MASTERS PROGRAMMES:
ENGINEERING MANAGEMENT
PROJECT MANAGEMENT
TECHNOLOGY AND INNOVATION MANAGEMENT

PROGRAMME GUIDE FOR 2021

GRADUATE SCHOOL OF TECHNOLOGY MANAGEMENT

UNIVERSITY OF PRETORIA

January 2021

FOREWORD

This document contains information about the MEM, MPM and MTIM postgraduate Programmes offered by the Graduate School of Technology Management (GSTM) of the University of Pretoria. Please note that prospective candidates need to apply for admission to any particular programme - closing dates for applications are provided in this brochure. Application material is provided separately. Enquiries may be directed to –

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This information brochure should be read in conjunction with the applicable *General Regulations as well as the year book of the University of Pretoria, Faculty of Engineering, Built Environment and Information Technology,* which contains all the current regulations and syllabi. The requirements of the Yearbook will apply irrespective of the information contained in this brochure. Although every attempt has been made to ensure that this brochure is correct and up to date at time of publishing, the Graduate School of Technology Management reserves the right to make any changes without prior notice and without prejudice.

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1. INTRODUCTION

Welcome to the University of Pretoria and in particular to the *Masters Programme in Engineering Management (MEM), Masters Programme in Project Management (MPM) and Masters Programme in Technology and Innovation Management (MTIM).* We are looking forward to meeting you all and working with you during the next two years. This document contains important information concerning the masters' programmes. Please read it carefully and contact us if there is anything that you do not understand – it may just save you considerable time and effort later on.

The purpose of this programme guide is to provide information mainly to prospective students, but it is applicable to and should also be useful to current students. Please note that this programme guide has been prepared well before the commencement of the new academic year and that some information is subject to confirmation (e.g. programme schedules and fees).

2. ENGINEERING-/PROJECT-/TECHNOLOGY and INNOVATION MANAGEMENT

The purpose of these programmes is to provide management education for the practising engineer, project manager and technologist, irrespective of undergraduate discipline. These postgraduate management programmes are sought-after and address an important and growing need in business and industry. Whereas the traditional engineering disciplines focus mainly on technology itself, these programmes focus on the utilisation of technology (and other resources) in the business environment for the creation of wealth at project, enterprise and national level.

The need for postgraduate education in engineering and technology management arises from two primary considerations, namely the classic approach to undergraduate education and the requirements of industry. The classic approach educates engineers in a specific engineering discipline such as electronic, mechanical, civil, industrial or computer engineering. The result is that the graduate engineer enters his/her practical career primarily as a specialist. Considering the vast scope and content of the various disciplines, as well as the maturity of the average undergraduate student, it is not feasible to devote attention to the "engineering process" or "management issues" at undergraduate level. Within typically the first 3 to 6 years of the engineer's career he/she will *become increasingly involved in the management of the process* by which engineering systems, products and services are created, utilised, and maintained. This requires the management of projects and related resources such as technical and personnel, the management of funds and facilities, and the cost-effective integration of the contributions of more than one person and more than one discipline. This calls for skills and knowledge the engineer has not been trained for.

Historically, engineers in South Africa have been primarily involved in the operation and maintenance of engineering equipment and systems. With the exception of civil and mining engineering, a significant portion of design and development work were contracted in from abroad and operated locally to achieve some economic benefit. Over the last decades, however, the need for local design and development has also arisen in the petro-chemical, defence, telecommunication and other technology-based business sectors. Local capabilities to establish a technology base have become increasingly important and are now vital to the growth of the economy and international competitiveness. An in-depth understanding of the total life-cycle as well as the application of resources in this context is required for a career in the management of engineering and technology.

Engineering Management, Project Management and Technology and Innovation Management are global evolving disciplines. The increasing complexity of engineering systems and activities,

the scope and sophistication of resources as well as advances in technology, e.g. Industry Revolution 4.0, have all been driving forces in the evolution of these disciplines.

Resources at the disposal of the engineering, project and technology manager are typically technology, people, money, facilities, equipment, and information. All of these resources are vitally important to the manager in achieving business objectives in practice. Of specific importance, however, is technology, a resource fulfilling a central role in the engineering environment. The *life-cycle processes of engineering systems* and products can be described as follows: design and development, production or construction, operation, support, maintenance and phase-out.

The availability of resources and knowledge of the life-cycle processes are not sufficient to create something useful - it is necessary to synthesise these two dimensions: resources must be applied in the context of the processes in order to create products or services. Synthesisers fulfil this role in the engineering space. Important *integrating management functions* like strategic management, project management and system engineering are addressed as well as *conceptual tools* like risk management, quality and decision analysis.

In order to gain insight into a system it must be viewed in the *context of its environment*. The (high-tech) enterprise, within which Engineering, Project and Technology Management are applied, is such a system where the environment has a significant impact on system performance. The environment can be classified as economic, legislative, technological, industrial, socio-political, and natural.

It is important to understand that engineering, project and technology management supplement and enrich the technical training of the engineer, scientist or project manager, not replacing it.

3. HISTORY AND ORIGIN OF PROGRAMMES

A Chair for Engineering Management was established at the University of Pretoria in 1987. The Chair developed a *Master's Programme in Engineering Management (MEM)* and the first group of 45 students was admitted in 1989. Since then, between 40 and 50 practising engineers from across the industry spectrum registered for the Programme every year. Building on the success of the start-up years, a formal separate department, the *Department of Engineering and Technology Management* was established in 1994 in the then Faculty of Engineering, the one and only of its kind in South Africa. Today the Department of Engineering and Technology Management offers a variety of engineering, technology and project management related programmes. Knowledgeable and experienced individuals from industry are also involved on a part-time basis, often as "extraordinary professors".

A *Masters Programme in Project Management (MPM)* was established in 1999 and initially 45 students were admitted. This programme is based on the same format of presentation as the MEM, but the emphasis is on Project Management in technology-based enterprises. However, project management principles can be applied in any type of organisation. Most work in modern organisations is executed by multi-disciplinary teams led by project managers, hence the popularity of this programme.

In 2004, a *Master's in Technology Management (MTM)* with four modules and a Mini-dissertation was introduced. This degree was aimed at graduates with an Honours in Technology Management degree to further prepare them for leadership roles in business through professional postgraduate education.

In 2018 the MTM was restructured and a *Master's in Technology and Innovation Management (MTIM)* with twelve modules and a Mini-dissertation was introduced. In this Masters programme, you will be introduced to the basics and innovation management, technology management, human resource development and strategic management, all of which support the long-term goals of building levels of innovation and productivity within an organisation.

During 2017 and 2018 *all Masters programmes* have been scrutenised and *re-designed*. Courses are updated and better integrated. The research project is one integrated process, not separate "courses" anymore and constitutes 50% of the credits for the total programme. These *new designs were launched in 2019.*

Since the year 2000 the *Graduate School of Management,* in close co-operation with the Department, managed the MEM and MPM programmes. Due to the multi-disciplinary nature of the programmes, the programmes were managed by the GSM to optimally integrate other important disciplines such as human resources, financial, marketing and information management. However, the academic home of the programmes remained the Department of Engineering and Technology Management.

Significant growth of these types of programme is expected in South Africa and abroad during the coming years. International standards and recognition become more important as UP becomes part of global research and education. Additional focus, resources and research were required. Consequently, the *Graduate School of Technology Management (GSTM)* was established in *2007* to offer the management programmes. The GSTM is strategically positioned in the Faculty of Engineering, Build Environment and IT (EBIT). The integration of research, teaching, programme design and delivery as well as industry contact, proved to be successful.

4. PROGRAMME MANAGEMENT MODEL AND PERSONNEL

These programmes are managed as distinct individual programmes by the **Chair Person of the GSTM** and supporting staff of the GSTM. The objective is to maintain a focussed programme view and to utilise scarce resources (e.g. lecturers) optimally. The *Chair Person* is supported by the *Programme Coordinator* and the *Programmes Office Manager*, as well as the *Programme Administrators.* In addition, each individual programme has an academic advisor, who provide guidance on the technical and specialist content of each programme. The academic/intellectual content and quality resides with the GSTM.

About 60% of lecturers on the programmes are from the GSTM. Due to the multi-disciplinary nature of the Programmes, lecturers from other faculties in the University and from industry also present modules, depending on where the required expertise is available. In particular, some of the first-year modules are presented by lecturers from the Faculty of Economic and Management Sciences. Although they are exclusively presented to GSTM students, these modules remain the responsibility of the source department. This responsibility includes all operational aspects, such as module design, delivery and assessment, etc. In essence, the "deliverable" to the programme is the list of final marks for the class.

5. ADMISSION PROCESS

5.1. Admission and Selection

Admission is competitive and a selection committee carefully selects candidates with the highest potential. A fair and unprejudiced selection process is strived for. All applications for admission

to the Programmes are subject to a selection based on academic achievement, relevant experience, and objectives for career development. For this purpose, applicants must also submit a full academic record (subjects, marks, time frame for completion) as well as a letter of recommendation from his/her employer. Selection may include a personal interview.

5.2. Qualifications Awarded

Two types of qualification can be awarded: MEng (Engineering Management, or Project Management or Technology and Innovation Management) or MSc (Engineering Management, Project Management or Technology and Innovation Management) depending on undergraduate study. The course structure and duration are nominally the same for both degrees.

5.3. Admission Criteria

Required Qualification: Candidates for the MEng (Engineering Management, Project Management or Technology and Innovation Management) must be in possession of a four-year bachelor's degree in engineering from a recognised university. Candidates for the MSc degree must be in possession of a BSc honours degree in a suitable scientific field. Candidates following the BTech route should also have an appropriate BSc honours degree or MTech to be considered for the MSc programme.

Only applicants with a minimum average of 60% (calculated on the grades of all the final year modules (failed/passed) for the pre-requisite degree) will be considered for admission to the MSc (Engineering Management, Project Management or Technology and Innovation Management) degree. The average of 60% is not applicable if the applicant has already completed another master's degree, or completed the ETM/MOT degree at the University of Pretoria with a minimum average of 55%.

Required Experience: All candidates should have at least 3 years relevant post-degree working experience, preferably more. Exceptional academic achievement (e.g. distinction for degree) could allow applicants on the programme with only two years working experience. This however is the exception not the rule. Granting this exception will be the decision of the selection committee and is not guaranteed.

Compliance to the criteria does not guarantee admission.

5.4. Application and Closing Date

Application must be completed through the UP website.
The closing date for applications for a specific year is typically the last week in **September**, of the previous year.

5.5. Registration and Orientation Day

Registration
Students register online on the UP portal. Website: www.up.ac.za and click on My Tuks login.

Orientation day
This event is only for *first year* students. Attendance of this event is *compulsory*. Programme orientation, meeting with academic personnel, "clickUP" training (e-learning) and access, the issuing of all study material, etc. are important activities to kick-off the first academic year.

Second year students do *not* come to campus for orientation or registration but register online on the UP portal. Website: www.up.ac.za and click on My Tuks login.

5.6.   Registration and Student Card

After registration you will be able to print a proof of registration on the UP portal. You need to present your proof of registration at the Client Service Centre (CSC) on campus (at some convenient time) to have your student card issued. You could do that during your first study block. You will need your student card to enter the campus and access the library. It is essentially your campus ID and you should have it with you at all times when on campus.

6.   FINANCIAL INFORMATION

6.1.   Programme Fees

The total fee for the programmes for 2020 was R 135 000. These fees apply to students completing the programme within the prescribed two-year period. The fees are typically payable as follows: 60% in the first year, and 40% in the second year. When required, arrangements can be made to pay each year's portion in two equal instalments. If necessary to register for a third year (*maximum*), a re-registration fee of approximately R8000.00 will be payable for each additional year. Students who do not have South-African citizenship are liable for an additional ±R2 700.00 per annum administration fee.

Distance examinations are arranged for students who apply, but at an extra cost of approximately R600 per examination paper within the RSA and SADC countries and approximately R1400 per examination paper for international countries. Examination fees are reviewed annually, and could thus be higher in 2020. Fees will be finalised towards the end of the year, typically during November. Although every effort is made to keep the total fee fixed for students entering in a particular year, the University reserves the right to increase fees. This may particularly be necessary when the exchange rate affects the price of textbooks.

An approximate increase of 10% is expected for 2021.

6.2.   Bursaries and Loans

A limited number of bursaries are awarded annually to deserving candidates. The criteria include a means test, the student's potential and past academic performance. Continuation of financial support is subject to satisfactory performance. Information can be obtained at "Bursaries and Loans" at the Client Service Centre (CSC) (012 420 3111), *not* from the GSTM programme management team.

6.3.   Student Finances

Please contact student accounts for any queries with regard to your account.

Contact detail:

Mr Frans Mothogoane
e-mail: frans.mothogoane@up.ac.za
Tel Nr: +27 12 420 5115

Mr Ayanda Simelane (Head of Student Accounts)
E-mail: ayanda.simelane@up.ac.za
Tel Nr: +27 12 420 6393

7. LEARNING PROCESS AND SYSTEM

7.1. GSTM Student Resources

The GSTM Student Resources website (www.up.ac.za/gstm/student) contains all programme documents, e.g. modules, timetable, assignment cover pages, guidelines for written assignments, etc. Make sure you visit the website.

7.2. English Proficiency

The medium of instruction and communication of the programme is ***English***. It is hence essential that applicants can properly write, read and express themselves in English. A TOEFL or IELTS test may be required of candidates who have not studied the prerequisite degree through the medium of English.

7.3. Learning Model

The programme is delivered as a ***closed programme*** for "technical professionals" to enhance group activity, personal development and a higher level of intellectual interaction. It is recognised that effective learning depends largely on group activity and the intellectual level and maturity of the participants. It is hence required from participants to actively take part in class and group interaction.

Participants are typically professionals, entrepreneurs and (project/technical) managers in the age group of 27-43 years and fully active in their careers. Hence, available time for class attendance is limited. Student/lecturer contact is however considered to be crucial. In view of the above, candidates are expected to ***free themselves completely*** from other duties ***during class contact***. Candidates may be expected to work in the evenings and over weekends during study blocks.

Programmes are structured around study blocks presented over a period of two years: two study blocks, of two contact weeks each, per year typically during ***February*** and ***August***. It is ***compulsory*** to attend the ***study blocks***. A web-based distance support system is used to create a virtual classroom. For this reason, all students are required to have access to the Internet through a suitable browser and be able to take part in discussions using the Internet. Lecturers facilitate distance learning (group and individual activities) throughout each academic cycle. It is expected from participants to come to contact sessions fully prepared. Pre-assignments are required for most modules. Student/lecturer interaction is consequently on a higher intellectual level where concepts and the application of theory are discussed. Assignments are done during and after the class contact sessions. Group interaction as an integral part of learning and personal development is emphasised. Lecturers furthermore facilitate the learning process to enhance group activity. A ***balance*** between ***theory*** and ***practice***, ***individual*** and ***group activity***, class ***contact*** and ***distance*** education is hence strived for.

Although a single lecturer is appointed to accept responsibility for a given module, a selection of guest lecturers can also be used.

7.4. Study groups and teamwork

Groups A and B allocations will be made during registration/orientation day. Students will be allocated to groups at TBI for future teambuilding activities. Study groups for assignments for different modules will be finalised as necessary. Some form of group work will be required to be completed prior to commencement of the study blocks. The groups will typically have 5 to 7 members. Since all of you must have ***access to the Internet***, geographic location should not be a problem – you will not be grouped on a geographical or company basis. You are not permitted to

make any changes to the group allocations without discussing it with the responsible lecturer. The programme administrator should be informed about any changes in study groups. Bear in mind that a *great deal of the course value is derived from the interaction you have with fellow students* from other companies. Groups will be formed to be as diverse as possible. This interaction is often challenging; try to learn from one another!

If a group member does not make an *acceptable contribution* the group/group leader or class leader should *seriously discuss the matter* with the specific member as soon as possible to get him/her *on track again*. If this unacceptable/no inputs to group work continues, the group should peer review each other and allocate a percentage to each other when handing in the group assignment. 0% contribution means the mark of the specific member will be 0% of the final mark for the group assignment; meaning 0%. The same goes for e.g. 50%, 60% or 75%. The purpose however remains *open* and *honest discussion* within the group to include and motivate all group members to *successfully participate in group assignments*. However, unresolved problems should be discussed with the responsible lecturer, the sooner the better. Only in the final instance, the Programme Director will intervene to help to resolve study-group issues.

7.5. Personal Development and Teambuilding Programme

The development of you as a *person* and a *manager* is a key aspect of these programmes. Class presentations and final year symposium, e.g. provide opportunities to improve self-confidence and public speaking. Within study groups, team spirit develops and group assignments are done. Study-group activities enhance interpersonal and communication skills and significantly enrich the learning experience. The People Management (academic) module is also essential in this regard.

A teambuilding programme was specifically developed for these programmes. Participation is *compulsory* and will be *formally evaluated*. You should *complete your HBDI profile on-line* using the link supplied. The teambuilding programme comprises three phases:

Phase 1 is a day of socialising, fun and getting to know one another. You will also meet your *study-group* members. During this event a *class leader* for each class is elected. This event is typically scheduled for the *Friday afternoon* or *Saturday after your Orientation day in January*. MEM/MTIM and MPM students have their own event on different days.

Phase 2 is about a better understanding of your-self. Your individual HBDI profile will also be discussed. It is essential to communicate efficiently and to start working as a team, specifically to do your group assignments. Phase 2 is scheduled in the *first semester for the Saturday before your study block commences on the Monday*. Refreshments will be provided.

Phase 3 focuses on whole-brain problem solving, decision making and some career advice. The formation and management of teams will be addressed. Activities are scheduled in the *first year, second semester, during the study block from 15h00 to 20h30* on a specific, pre-determined day for each study group. Details will be communicated with you well in advance.

7.6. Class Leader and committee

A class leader (representative) is elected for each programme intake on the first teambuilding day. *Communication*, *team spirit* and *effective functioning* of *study groups* should be the primary focus of the class leader. The representative will be responsible to act on behalf of the class and serve as liaison with the programme management team for the rest of the year (you can elect somebody else for the following year). The Programme Administrator will communicate with the class leader regarding any important administrative issues concerning the class. Class leaders can contact the Programme Director to discuss any programme-related matters. Any

problem that you would like to bring to our attention should also be communicated via the class representative. A single channel of communication will avoid misunderstandings and loss of information. You can decide on your own how you should go about electing this person. The group can decide whether they want to elect a committee to support the representative. Problems should be discussed in the group/committee first before it is presented to the programme management team.

7.7. Class Attendance

Class attendance during study blocks is *compulsory* and *important*. If, for some unforeseen reason, you will be absent from a lecture for a few hours, you must obtain the lecturer's permission beforehand. This will not necessarily be granted. If you cannot attend a study block, please inform the Programme Administrator to *deregister* you for the particular module. The onus is on you to re-register the next year to *do* the module. Please do not request permission from the Lecturer or Programme Director to be excused from a study block!

7.8. Typical class contact day, evenings and weekends

A typical class contact day starts at 08h00 to 17h00. On *Wednesdays* at lunchtime a module is typically concluded. The next module will commence at *13h00* after lunch. You can be expected *to be available at short notice* to attend guest lectures and/or do group work or self-study during the evenings or weekends of the study blocks; hence keep this time open for academic or teambuilding activities.

7.9. Tea and Lunch Breaks

Early-morning coffee at 07h30, mid-morning tea at 10h00 and afternoon tea at 15h00 will be served at the Graduate Centre on the scheduled lecture days. Individual lecturers will arrange the duration of tea breaks with you, typically 15 minutes. Lunch will be available from 12h00-13h00 at Adler Restaurant situated adjacent to the Graduate Centre (southern side).

7.10. Distance Support

Distance support for the programmes is provided via the internet. Each module has a separate "web page" and provides module content, proposed study schedule, assignments, communication tools and download facilities. The study guide for each module can also be downloaded and printed. You will receive a manual on the use of clickUP (e-learning system) as part of your registration documents. As soon as you are registered, you will have access to Student online services (clickUP) at www.up.ac.za (click on current students/portal log-in). If you do not have a password, log on with your student number (e.g s14552536) and your ID number. If you experience any technical or password problems, please phone (012) 420 3837 or email studenthelp@it.up.ac.za (please state your student number in the e-mail). You need to access clickUP **before** the first classes, as you need to prepare **before** the first classes.

7.11. Self-study and Preparation

Graduate study differs from undergraduate study in a number of ways. One important difference is the amount and level of self-study required. It is important that you realise this and *plan for a substantial amount of work at home* in order to master the module material. The web-based support has been specifically introduced to assist you in this regard – make use of it. Make sure you check your mail (in clickUP) and the discussion space regularly *(at least once a week)* and respond when required. Take part in group and class discussions. The contact time is not sufficient to internalise and digest everything. Rather, this time will be used to highlight important areas, obtain feedback from the class, have group discussions and presentations, and

also have lectures on specific areas. You are encouraged to read wider than the material provided and make use of the library.

Create your own project plan for each semester with important events, deliverables and dates. Organise yourself accordingly.

Please make sure that you are aware of any *preparation* required for a module before the study block, so that you come to class *fully prepared*.

7.12. Pre-requisite modules

The required *logic* and *sequence* of modules are built into the programme and domains. The best "route" to follow is defined in the Programme Architecture and schedule for each specific Programme and selected domain. When a student fails or cancels a module, he/she can carry on and do the remainder of the modules scheduled for the semester/year. However, students should not switch modules around unnecessarily

8. ASSESSMENT PROCESS

8.1. Assessment Policy and Marks

Students are assessed in a number of ways. Preparation and participation in class is important. Class presentations and group tasks during study blocks will be evaluated. Individual and group tasks during the semesters also contribute towards a semester mark. The semester mark and the final examination will typically have equal weight to constitute the final mark.

The final pass mark for all modules is 50%. You require a *sub-minimum of 40%* for your semester mark in order to *qualify to write the exam*. The sub-minimum for the examination is also 40%. There may also be sub-minima for different sections of a module.

Final examination will typically take the form of a 3-hour written examination. There is no programme policy as to exactly how each module will be assessed. In all cases, however, there will be assignments plus a final examination. This depends on the nature of the module. Often there will also be a component of class contribution. However, the *grading policy for each module is clearly defined in the study guide on clickUP*. Please read it carefully.

In addition to the final marks for each module being posted on the University's web page each individual lecturer will publish interim semester marks on *clickUP*. The UP Portal should be used to access this information. You will *receive training (including an instruction)* on how to access the portal and clickUP. No marks will be given by telephone. Individual lecturers can give further details as to the availability of marks for their particular module.

8.2. Examination days

All final examinations will typically take place on *Fridays, from 09h00 to 12h00.* No notebook or laptop computer is allowed during exams. Examinations may be open book, semi open book or closed book (consult your study guide). You should bring along the allowed materials you want to consult.

8.3. What if you fail a Module?

No re-evaluations (supplementary exams) are allowed on post-graduate level. This means that if you fail a module you will have to *repeat* the *total module* the next year. You may *repeat a module* only *once*. If you fail a module twice you are automatically excluded from the

programme. The ***Dean must approve*** any requested ***re-registration thereafter***. If you fail a module it is your responsibility to register for it again the ***following year***. Make sure that the module you repeat ***does not clash*** with a second-year module in terms of class contact or exam. You must complete first-year modules first. The onus is on the student to make sure there will be no clashes. If you register for a module but then decide not to do it, you should make sure that you request the programme administrator (by e-mail) to de-register the module at least ***two weeks*** before the examination of that particular module. If not, you will automatically earn a fail mark and forfeit one of your chances to pass it.

Also note that there is a ***time limit*** on the completion of the Programme. You will need special permission from the Dean of the EBIT Faculty and a valid reason to complete your degree over a period ***longer*** than ***three years.***

8.4.   Grievance procedure

All issues should be reported in writing, providing details of the complaint or issue. First consult the lecturer concerned about the complaint or issue. If the matter is, however, not resolved, you should consult the class representative (the primary function of the class representative is to serve as a two- way communication channel between the class and the lecturer.) If the matter remains unresolved you should consult the module co-ordinator in the case of large module classes with multiple lecturers. Where the co-ordinator is unable to or fails to resolve the matter, you should consult the Programme Director. Should the matter remain unresolved, you may approach the Head of Department and only thereafter the Dean of the Faculty.

8.5.   In case of Sickness or Accident

In the unfortunate situation of sickness or an accident you should inform the programme administrator that you cannot write the examination. You should contact the Dean's Office (Mr Kenneth Nkanyana – kenneth.nkanyana@up.ac.za, head of academic administration), to apply for a sick exam. This may or may not be approved.

8.6.   Distance Examinations

Students who do not reside within a **200-km** radius from Pretoria may apply to write distance examinations. The policy and procedure as well as application form for distance examination will be handed out early during each study block period and should be completed and returned to the programme administrator before the end of the first block week. Distance examinations will not be arranged without an application handed in on time.

PREREQUISITES:
- Students do not automatically qualify for distance examination.
- We will attempt as far as possible to arrange your examination at your requested venue but alternative venues might be arranged. You will be notified.
- Students within a 200 km radius of Pretoria do **not** qualify for distant examination. Students may however apply to write in Emalahleni (Witbank).

FEE:
Students wishing to write their exams outside of Pretoria have to pay an ***additional fee*** per paper. Refer to Programme Fees for details. Examination fees are reviewed annually, and could thus be higher the next year. Forms to apply for distance examination will be handed out in the various classes. Contact your programme administrator if you are not sure.

8.7. Assignments and back-ups

Most modules will require you to submit one or more assignments. In *most cases* lecturers will require you to submit assignments via the *clickUP assignment tool.* Read your study guide to determine the mode of assignment submission. If you are not certain, confirm with the lecturer. You should always keep *electronic backups* of *assignments* at least until the semester is concluded and *all marks* have been finalised and published.

Note that where assignments are part of the final examination they will not be returned to you. You are however welcome to inspect your assignment by prior arrangement with the lecturer after it has been graded.

8.8. Code of Honour

Although we encourage group work to facilitate the exploration and understanding of module material, in the final instance you also have to earn an individual mark for each module. This means that *the work you submit on an individual basis must in fact be your own.* To simply "copy and paste" from Websites or other material is not acceptable unless you quote a writer. Make sure that you distinguish between group assignments and individual assignments, and act accordingly. Refer also to the GSTM Student Resources web page regarding plagiarism. Turn-it-in (a web-based plagiarism detection service) is used to detect possible plagiarism.

9. ARCHITECTURE OF PROGRAMMES

9.1. MEM Programme Objectives

To develop next generation professional engineering managers based on sought-after world-class curricula, excellent teaching and research underpinned by local and international collaborations, and to conduct these activities in alignment with the respective school, faculty, and university strategies.

9.2. MPM Programme Objectives

The Masters in Project Management empowers graduates to apply scientific thinking and advanced interdisciplinary skills to manage projects over the project life-cycle.
Viewing projects as temporary endeavours, the programme facilitates learning of the fundamentals of project management to enable learners to identify, develop, implement and close projects.

9.3. MTIM Programme Objectives

The programme aims to introduce students to the aspects of technology which support the long-term goals of innovation and productivity within an organisation.

Technology and Innovation Management focusses on the introduction of new products, processes, services or systems to an organisation, through the economic development and transfer of knowledge on the choice and application of technology and processes, in order to secure the organisation's growth, competitiveness and sustainability.

9.4. Required Outcomes of Modules of Programmes

Refer to Module study guides on clickUP for detail.

9.5. Programme Architecture

Each programme comprises seven core modules and two electives, i.e. *nine modules*. The programmes also include a *research project*. The student earns *10 credits* for *each module* successfully completed, and *90 credits* are earned for the *research project*. The research project must be relevant and is undertaken under the guidance of an adviser. Students with an *Engineering degree* register for the research project using *IGB899*. Students with a *BSc Honours or BTech plus Honours degree* register for the research project using *ISC899*.   A candidate qualifies for the appropriate qualification after obtaining 180 credits. A variety of electives are offered in the second year of study. Consult your specific programme design to ensure you select appropriate electives.

NB: The programme design (list of courses) is available to students on the **GSTM Student Resources web page.**

The University of Pretoria reserves the right to change programmes, modules, domains and credits without prior notice. However, once a student has registered for a specific programme and paid the required fees, a *learning agreement* is established which both parties (the UP and the student) must adhere to. Required changes will be negotiated in advance.

10. PROGRAMME SCHEDULE

The *Programme Schedule* is available to students on the **GSTM Student Resources web page.**

Carefully diarise orientation day, study blocks, personal development programme, assignments and examinations etc. well in advance. If you have any uncertainty regarding schedules, do not hesitate to contact the Programme Office or specific lecturer.

The *programme schedule* is *carefully designed for the two planned years of study.* Every effort has been put in to ensure a correct, meaningful and *executable* schedule. However, if students start to fail and consequently repeating modules, the *onus is on the student* to make sure that there are *no clashes* the next year in terms of his specific requirement regarding *study block attendance* and *examinations.* Special exams are not arranged to cater for clashes as explained above.

The bottom line is: *Do not register for a module that in any way clashes with another one*. The *priority* is to *complete first year modules first.* The Programme schedule is typically available 9-12 months before any scheduled event will take place. Thus, you can plan properly and prevent any surprise.

11. DESCRIPTION OF MEM, MPM and MTIM MODULES

A Short description of all modules are provided in the subsequent paragraphs.

Refer also to paragraph 7.12 for clarity on "pre-requisite modules".

MEM CORE (7 X 10 cts)	MPM CORE (7 X 10 cts)	MTIM CORE (7 X 10 cts)
Systems Engineering & Man (ISE801) Prod & Ops Management (IPP 801) Technology Management (ITB 801) People Management (PEM 883) Financial Management (FBS 830) Strategic Management (ISM 801) Eng Asset Management & Maint (IAM 801)	Project Planning (IMP 802) Finance & Cost Management (IPF 801) Project Organisation (IHR 801) Procurement and Contract Management (IPJ 801) Risk Management (IRI 801) Quality & Integration Management (IQM 801) Need to select one of: (i) Construction Management (KBS 803) (ii) IT and Service Project Management (IPK 803) (iii) Project Systems Engineering (ISE 802)	Fundamentals of Technology Management (ITB 802) Org & Innovation (INV 880) New Product Development (INP 880) Strategic Tech & Innovation Management (IST 880) Project Economics (IBD 880) Corporate Entrepreneurship (IEE 880) ST&I Policy (ISP 880)
Mini-dissertation (**90 cts)**		
ELECTIVES (2 x 10cts)		
New V& Entrepreneurship (IOE 801) Legal Aspects (ILC803) Sustainability (ILE 802) Commercialisation & IP (IKG881) Knowledge & Info Management (ILB 884)	Programme & Portfolio Management (IPM 802) Systems Thinking (IBI 801) Industrial Marketing (IIM 801)	New Product Development (INP 880) MEM, MPM) Risk Management (IRI 801) (MEM, MTIM) Project Planning (IPM 802)(MEM, MTIM)

Commercialisation & Intellectual Property
IKG881
Modern societies increasingly depend on the development and successful commercialisation of new technology that may exist either in the form of knowledge, process, product, service, or combinations of these forms. The module addresses principles and practices required to identify and package technology so as to increase the chance of successful commercialisation. The module highlights the significance of the systems of innovation concept and emphasises the integration of innovation and technology management with entrepreneurial flair in order to

facilitate successful commercialisation of technology towards the generation of economic growth, wealth and prosperity. Candidates studying the module will be required to analyse case studies and to carry out a practical exercise.

Construction Management I
KBS 803
The domain addresses the specific needs of the project manager active in the construction industry. An overview of the local and international best practise is provided. Organisational structures and role players within the construction industry are studied. The construction project management life cycle is addressed with specific reference to the design and construction processes.

Corporate Entrepreneurship
IEE 880
Corporate Entrepreneurship (CE) or Intrapreneurship refers to the means by which an organisation revitalises itself and alters its competitive contour through embarking in entrepreneurial activities which focus on innovation. CE is one of the key tools to take organisations forward in an environment faced by global challenges. This module focuses on the fundamentals of CE, how to design an entrepreneurial organisation, building cultures to support technological intrapreneurship, business model innovation, organisational digital transformation, and how to enable continuous intrapreneurial performance within a corporation**.**

Engineering Asset Management and Maintenance
IAM 801
Since the beginning of human history, man has continued to engineer artefacts that provide the means to enhance the way we live, often by directly replacing humans in numerous laborious and dangerous tasks. These engineered assets range from indispensable and personalisable gadgets (e.g., mobile phone) and tools (e.g., notebook computer) to small and large scale cyber-physical systems, equipment, facilities, infrastructure, machinery, and industrial plant that are deployed in all aspects of human endeavour. The module emphasises the value doctrine as the basis for managing engineered assets. Thus, the focus is on the synergy between multidisciplinary knowledge areas in science, engineering and technology, as well as the application of cross-disciplinary skills in operations, maintenance, finance, logistics, human resources, *inter alia*, to achieve effective management of engineered assets that constitute our built environment. Candidates studying the module will be required to analyse case studies and to carry out practical exercises.

Finance and Cost Management
IPF 802
The role of the engineer is to apply the wealth of scientific knowledge to produce products and services for the benefit of mankind. A design can demonstrate excellence in technical achievements but if the end user cannot afford it, the whole project will be one of futility. Taking into account the vast sums of money involved in the design, development of products and establishment of production facilities, poorly managed projects can seriously damage the profitability and survival of a company.
This course in Project Finance and Cost Management creates an opportunity for the learner to be acquainted to the theoretical principles and practical applications of finance and cost management aspects as applied to projects and programmes.
To achieve this objective, it is necessary to:

- Firstly, clarify the study field of engineering economics and its function in the decision-making process,

- Secondly to understand the elementary principles of cost estimation, allocation of cost elements and, financial risk management,
- Thirdly to understand the cost control principles in the management of a project or program

Financial Management
FBS 830

The aim of this module is to enhance engineering managers' understanding of Financial Management principles and its role in maximising the long-term wealth of the shareholders and other stakeholders. Three major decisions are involved: Firstly, capital structure decisions relate to how long-term sources of finance such as debt and equity are combined in an optimal structure for the firm. Secondly capital budgeting decisions relate to how these sources are optimally invested in for instance infrastructure and manufacturing assets. Thirdly, short term decisions relate to the use of current assets and current liabilities in the best possible way. Engineering managers need to understand how the results of these three types of decisions are reflected in the financial statements of the firm. Financial principles are important in assessing the financial health of a firm, be it private or public, large or small, profit-seeking or not-for-profit. A thorough understanding of these principles and how they interact from a risk-return perspective is crucial to best serve the strategic goals of the firm.

Fundamentals of Technology Management
ITB 802

Technology is often seen as the engine of economic growth. Technology management is therefore an important function within any organisation. Technology is present over the whole lifecycle of innovation projects and its activities. The typical technology management activities are Identification, Selection, Acquisition, Learning, Exploitation and Protection. Organisations should be able to master this portfolio of technology management activities to be competitive, especially in a technology and innovation environment. The module therefore addresses themes such as Technology Intelligence and Scanning, Technology Forecasting, Emerging Technologies, Technological capability assessment and development, R&D Management, Technology Transfer, Technology Planning and Road-mapping and Technology Protection.

Industrial Marketing
IIM 801

This module will primarily address marketing in the industrial environment, not commercial environment. It is based on the principles of business to business marketing (B2B) as well as services marketing. The primary objective of this module is to provide students from a technology or engineering background with a thorough foundation of basic marketing principles and how it can be applied in practice. The areas of market segmentation, macro and micro market environment, developing a value proposition, and understanding buyer behaviour will be explained. Services marketing will include: service development and design, pricing aspects, how services are delivered, how to manage employees and customers in service delivery, managing demand and supply, marketing communication aspects, building customer relationships and loyalty, and how to recover service failures.

Information Technology and Service Project Management
IPK803

IT and service project management look at the process of planning, organising and executing projects that achieve an organisations' specific information technology (IT) and/or service goals. Given the growth of these two industries, the objective of this module is that learners gain a practical and theoretical foundation for managing IT and service projects, while also being exposed to the latest trends, innovations and techniques (e.g. Agile) in these two related

management fields. At the completion of this module learners will have gained the knowledge and skills to lead effectively and creatively by using systems thinking to solve challenges in IT product and/or service design, development, and innovation.

Knowledge and Information Management
ILB 884
Information and knowledge systems are at the heart of virtually every business interaction, process, and decision, especially when one considers the vast penetration of the Web in the last few years. Managers do not have the luxury of abdicating participation in information and knowledge system decisions. Managers who choose to do so risk limiting their future business options. This is a module about managing and using information and knowledge, presented for current and future managers as a way of introducing the broader implications of the impact of information and knowledge systems. Attention will be given to IT in very broad terms, including traditional data processing and management information systems, as well as enterprise resource planning systems, electronic commerce data resource warehousing and data mining, managerial support systems, groupware, artificial intelligence applications, and so forth. The knowledge management theme will focus on aspects such as knowledge audits and mapping, knowledge systems / processes and the link to strategy. The importance of knowledge management in future thinking processes will also be discussed.

Legal Aspects
ILC 803
The objective of this module is to present the basic principles of the law with which the project manager has to deal with during the planning and execution of a project. An introduction is presented on the sources of law, the structure of the South African legal system and representatives sources of obligations. The general law of contract is done in great detail with special reference to clauses used in contracts, different types of contracts as well as breach and remedies. Practical examples are given to enable the student to understand how the law is applied in practice. Special attention is then given to the law of purchase and sale and to construction/engineering law (letting and hiring of work). Further attention is also given to aspects of labour law and alternative dispute resolution. Another relevant aspect discussed in less detail is representation (agency).

Mini-Dissertation
MEng: IGB 898 / MSc: ISC 898
A research project on a topic of the student's choice from any of the modules offered by the Graduate School of Technology Management is done. The work takes place under the supervision of a study leader (project adviser). In addition to the satisfactory completion of the report itself, the student also has to prepare an article based on the project and present it at the final year symposium held during November each year. Evaluation is based on the report content, article, as well as the presentation. A follow-up symposium is also held during May in the next year.

New Product Development
INP 880
The development of new products is a key business function. There is always a high risk of failure but the best companies manage to launch successful new products on a continuous basis. The objective of this module is to provide students with the concepts and insight necessary both to do product development and to manage it. The strategies, processes, tools and techniques used by leading-edge companies for new product development are introduced. The module examines different stages of product development, from idea generation to market testing and includes the assessment and selection of appropriate business models. The role and impact of fourth industrial

revolution technologies, like rapid prototyping with 3D printing, are also considered. Key questions addressed in the module are: how does product/process development fit into the overall business context; what products, processes, systems or services should be developed; how does one go about developing a new product/process; and how should one measure performance in product/process development and improve? Further selected concepts and topics like design thinking, design management, success factors, relationship to systems engineering, reduction of uncertainty, and software for NPD are also introduced. Although the emphasis is on physical products, many of the concepts covered in the module are equally applicable to service development.

New Ventures and Entrepreneurship
IOE 801
This subject aims to provide a wider understanding of the concepts and importance of entrepreneurship and the requirements and processes in commercialising technology-based ventures.

The themes include methodology in screening opportunities and understanding the commercialization process; compiling Technology Entrepreneurship Strategies, Product Development Process & Business Model development; understanding and protecting Intellectual Property, funding options for Entrepreneurial Ventures and understanding the scope and content of a Business Plan.

Organisation and Innovation
INV 880
The Master module Organisation and Innovation has been designed for Master students wishing to build substantive and methodological knowledge in two profound and related disciplines and phenomena: organisation studies and innovation studies. It focuses on providing an overview of the main concepts, theoretical perspectives and models regarding organisation, technological innovation and the relationships between different forms of organisation and technological innovation (e.g. organizing for creativity; systems supporting innovation). This module further explains innovation at several levels of analysis (individuals, teams, organisations, sectors, nations). Students are expected to apply the acquired knowledge in their workplace.

People Management
PEM 883
The aim of this course is to equip engineering managers with the key competencies they require for managing in both South African and International Engineering and Technology environments. The course focuses on key elements of organisational behavior and explains how to manage individuals, teams and organisations with regard to various dimensions of thereof including: individual diversity, emotional intelligence, motivation and team performance, communication, leadership, power and politics, organisational culture and stress, with a view to optimising performance in organisations. Furthermore, the course aims at developing an understanding of talent management processes with a focus on the relationship between the HR department and the engineering manager, the aim being to highlight the role of the latter in the management of people.

Procurement and Contract Management
IPJ 801
Most projects contract out some if not all project work to other organisations or internally. Procurement is the process of selecting, contracting and acquiring goods, services or works from an external source and is thus a vital part of project management. The objective of this module is that learners are able to select and apply a meaningful and sensible procurement strategy appropriate to the project. Topics to be covered include the procurement decision; law of

contract, the procurement process; various aspects of procurement planning such as procurement methods, source selection, risk allocation, contracting strategies, contract payment types, standard forms of contract; control and dispute resolution.

Production and Operations Management
IPP 801

This module presents an integrated perspective on the central role of production and operations (manufacturing and services) within industrial enterprises and covers the spectrum of systems, products and services. Firstly, the module deals with the role of the production and operations function in the enterprise and its interaction with the other functions in the organisation, emphasising aspects like customer requirements, competitiveness and measurements. An overview of the different types of production/operations processes is also provided. Secondly, the basic elements within the POM environment are covered in detail and include day-to-day operations management decisions, master planning consisting of demand management, production and capacity planning and the master production schedule, in/outsourcing, scheduling and inventory reduction. TOC with its foundation as a continuous improvement management approach is central to the module. The aim is to supply the student with background knowledge to understand the principles of production and operations management applicable to all industries and types of organisations.

Programme & Portfolio Management
IPM 802
This module introduces programmes, portfolios, the basics of corporate strategy, as well as the processes that link projects to strategy.
The processes include: screening and selection of projects; portfolio design for strategic fit and balance; allocation (and scheduling) of funds and other key resources to selected projects; the interface to detailed planning, execution, and gate reviews; as well as benefit assessment of individual projects and programmes.
Attention is paid to the roles of PM methodologies, front-end loading, feasibility studies and business cases in the process of project screening, as well as to techniques used to assess projects individually and relative to one another.
The roles of individuals and groups such as the Corporate Board, executives, steering committees / review boards, a project management office, a project portfolio manager and the project sponsor in the processes that link strategy and individual projects are described.

Project Economics
IBD 880
The module Project Economics, IBD 880, will focus on insight in the field of Decision Analysis (DA), Risk Management (RM) and Techno-Economic Analysis (TEA), with the application of the basic principles of decision analysis, risk identification, feasibility assessment and financial return in the context of innovation and technology activities within the enterprise. Theory as well as practice are important and is illustrated by for example the application of DA and TEA in various functional areas of the enterprise. Techno-economics analysis (TEA), also referred to as economic feasibility studies, is a core technique which is used to support decision making within the technology and innovation context of enterprises. Some of the fundamental approaches for DA, RM and TEA use the generic models of net present values, discounted cash flows, internal rates of return and the time value of money to compare expenses against earnings. In this module, aspects of the principles of techno-economics and the structure of TEA will be integrated with DA and RM to support and guide decisions relating to investment in, for example, future technology and innovation projects.

Project Organisation
IHR 801
This module takes an in-depth look at the conscious and unconscious human dynamics that affect the performance of project teams. The importance and complexity of the project manager's leadership role in containing and transforming anxiety into creative and productive energy is emphasized. The systemic relatedness between project teams and the social systems (organisation, industry, nation state) they form part of, and what this asks of the project manager, are explored. The module looks at the dynamics of authority, delegation, roles, boundaries, change, diversity, inclusion and exclusion and how the less obvious dimensions of these dynamics can be observed and responded to. The idea of the system-in-the-mind and how this influences the 'mind-of-the-system' is studied and experienced in class. The module draws on literature form the fields of organizational behaviour, leadership, systems psychodynamics and group relations. The module consists of self-study, experiential discussions in class, group work and individual work.

Project Planning
IMP 802
Project Planning introduces the learner to the basic concepts of project management. This module will set the scene for the rest of the MPM course and addresses project management principles, standards, guidelines, institutes, certifications, professionalism and best practices. Defining and designing a project life-cycle is discussed followed by the process of initiating and planning a project. The importance of a well-defined scope statement and work-breakdown structure are explained which will include needs analysis, user requirement definitions and systems thinking. Time management remains integral with different scheduling techniques addressed and applied. The last part of the module provides an overview of the module to follow and how each will fit into the total discipline of project management.

Project System Engineering
ISE 802
The PSE process is discussed within the context of the technology-based enterprise. The first objective is to conceptualise and model a tech-based enterprise in terms of core business processes and the interaction amongst them. SE processes are hence understood in the context of the project and organisation. The concepts of "system, project and process" are explained.

The design and development of the total system for the total system life-cycle, taking into account the requirements of all stakeholders is the heart of PSE.
All stakeholders and their requirements are identified, described and managed over time. The system life-cycle stages/phases and related system design processes are focused upon. A number of SE topics, e.g. information and configuration management, life-cycle cost, quality of design, downstream "design to" requirements and logistics are touched on. SE planning within the bigger Project plan is investigated. The important and integrating role of the Project Manager to make SE successful, particularly in the early phases of the project, is highlighted.

Quality and Integration Management
IQM801
The module details the quality journey in projects and how all project knowledge areas are integrated into a final project plan to ensure the quality of project management. It further addresses the quality of the project's products through the proper definition of the project business case, scope definition and the breakdown of the project's products into manageable deliverables that will meet stakeholder expectations. Though specification development of the deliverables using quality planning (QP) techniques, the quality metrics or quality measurement criteria for the specification will be established. These criteria will form part of the project's

quality assurance plan which is integrated with the project's life cycle and schedule as well as management and approval authorities. Quality control and quality assurance processes and activities to test, verify and audit product, support as well as managerial processes and deliverables are also discussed and non-conforming elements are recommended for improvement through the use of quality improvement tools and techniques. The use of quality standards and methodologies to enhance the quality of projects is also discussed. The module concludes with the development of an integrated project plan, incorporation all knowledge areas addressed in the different modules of the programme.

Risk Management
IRI 801
The module Risk Management, IRI 801, focuses on insight in the field of Risk Management and the application of the basic principles of risk identification, assessment, treatment and control in the business enterprise and also systems technology innovation and project management. Theory as well as practice is important and a number of case studies are used to illustrate the application of risk management in various functional areas of the enterprise. Risk can be defined as "the presence of adverse events or conditions that can threaten the survival of the system, or prevent the objectives of the system to be achieved". All systems including project or technology systems, natural and human-made, are exposed to risk and this risk should be managed in a responsible way by any business enterprise. The risk exposure of modern organisations is increasing due to complex technical systems, resource structures, processes and interactions. The risk management process involves establishing the goals and objectives for the organisation or functional unit, identifying the risks, quantifying and prioritising the risks, developing responses to the high priority risks, and monitoring the operations. Business enterprises in the manufacturing and service industries have a number of functional areas and processes that are interlinked. Risk management and decision analysis are therefore applied in development of new products or services, operations, maintenance, projects, safety and security. The module also includes aspects of detailed risk analysis such as risk simulation etc.

Science, Technology and Innovation Policy
ISP 880
Science, Technology & Innovation (STI) policy is about decisions and actions that are taken by governments in order to promote research, technology development and innovation which are critical to economic growth and development, as well as the procurement and use of scientific knowledge in public policy-making. In this module students will be introduced to concepts of and issues in STI policy, followed by a brief history of innovation theory and how STI are critical to economic productivity and development. The range of policy instruments which can be used to stimulate STI will also be reviewed, as well as the characterisation of the instruments which have been adopted by African countries. A range of frameworks for assessing the effectiveness of different STI policies and innovation systems, with particular reference to South Africa and other African countries, forms part of this module.

Strategic Management
ISM 801
The objective with this module is to stimulate strategic thinking and the development of strategic decision-making skills amongst students in the field of strategic management in an engineering environment. In this module the following topics are addressed:
Concepts and Practice of Strategy: An historical background serves as introduction. Classical concepts and misconceptions in strategic and operational management work are given.
The Process of Strategic Management: The work content and structure of strategic management are discussed. A schematic model of the process is developed.

Formulation of Strategy: This section gives a statement of the work to be done in formulation of strategy. The following aspects are covered: The company mission. External environment. Environmental forecasting. The company SWOT analysis. Formulating objectives and grand strategies. Strategic analysis and choice.

Implementation of Strategy: In the concluding part of the module attention is given to implementation through business functions, structure, leadership and culture, rewards, control mechanisms for measuring, evaluating and corrective actions.

Strategic Technology & Innovation Management
IST 880
The objective of this module is to provide students with the necessary skills to develop technology and innovation strategies for organisations. Themes include the concepts of technology and innovation strategy, processes of strategic management, formulation of technology and innovation strategies, strategy implementation, technology road-mapping, scenario development and future thinking. Appropriate case studies are used to link the theory and practice.

System Engineering and Management
ISE 801
SE & M is discussed within the context of the technology-based enterprise. The first objective is to conceptualise and model a tech-based enterprise in terms of core business processes and the interaction amongst them. SE processes are hence defined and managed in the context of the project and organisation. The concepts of "system, project and process" are explained.

The design and development of the total system for the total system life-cycle, considering the requirements of all stakeholders, is the heart of SE. SE & M focuses on the management of the SE process and the establishment of a SE capability in the organisation.

All stakeholders and their requirements are identified, analysed, described and managed over time. The system life-cycle stages/phases and related system design processes are focused upon. A number of "specialty engineering topics", e.g. information and configuration management, life-cycle cost, quality of design, downstream "design to" requirements and logistics are touched on. The enabling role of SE within Engineering Management is emphasised.

Systems Thinking
IBI 801
The modern world consists of "systems". This is evident from everyday discussions. Statements such as "The system failed us", or "The national energy system is under pressure" abound. Most people have little or no understanding of 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", or as some describe it, "thinking in systems", rarely succeed when attempting to solve the problems of our time mainly because they do not know how to deal with trending patterns. Peter Senge, author of the book The Fifth Discipline and well-known systems thinker, defines systems thinking as "both a thinking skill and a language for understanding and working with complexity". This course will provide you with the know-how and tools to achieve the desired outcomes in your real-world environment, notably when that world includes complex and wicked problems. The real-world in this case includes people as well. This course will challenge almost everything you have been taught to date. After completing this course you will view the world in a different way. You will become a big picture thinker who can transcend your own discipline with ease. The course includes the history and benefits of systems thinking, systems thinking terminology, managing interrelationships, overview of appropriate tools and methodologies including system dynamics, soft systems

methodology, systemigrams, etc. These will be illustrated further by applying them to relevant case studies. This course compliments systems engineering, which focuses mainly on hard systems whereas systems thinking focuses on soft systems.

The role of projects in realizing (more) sustainable business strategies and a more sustainable society is one of the emerging topics in project management. From the literature on this topic, two types of relationship between sustainability and project management appears: the sustainability of the project's product, the deliverable the project realizes, and the sustainability of the project's process of delivering and managing the project. The first relationship, sustainable projects, is well studied and addressed, for example in relationship to eco-design and 'green' construction. The second relationship, sustainable project management, is emerging as a new 'school of thought' in project management.

As project managers play a pivotal role in the sustainability of their projects, this course will discuss the 'why?', 'what?' and 'how?' of sustainable project management. The lectures will discuss the concepts of sustainability, the role of projects in sustainability, the impact of sustainability on project management, the integration of sustainability in the project management process and the structure of a 'Sustainability Management Plan'.

Sustainability
ILE 802
The role of projects in realizing (more) sustainable business strategies and a more sustainable society is one of the emerging topics in project management. From the literature on this topic, two types of relationship between sustainability and project management appears: the sustainability of the project's product, the deliverable the project realizes, and the sustainability of the project's process of delivering and managing the project. The first relationship, sustainable projects, is well studied and addressed, for example in relationship to eco-design and 'green' construction. The second relationship, sustainable project management, is emerging as a new 'school of thought' in project management.
As project managers play a pivotal role in the sustainability of their projects, this course will discuss the 'why?', 'what?' and 'how?' of sustainable project management. The lectures will discuss the concepts of sustainability, the role of projects in sustainability, the impact of sustainability on project management, the integration of sustainability in the project management process and the structure of a 'Sustainability Management Plan'.

Technology Management
ITB 801
Technology is important for an organisation's competiveness and productivity. Technology management is therefore an important function within any organisation, whether it be as a core resource of technology-based companies or as a support resource in service organisations. Technology is present over the whole lifecycle of projects and operations with technology management activities such as Identification, Selection, Acquisition, Learning, Exploitation and Protection. The module therefore addresses themes such as Technology Dynamics, Technology Identification, Technology Audits, Technology Selection, Technology Road-mapping, Technology Acquisition, Technology Adoption, Technology Management in the operational lifecycle.

12. GENERAL INFORMATION

12.1. Location of Offices

The programme offices are in the GSTM, situated on the western side of campus (Engineering Building 2, second floor).

12.2. Lecture and Syndicate Rooms

Most lectures take place at the *Graduate Centre* (eastern side of campus), or in close proximity thereof. *Lecture rooms will be clearly indicated at the start of the study block.* Syndicate rooms will be allocated as and when required.

12.3. Parking and Property

Please take note that parking is at your own risk. Likewise, any property that you bring with you and leave in class is also at your own risk. Unfortunately, there have been *some thefts in the past* and you are therefore advised not to leave any valuables (especially *mobile phones* and *notebook* computers) unattended.

12.4. Cell Phones and Messages

All cell phones must be switched off in class and no calls may be taken. Except in extreme emergencies (medical, accident, death, etc.) no messages will be taken at our offices. If such an event occurs, we will do our best to contact you. Unfortunately, the telephones and fax machine at our offices cannot be made available for your personal or official use. In general, it is important to free yourself from your office and your place of employment during the study block periods. Please request your colleagues and superiors to respect this. You will need all the time to focus on your studies.

12.5. Personal information

Please keep the *Programme Administrator informed* of any changes of personal information, specifically e-mail addresses and telephone numbers. This is essential for communication and registration purposes.

12.6. University and Faculty Regulations

In addition to information contained in this document there are also University and Faculty Regulations of which you should also be aware. It is important that you familiarize yourself with these regulations. Copies are available from Faculty Administration.

12.7. Alumni Affairs

The GSTM considers our Alumni as key role-players regarding continuous education, programme development as well as potential partners in business endeavours and research. We have a dedicated person coordinating alumni affairs. More detail will be provided during the course of the programmes.