prepared. 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 ISE 780 (16 credits)**

The modern world is made up of "systems". This is evident from everyday discussions amongst even the general public. Statements such as "The system failed us", or "The national energy system is under pressure" abound. Unfortunately most people have little or no understanding what a system is, or how to deal with it. Digging deeper into the concept of "system" leads one to realise that engineers and scientists without any working knowledge of "systems thinking" cannot succeed when attempting to solve complex problems. The module will equip students with the ability to solve problems from a "whole", "big picture" or holistic perspective. Students will develop a range of critical skills allowing them to successfully function in a complex world made up of many interrelated

systems. The module will also provide students with an overview of systems engineering resulting from systems thinking, including the requisite tools and processes. This module will challenge much about a students' work environment, but it also will be unlike any other module a student has ever completed, mostly presented independent of any traditional engineering discipline.

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.

### **Technological Entrepreneurship IEE 780 (16 credits)**

A research term paper will be prepared. Technical solutions can overcome various problems confronting the world, but new business leaders need to emerge by identifying these potential opportunities that can lead to sustainable enterprises with more employment opportunities. The module highlights the role of technology innovation and strategy in entrepreneurship, the development of business models and plan, the lean start-up principle, legal aspects and venture leadership. Entrepreneurship is an intellectual discipline in its own right with its own systematic methods and techniques that can be learned and mastered through professional practice and hard work. This module will equip you with the fundamentals of technological entrepreneurship that can be applied in new ventures or your existing career.

### **Research Project IGB/ISC 780 (32 credits)**

The research project is the capstone of the ETM programme. It comprises an independent research study into an area of technology management, applying the principles learned during the programme. Although this is a research project of limited breadth and scope, it nonetheless has to comply with the requirements of scientific research on post-graduate level. The total volume of work that is to be invested in this module by an average student must be 320 hours. Normal requirements for assessment that include the use of an external examiner apply to this module.