UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

POSTGRADUATE BROCHURE 2025

Department of Mechanical and Aeronautical Engineering

Departmental website address:
http://www.me.up.ac.za

Updated by:
Prof J Dirker
Prof WG le Roux

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1. INTRODUCTION

As part of the postgraduate programme in the Department of Mechanical and Aeronautical Engineering, engineering students can register for one of the degrees as shown in the summary below:

2025 Offerings:

Programme	**Minimum duration**	**Requirements:**
B.EngHons (12240052)	1 yr	• B.Eng or equivalent (see yearbook link) Note: 65% or more is recommended but not a requirement
B.ScHons in Applied Science specialising in: • Mechanics: (12243053) • Physical Asset Management (12243059)	1 yr	• See yearbook links
M.Eng Option 1 **(preferred)** (12250052)	1 yr (after 1 yr B.EngHons)	• Must first have a supervisor • 65% or more for B.EngHons
M.Eng Option 2 (new) (12250052)	2 yrs	• Must first have a supervisor • 65% or more for B.Eng • concurrent non-degree purpose modules on honours level that will meaningfully benefit the masters work (as required by the supervisor).
PhD (12263042)	2 yrs	• Must first have a supervisor • A suitable master's degree (see yearbook link)

With this brochure, particulars pertaining to requirements, available modules and study arrangements are described in detail. The brochure is, however, intended to provide information and must be read in conjunction with and subordinate to the Yearbook of the University of Pretoria. Instead of using this link, one can also navigate to this by visiting http://www.up.ac.za, then select "Yearbooks" from the "Study" menu.

This brochure is a dynamic document that may change while the year progresses. Changes are recorded in a register on the last page. Students are encouraged to continually check the postgraduate web page of the department for the latest version of this brochure. In addition to the link above, the postgraduate web page can be reached via the departmental web page at http://www.me.up.ac.za; select "Postgraduate Programmes" from the "Study" menu.

1.1. Contact Information

Further enquiries with regard to postgraduate studies may be directed according to Table 1.

Table 1: Important contact details.

Academic Arrangements (Department)			
Administrative officer Registration Module changes Administration enquiries	Ms C Tshiping	012 420 6890 constance.tshiping@up.ac.za	
Coordinators for postgraduate studies; curriculum structure, all postgraduate degrees	Prof J Dirker (Honours) Prof WG Le Roux (Masters and PhD)	012 420 2465 jaco.dirker@up.ac.za 012 420 2446 willem.leroux@up.ac.za, Note: during some periods of the year, either Prof Dirker or Prof Le Roux may experience such electronic mail overload that they may not respond to electronic mails. If this happens, students/applicants are advised to send queries to constance.tshiping@up.ac.za	
General Administration (EBIT Student Administration, Engineering I level 6)			
Applications & general admin: Honours	Mr R Mashiloane	012 420 3656	roy.mashiloane@up.ac.za
Applications & general admin: Master's	Mr K Nkanyana	012 420 6735	kenneth.nkanyana@up.ac.za
Dissertations	Mr K Nkanyana	012 420 6735	kenneth.nkanyana@up.ac.za
Applications & general admin: PhD's	Mr K Nkanyana	012 420 6735	kenneth.nkanyana@up.ac.za
Theses	Mr K Nkanyana	012 420 6735	kenneth.nkanyana@up.ac.za

Enquiries in connection with specific modules must, as far as possible, be directed to the lecturer concerned (see Table 2 in section 11 for contact details). Any enquiries that cannot be answered by the lecturer may be e-mailed to the administrative officer listed in Table 1.

Further information on the department and its research programmes can be obtained at the departmental web page at http://www.me.up.ac.za.

2. HONOURS DEGREES

The degree links included in this section are to the degree descriptions in the University of Pretoria Yearbook.

The Department awards the following taught honours degrees:

- the BEngHons Mechanical Engineering degree (degree code 12240052) follows on a BEng or a BScEng degree,
- the BScHons Applied Science Mechanics degree (degree code 12249053) follows on a BSc, a BTech degree or equivalent, and
- the BScHons Applied Science Mechanics: Physical Asset Management degree (degree code 12249059) follows on a BEng, BSc, BTech degree or equivalent.

Credits:
For all honours degrees the candidate must successfully complete modules that total 128 SAQA credits (one credit represents 10 study hours). The minimum duration is one year of full-time study. Except for one research module (32 credits), all the postgraduate semester modules offered by the department carry a weight of 16 credits. Normally an after-hours student (i.e., a student who is working for an employer on a full-time basis but also studies after-hours; previously called a part-time student), shall complete 64 module credits per annum so that the degree may be conferred after two years. This can however be accelerated.

Purpose:
The purpose of the honours degree is, on the one hand, to gain a deeper and more focussed knowledge and understanding of a field of specialization in engineering science, usually as preparation for master's research, but sometimes also in support of specific career goals in industry. On the other hand, the honours degree can also serve the purpose of broadening the student's knowledge of the engineering science in general, and depending on the selection of honours degree modules, both of these purposes may to some extent be served by a specific honours degree.

ECSA:
The honours degree, and specifically the two BScHons Applied Science Mechanics degrees, **cannot** be used as an alternative route or as a support mechanism for registration, with the Engineering Council of South Africa (ECSA), as a professional engineer (PrEng). The recommended and correct route to registration is to complete a four-year BEng degree (or equivalent) at a university that is accredited for this purpose in terms of the Washington Accord (see http://www.ieagreements.org/accords/washington/).

Style:
Postgraduate modules are presented in blocks or in periods, or sometimes something as a combination of these. Block presentation in its basic form entails three full-contact days, typically presented at one-month intervals. On the other hand, presentation in periods occurs in either 50-minute periods, weekly two-hour periods, bi-weekly four-hour periods or even a number of three-hour periods. Some modules are presented in 6 half-day blocks rather than 3 full-day blocks. The mode of deliver might differ from one module to the next and could be one of the following: campus only, campus with recorded videos, or campus with live streaming. Further details are shown in Table 2. In addition to attending the formal contact days, students are expected to complete assignments. Satisfactory completion of these assignments and formal tests form part of the examination entrance requirements. According to the SAQA guidelines of one credit per 10 notional hours, it is expected that a student will typically do 160 hours of work to complete a 16-credit module, or 320 hours in the case of a 32-credit module.

General rules:

- Note that, with the exception of the compulsory modules of the BScHons Applied Science Mechanics and the BScHons Applied Science Mechanics: Physical asset management programmes (see sections 2.2 and 2.3 respectively), a student may repeat any module only once.
- No supplementary or special examinations are granted at honours degree level.
- The General Regulation G.12.5 (see General Regulations) pertaining to undergraduate students who miss examinations due to unforeseen circumstances or illness, also apply to honours students with respect to all modules offered by the department. All exams are written in-person on campus only (not on-line). A student who has missed an exam for a valid reason in terms of this regulation and would like to write the aegrotat exam needs to apply at student administration on level 6 of Engineering Building I.

2.1. Compulsory module: Research study

In order to meet governmental requirements, all students must do the 32-credit module MSS 732 Research study 732. Students who have already committed to continue directly after the honours degree with a master's degree, and who have already made arrangements to have a master's supervisor and project, should do this module focussed on their intended master's research project. This module is then to be used to do preparatory research for the master's degree. This study must be done under supervision of the intended master's supervisor. Students who do not plan to continue with a master's degree or who do not yet have a master's degree topic, will be allocated a topic and corresponding supervisor at the beginning of the semester, in which he/she has registered for the module with the preference of the student being considered if possible.

A student may do this module either in the first or second semester. The student may also complete the module over a year (meaning two consecutive semesters). If a student decides to select this module over two consecutive semesters, he/she needs to register for this module in the second semester. The module is assessed by means of a written project report, which is submitted to the supervisor as examiner by uploading the report to an assignment on the module clickUP page. The reports of all students are subjected to external examination. It is therefore essential that the student reports on all aspects of the project for which he/she would like to receive credit under this module.

2.2. Compulsory modules for the BScHons Applied Science Mechanics degree

Candidates for the BScHons Applied Science Mechanics degree (degree code 12243006) must select and study any one of the following three 32 credit module combinations, which start them off on the specialization indicated:

1. Structural Mechanics specialization
   - MSV 780 Fatigue 780 (16 credits)
   - MWN 780 Numerical methods 780 (16 credits)

2. Thermo-flow specialization
   - MSX 780 Fluid mechanics 780 (16 credits)
   - MWN 780 Numerical methods 780 (16 credits)

3. Maintenance specialization
   - MIP 780 Maintenance Practice 780 (16 credits)
   - MIR 781 Reliability Engineering 781 (16 credits)

The modules listed as options above are all presented in the first semester of each year. **Both modules in a combination must be done simultaneously in the first semester of registration in the programme. These modules must be passed on the first attempt.**

Failing to pass at first attempt will result in the termination of the student's registration and will thus not be re-admitted to the program. In addition to these modules and the compulsory module MSS Research study 732 (see section 2.1), BScHons Applied Science Mechanics students may choose the remaining 64 credits from the postgraduate modules offered by the department, subject to the normal prerequisites as well as the additional prerequisites listed in Table 2 below. Students will be allowed to register for first semester modules without having passed the prerequisite module listed in Table 2 provided that the student is concurrently registered for the prerequisite module.

2.3. Details of the BScHons Applied Science Mechanics: Physical Asset Management degree

The BScHons Applied Science Mechanics: Physical Asset Management degree (code 12243037) programme is not described in detail in this brochure, but in its own brochure instead, which in addition to this link, is available on the postgraduate web page of the department. The modules in this programme presented by the Department of Mechanical and Aeronautical Engineering are described in this brochure, in Table 2 and section 12.

Note that this programme has, in addition to the compulsory MSS 732 Research study 732, four other 16 credit compulsory modules. Students need to pass two of these 16 credit compulsory modules in the first semester of study (on their first attempt); otherwise, the student's registration and admission status will be cancelled.

3. MASTER'S DEGREE

The degree link included in this section is to the degree descriptions in the University of Pretoria Yearbook.

The department awards a research-based master's degree, namely the MEng Mechanical Engineering degree (degree code 12250052)

The master's degree is awarded on the basis of 128 credits based on a dissertation and an examination covering the field of the dissertation.

The master's degree **cannot** be used as an alternative route or as a support mechanism for registration, with the Engineering Council of South Africa (ECSA), as a professional engineer (PrEng). The recommended and correct route to registration is to complete a four-year BEng degree (or equivalent) at a university that is accredited for this purpose in terms of the Washington Accord.

All candidates for the master's degree must prepare and submit at least one article for publication in an DHET accredited journal (listed at DHET Accredited Lists), before submitting the dissertation. This article must be based on research done for the dissertation, and must be approved by the supervisor (see Appendix 2).

4. DOCTORAL DEGREE

The degree link included in this section is to the degree descriptions in the University of Pretoria Yearbook.

The PhD Mechanical Engineering (code 12263042) degree is awarded on the grounds of a research thesis and an examination covering the field of the thesis. This degree follows the MEng Mechanical Engineering degree. Generally, the appropriate master's degree must be completed before admission to the doctoral degree will be considered.

The doctoral degree **cannot** be used as an alternative route or as a support mechanism for registration, with the Engineering Council of South Africa (ECSA), as a professional engineer (PrEng). The recommended and correct route to registration is to complete a four-year BEng degree (or equivalent) at a university that is accredited for this purpose in terms of the Washington Accord.

All candidates must prepare and submit at least two articles for publication in an DHET accredited journal (listed at DHET Accredited Lists). The research for these articles must be done in collaboration with the department. Before submitting the articles to the journals, approval must be obtained from the supervisor (see Appendix 2).

5. ADMISSION TO POSTGRADUATE STUDIES AT THE UNIVERSITY OF PRETORIA

The student admission procedure to the University of Pretoria is slightly different for South African citizens and for international applicants. International applicants are referred to section 5.2 below. Also refer to section 7 below for registration once admitted to postgraduate studies.

5.1. Applicants who are South African citizens

Before registration, prospective postgraduate students from other universities and students who have discontinued their studies at the University of Pretoria for a year or longer must apply online for admission to the University. Please visit the Applications section of the University's website at this link or at http://www.up.ac.za, then select "Apply" from the "Study" menu.

Applications for all honours degrees close on 30 November of each year for South African students planning to commence with this degree in January of the following year. There is no closing date for master's and PhD degree applications.

The online application system of the university may no longer be available after the closing date for applications indicated on the University of Pretoria web page. After that date applicants can contact the relevant person (see Table 1) to apply by electronic mail on an application form.

A student planning to commence with postgraduate studies without interruption directly after completion of another degree at the University of Pretoria does not need to apply for admission, although he/she is required to indicate his/her intention by completing an internal application, online from the student portal. Only after an internal application has been processed, will the online registration system be set up correctly to allow registration.

5.2. International applicants

Before registration, prospective international postgraduate students must apply online for admission to the University. Please visit the Applications section of the University's website at this link or at http://www.up.ac.za, then select "Apply" from the "Study" menu.

Applications for all honours degrees close on 31 August of each year for international students planning to commence with this degree in January of the following year. There is no closing date for master's and PhD degree applications.

Prospective international students are encouraged to also visit the University of Pretoria International Cooperation Division website at this link or at http://www.up.ac.za, then select "International Students" from the "Study" menu.

Current international students who plan to begin with a new programme, for instance to start with a master's degree after completing the honours, do not need to submit a formal application, but need to submit online from the student portal, an internal application (see the last paragraph of section 5.1 above), provided that the International Cooperation Division is consulted on this.

6. ADMISSION REQUIREMENTS

6.1. BEngHons Mechanical Engineering

The admission requirements are clearly stated in the yearbook: BEngHons Mechanical Engineering.

A candidate who holds a degree in engineering that was awarded by a university outside South Africa, where the comparable registration authority of that country accredits this degree in a similar way, while that country is a signatory to the Washington Accord (see http://www.ieagreements.org/accords/washington/), may also be admitted to this programme.

If the foreign country is not a signatory to the Washington Accord, the candidate will be considered for admission to this programme only if he/she, at his/her own cost, obtains clearance from ECSA that his/her degree would be deemed acceptable for the purposes of registration as professional engineer (or a candidate engineer) in the Republic of South Africa. More information may be obtained from ECSA's website at this link, or www.ecsa.co.za, then select "Evaluation of Qualifications" under the "Education & Accreditation" heading. Furthermore, after such clearance has been obtained from ECSA, the Head of the Department must authorize admission of the student to the BEngHons Mechanical Engineering programme.

Typical examples of appropriate bachelor's degrees are a BEng degree, a BTech degree in engineering or a related field and a BSc degree in Mathematics, Applied Mathematics or Physics. A candidate, whose bachelor's degree in engineering does not meet the admission requirements for the BEngHons programme, may also be admitted to the BScHons Applied Science Mechanics: Physical Asset Management programme.

6.2. BScHons Applied Science Mechanics

The admission requirements are clearly stated in the yearbook: BScHons Applied Science Mechanics.

6.3. BScHons Applied Science Mechanics: Physical Asset Management

The admission requirements are clearly stated in the yearbook: BScHons Applied Science Mechanics: Physical Asset Management.

6.4. MEng Mechanical Engineering

The admission requirements are clearly stated in the yearbook: MEng Mechanical Engineering.

In the case of an applicant who has completed his/her first degree in engineering in a foreign country that is not a signatory to the Washington Accord, this first degree needs to be submitted to ECSA for clearance as described in section 6.1. Once clearance is obtained, the

applicant's admission to the MEng Mechanical Engineering programme must also be authorized by the Head of the Department.

Meeting the above requirements, however, does not automatically secure admission to the MEng Mechanical Engineering programme. Admission is possible only for candidates with excellent academic records. Furthermore, admission will be granted only if the intended research fits in with the research foci of the department and the supervision capacity exists, as decided by the Head of the Department.

6.5. PhD Mechanical Engineering

The admission requirements are clearly stated in the yearbook: PhD Mechanical Engineering.

In the case of an applicant who has completed his/her first degree in engineering in a foreign country that is not a signatory to the Washington Accord, this first degree needs to be submitted to ECSA for clearance as described in section 6.1. Once clearance is obtained, the applicant's admission to the PhD Mechanical Engineering programme must also be authorized by the Head of the Department.

The MEng degree requirement implies that the master's degree must have been a research-based degree.

Having obtained the MEng degree (or equivalent) does not automatically secure admission to the PhD Mechanical Engineering degree. Admission is possible only for candidates with excellent academic records. Furthermore, admission will be granted only if the intended research fits in with the research foci of the department and the supervision capacity exists, as decided by the Head of the Department.

7. REGISTRATION

Most students register in the beginning of a year which is done online. Please note the details of the registration process in the sections below. Also note that a person can register only after he/she has been admitted to a programme (see section 5).

7.1. Online registration

The online registration typically opens on the day that the university reopens after the end-of-year recess. Details of the online registration process are available to students on the university web page. Registrations occur via the student portal (via www.up.ac.za and clicking on "My UP Login").

If a student chooses to register for a module(s) offered by another department (see section 11.3), this must be approved in writing (typically by electronic mail) by the other department as well as one of the coordinators for postgraduate studies (see Table 1). In this case, the student should first register online for all the other selected modules, thereafter receives permission from the other department. Lastly, request this approval by email from the coordinators for postgraduate studies who will in turn, if he also approves, forward the electronic message to the Student Administration with a request to add the module(s) to the student's existing registration.

7.2. No credit for modules registered incorrectly

With online registration there is no longer a rigorous check that the student's registration is in order. Each student therefore has the responsibility to ensure that he/she is registered for the correct modules that bear credit in the student's programme of study and that no rules, specified in this brochure, the yearbook or otherwise, are contravened. A student will earn no credits for incorrectly registered modules, even if the student passed such modules.

It is especially important for students enrolled in one of the BScHons Applied Science Mechanics programmes to take note of this issue. If a BScHons Applied Science Mechanics student register for a module contrary to the prerequisite rules specified in Table 2 and passes the modules in question, he/she may forfeit the credits so earned.

7.3. Problems with online registration

If a student experiences a problem with the online registration system, he/she should contact the EBIT Student Administration at Engineering I level 6. Examples of such problems are:

- If the student submitted a late application he/she may not be able to register online.
- The online registration closes at some point in time in the first quarter. After that time some assistance could be given to the student if he/she still needs to register.
- If the only module that a student plans to do in a certain year is offered by another department, the student cannot register online.

7.4. Registration fee

Before a student can register for an academic year, he/she needs to pay the appropriate registration fee. The registration fee is the first instalment on the tuition fee for the year. This fee can be paid into the University's bank account, with the student number as reference. The bank account details are available on the University's website at this link or at www.up.ac.za, then select "Fees and Funding" from the "Study" menu, then select "Read more" under "Fees", then select "Click here" under "Bank details". The payment of the registration fee can be waived if the student can provide the University with acceptable documentation showing that a sponsor will pay the tuition account.

7.5. General

Students planning to complete the honours degree over more than one year should, during a specific calendar year, register only for those modules they plan to study during that year.

International students need to ensure that their study permits are valid before registration.

Students wishing to discontinue any module must not only inform the lecturer involved, but must also fill out the necessary forms at Student Administration. Students who have not formally discontinued modules by the dates specified by Student Administration will be held financially accountable.

Students may commence their studies in the BEngHons Mechanical Engineering programme in the second semester. This option is not available in the two BScHons Applied Science Mechanics programmes.

8. DURATION OF STUDY

A student registered for the honours degree must complete his/her studies within 2 years. A full-time student and an after-hour student (previously referred to as a part-time student, meaning a student working on a full-time basis and studying after-hours) within 3 years after first registration for the degree. For a master's and doctoral degree, 3 and 4 years are allowed respectively.

If a master's or doctoral student does not obtain the degree for which he/she is registered within the allowed time period, his/her registration will be terminated unless the dean, on the recommendation of the Head of Department, can be convinced that the progress was satisfactory.

9. PLAGIARISM

Students who commit plagiarism will forfeit all credits obtained in the plagiarised work. The matter shall also be referred to the Students Disciplinary Committee for consensus. Plagiarism is regarded as a serious contravention of the University's rules and can lead to expulsion from the University. More details are available on the departmental notice board (see section 10.1) and at the link below. It is expected that all students should familiarise themselves with the content of these documents.
https://www.up.ac.za/students/article/2745913/what-is-plagiarism

10. GENERAL

10.1. Communication between the department and the student

The official notice board of the Department of Mechanical and Aeronautical Engineering is on the departmental website, http://www.me.up.ac.za, select "Student Noticeboard" under the "Study" menu or at the this link.

Students are encouraged to browse through this notice board on a regular basis. The department uses this notice board as a means of communication with students and it is the student's responsibility to ensure that he/she takes note of all-important notices that may appear on the notice board from time to time.

In addition to the notice board, the department also uses the official postgraduate electronic mailing list to send out electronic mail messages to reach all postgraduate students. This list is compiled at the beginning of each year from all the electronic mail addresses of departmental postgraduate students on the University's student administration system. The list is updated every three months. Since this is an important communication channel, it is extremely important that each student ensures that the electronic mail address listed on the student administration system is current. This is especially important in the case of relocation where a campus resident master's or PhD student has completed his/her research work, and omitted to change to their new electronic mail address. The onus is on the students to update the system with their new electronic mail address, once fulfilling all requirements for his/her degree. The department does not accept any responsibility for a student having missed an announcement or message due to the absence of their current electronic mail address of preference as indicated on the university's student administration system, in the case of an individual electronic mail message, or otherwise to all students on the postgraduate list.

10.2. Contact session time table for honours degree modules

Once the time table for honours degree modules becomes available, it will be published on the departmental notice board (see section 10.1 above).

If venues are not yet indicated in the time table on the departmental notice board shortly before the first contact session, please consult the responsible module manager (see Table 2) or look for a possible announcement on the clickUP pages of the module in question.

Some second semester honours degree modules, namely MHM 780 Advanced heat and mass transfer 780, MUA 782 Reactor coolant flow and heat transfer 782, and MOO 780 Optimum design 780, are presented simultaneously with corresponding BEng final year undergraduate elective modules under different module codes. These modules are therefore presented according to the undergraduate time table of the School of Engineering, with three 50-minute periods per week. In both the case of MOO 780, these three periods typically fall on a single week day. For the mentioned modules, there will be two semester test weeks, during which there are no lectures. The contact dates and times for these modules will not be indicated in full on the honours degree module time table on the departmental notice board.

No classes are presented on public holidays. **All information in this paragraph pertains only to the explicitly mentioned modules.**

10.3. Preparation for 1st contact session of honours degree modules

It is expected that students will be prepared for their first contact session of each module. Once a student is registered for a module, he/she should have access to the module web page on clickUP, if such a page exists. The web page typically includes the module study guide. Preparatory work expected of students will be indicated in either the study guide or the module web page. Students who are planning to study a module, but have not yet registered for the module two weeks prior to the start of the module, should contact the relevant lecturer to determine what preparatory work needs to be done.

10.4. Examination time table for honours degree modules

The examination time table for June and November will be finalized as early as possible during the 1st and 2nd semesters, respectively, except:

- During the 2nd semester, in the case of the modules that are presented simultaneously with the BEng final year elective modules (see 3rd paragraph in section 10.2 above). For these modules the examination time table is fixed only about one month before the examination.

The official examination time table for postgraduate modules will be published on the departmental notice board (separately from the undergraduate examination time table) whenever this becomes available. Unlike the exam time table for undergraduate modules, the drafting of the time table for honours degree modules are the sole responsibility of the department. Therefore, no exam times for the modules for which students are registered, will be listed on their student portals.

10.5. Prescribed text books for honours degree modules

The prescribed text books for modules are loaded on the Nevada system during the semester preceding the one in which the modules are presented. The Nevada system can be reached from the library's website (once on the Nevada website click on the "Students" link), or at http://www.nevada-cloud.com/Students.aspx. To find the prescribed book(s) for a module, once inside the Nevada website, select "University of Pretoria" under the "Site" menu and then type in the module code, with a space between the three letters and the three numbers.

10.6. Cost of postgraduate studies

The cost of studies is published by the University on its web page at this link, or go to http://www.up.ac.za, then select "Fees and Funding" from the "Study" menu, then "Read more" under "Fees", then "Read more" under "Postgraduate Students". The cost of a single 16-credit module is one eighth of the cost listed for the whole BEngHons degree (use the value on the lower end of the range), and that of a 32-credit module is one quarter. The registration fee is generally considered as the first payment of the tuition fees. Note that at the bottom of this web page, it explains how a student can request a quotation for the intended study from the student portal.

Note that for foreign students from countries that are not members of the Southern African Development Community (SADC), the tuition fees of the honours degrees are double to those published at the above link, as these students do not earn a subsidy from the SA government.

10.7. Funding of postgraduate studies

Funding for postgraduate studies may be obtained through research assistantships that are awarded by individual lecturers. Prospective students can apply for this type of funding from lecturers working in their fields of interest. New students coming to the University of Pretoria, after having completed a qualification at another university, need to submit the following with their funding application:

- A full Curriculum Vitae
- A full academic record from all tertiary institutions where the student has studied before
- Two reference letters.

10.8. Examination process for Masters and PhD studies (Roles and Responsibilities)

Monthly oral examinations are scheduled as the last Thursday of each month unless communicated otherwise. February and July would usually be scheduled on different dates to accommodate the faculty deadlines for the last day of examination to be included in the Spring and Autumn graduation ceremonies.

The supervisor initiates the intent for examination by uploading the examiner reports under the respective examination date folder on Google Drive and informs the student that the process has started as well as the intended date of examination.

The **remaining files** are the **students' responsibility** to be **completed** and **emailed to** the **assistance** of the administrative officer in Table 1 with the email subject: *Postgraduate_Oral_Exam:<STUDENT_SURNAME>_<STUDENT_INITIALS>_<STUDENT_NUMBER>_<SUPERVISOR SURNAME>*

The remaining files to be completed and uploaded requires the **filename convention** below:

A. **2_Consolidated_Report.pdf** -> Defence report filled-in by student and signed by supervisor
B. **3A_Article1.pdf** -> Proof Journal Article 1 (Masters only one required)
    a. **3A_Arcticle1CoverPage.pdf** -> Cover page indicating the affiliations.
    b. **3B_Article2.pdf** -> Proof Journal Article 2 (PhD only two required)
    c. **3B_Arcticle2CoverPage.pdf** -> Cover page indicating the affiliations.
C. **4_Turnitin.pdf** -> TurnItIn Report
D. **5_Declaration.pdf** -> Declaration of changes made to thesis or dissertation completed and signed by supervisor.
E. **6_Abstract.docx** -> Completed and spell checked Abstract
F. **7_ThesisOriginal.pdf** -> Original thesis
G. **8_ThesisUpdated.pdf** -> Updated thesis

All submissions have to be completed by the Monday before the Thursday examination. Incomplete examinations will be carried over to the next examination date. A student will only be allowed to be carried over for three consecutive examination dates.

11. CURRICULA HONOURS DEGREE PROGRAMMES

11.1. General arrangements

The following general arrangements apply to students registered for course modules:

- For each of the three honours degrees, 128 credits are required.
- For an honours degree, a maximum of 32 credits from approved modules offered by other departments, may be followed. This rule does however, not apply to the interdisciplinary BScHons Applied Science Mechanics: Physical Asset Management degree, by its very nature.
- A full-time honours student may select any combination of credits between the two extremes of 96 credits in one semester and 32 credits in the second, or 64 credits in both semesters. Spacing the modules in a 3:1 ratio over the first and second semesters, typically allows the student to have more preliminary research done towards his/her master's degree, during his/her honours year. Although this research is done on an unofficial basis, it plays an important role in the completion of the master's degree at the end of the second year, and in time to graduate at the April

ceremony of the third year (for a student starting his/her honours programme in beginning of the first semester of the first year).

- The department retains the right to cancel any module in a certain year if too few students register for the module or if a suitable lecturer is not available because of unforeseen circumstances.

11.2. Postgraduate modules presented by the department

A list of modules with the semesters in which these modules will be presented, is given in Table 2, while the modules listed in Table 3 are not presented this year, even though they appear in the yearbook.

Table 2 indicates the module managers with their contact information. The syllabi and pre-requisites (if relevant) for these modules are given in section 12. The two numbered columns indicate the two semesters. Lectures for the first semester commence in February until June and the second semester from July until November. The letter “B” in the semester column refers to a module being presented in block format and “P” to a module presented in either 50-minute periods, weekly two-hour periods, bi-weekly four-hour periods or even a number of three-hour periods. The mode of delivery is also indicated where “C” means in-person contact on campus, “R” means that recordings will be made available, and “S” means that the lecture sessions will also be streamed. Table 2 also indicates that for each module, the concurrent registration prerequisite applies as in the case of BScHons Applied Science Mechanics students. These prerequisites do not apply to BEngHons students.

Table 2: Modules offered by the Department of Mechanical and Aeronautical Engineering

Code	Module and Module manager details	Semester		Assessments			BScHons Appl.Sc. Mechanics requirement *
		1	2	A	S	E	
MEE 781	Advanced finite element methods 781 Prof S Kok 012 420 5809, schalk.kok@up.ac.za	B (C, R)		yes	1	1	MSV 780 & MWN 780
MEG 780	Mechatronics 780 Dr. H Hamersma 012 420 2926, herman.hamersma@up.ac.za		B (C)	TBC	1	1	MSX 780 & MWN 780 or MSV 780 & MWN 780
MEV 781	Vibration-based condition monitoring 781 Dr S Schmidt 012 420 2781, stephan.schmidt@up.ac.za	B (C)		yes	TBC	1	MSV 780 & MWN 780 or MIR 781 & MIP 780
MHM 780	Advanced heat and mass transfer 780 Dr. B Bock 012 420 2195, bradley.bock@up.ac.za		P (C)	yes	2	1	MSX 780 & MWN 780
MIL 780	Engineering Modeling 780 Dr S Schmidt 012 420 2781, stephan.schmidt@up.ac.za	B (C)		yes	TBC	1	MSX 780 & MWN 780 or MSV 780 & MWN780
MIP 780	Maintenance practice 780 Mr L van Eyk 012 420 8388 luke.vaneyk@up.ac.za	B (C, R)		yes		1	
MIR 781	Reliability engineering 781 Dr. D. Fourie 012 420 2452, daniel.fourie@up.ac.za	B (C)		yes	1	1	
MLD 780	Aerodynamics 780 Dr B Huyssen 012 420 6316, barbara.huyssen@up.ac.za	P (C)		yes	1	1	MSX 780 & MWN 780
MLR 780	Air conditioning and refrigeration 780 Prof J Dirker 012 420 2465, jaco.dirker@up.ac.za	P (C, S)		yes		1	MSX 780 & MWN 780
MLV 780	Flight Mechanics 780 Dr. B Huyssen 012 420 6316,barbara.huyssen@up.ac.za	P (C)		yes	1	1	MSX 780 & MWN 780
MLD 783	Unmanned Aircraft Systems technology 783 Mr P Barrier pbarrier@iafrica.com		P (C)	yes	1	1	MSX 780 & MWN 780
MOO 780	Optimum design 780 Mr. R Grobler ruben.grobler@tuks.co.za		P (R)	yes	2	1	MSX 780 & MWN 780 or MSV 780 & MWN 780 or MIR 781 & MIP 780
MSD 780	Dynamics 780 Mr DL Hattingh 081 798 3112, dewald.hattingh@tuks.co.za		P (C, R)	yes		1	MSX 780 & MWN 780 or MSV 780 & MWN780
MSM 780	Numerical thermoflow 780 Prof K Craig 012 420 3515, ken.craig@up.ac.za	P (C)		yes	1	1	MSX 780 & MWN 780
MSM 781	Numerical thermoflow 781 Prof K Craig 012 420 3515, ken.craig@up.ac.za		P (C)	yes			MSX 780 & MWN 780
MSS 732	Research study 732 Dr. B Huyssen 012 420 6316, barbara.huyssen@up.ac.za	Either, Report based					MSX 780 & MWN 780 or MSV 780 & MWN 780 or MIR 781 & MIP 780
MSV 780	Fatigue 780 Dr AJ Oberholster 012 420 3288, abrie.oberholster@up.ac.za	B (C, S)		TBC	TBC	TBC	
MSX 780	Fluid mechanics 780 Dr WJ van den Bergh 012 420 4743, wj.vandenbergh@up.ac.za	P (C)		yes	1	1	
MTX 781	Advanced thermodynamics and energy systems 781 Prof WG le Roux 012 420 2446, willem.leroux@up.ac.za	B (C)		yes		1	MSX 780 & MWN 780
MUA 782	Reactor coolant flow and heat transfer 782 Prof J Slabber johan.slabber@up.ac.za		P/B (S)	yes	2	1	MSX 780 & MWN 780
MUA 783	Reactor engineering science 783 Prof J Slabber johan.slabber@up.ac.za	B (S)		yes	2	1	MSX 780 & MWN 780
MVI 780	Vehicle dynamics 780 Prof PS Els 012 420 2045, schalk.els@up.ac.za	B (C)		yes	1	1	MSV 780 & MWN 780
MWN 780	Numerical methods 780 Prof S Kok 012 420 5809, schalk.kok@up.ac.za	B (C,R)		yes	1	1	

Legend:
P = Periods, B = Blocks, (C) = Campus, (R) = Recordings (current, or from previous years), (S) = Live streaming
A = Assignments (mostly submitted online), S = Semester test (in-person), E = Exam (in-person),
* Concurrent registration prerequisites. A student either needs to be registered for the prerequisite concurrently, or should have passed it earlier. Where no prerequisite is specified the module is one of the compulsory modules for a specialization.

Table 3: Modules appearing in the yearbook, but which are **not** presented:

Code	Module and Module manager details	Semester		BScHons Applied Science Mechanics Prerequisite
		1	2	
MCT 780	Non-destructive testing 780	X		MSV 780 & MWN 780 or MIR 781 & MIP 780
MIC 780	Condition-based maintenance 780	X		MSV 780 & MWN 780 rr MIR 781 & MIP 780
MIP 782	Maintenance logistics 782		X	MSV 780 & MWN 780 or MIR 781 & MIP 780
MLD 784	Avionics 784		X	MSX 780 & MWN 780
MSF 780	Fracture mechanics 780		X	MSV 780 & MWN 780
MSY 781	Specialised structural mechanics 781 (Aircraft design)		X	MSX 780 & MWN 780
MUA 784	Reactor physics 784		X	MSX 780 & MWN 780
MUA 785	Reactor materials engineering 785	X		MSX 780 & MWN 780
MUA 786	Reactor materials engineering 786		X	MSX 780 & MWN 780
MUU 781	Fossil Fuel Power Stations 781		X	MSX 780 & MWN 780

11.3. Postgraduate modules presented by other Departments

Students may also consider modules from other departments. The final selection of modules must be approved by one of the postgraduate coordinators in Table 1. Should a student register for a module offered by another department, the responsibility rests with him/her to inquire in advance with that department for any special conditions and work that needs to be completed before the commencement of the module in question. Such students are urged to obtain the post-graduate brochures of the departments concerned. The departments in Table 4 could be considered.

Table 4 Contact details in other departments.

Industrial and Systems Engineering	Ms Hanli Helm hanli.helm@up.ac.za	012 420 5230
Electrical and Electronic Engineering	Ms H Gous heleen.gous@up.ac.za	012 420 2190
Engineering and Technology Management	Ms T Mvakali thuli.mvakali@up.ac.za	012 420 4605
Mathematics and Applied Mathematics	Mrs L. September Lorelle.bizaare@up.ac.za	012 420 3550
Department of Computer Science	Prof Vukosi Marivate vukosi.marivate@up.ac.za	

12. SYLLABI OF HONOURS DEGREE MODULES

The syllabi given in this brochure were compiled as accurately as possible. The department however retains the right to change these according to circumstances.

MCT 780 Non-destructive testing (16 credits)
Probability, 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.

MEE 781 Advanced finite element methods 781 (16 Credits)
Non-linear statics: Overview of non-linear effects: geometric, material and boundary conditions. Continuum mechanics: tensors, indicial notation, deformation gradients, stress and strain measures, transformations and rotations, stress-strain relationships, constitutive models. Principles of virtual work. Solution methods: direct iteration, Newton methods, incremental/iterative procedures. Lagrange engineering strains. Large displacement finite element analysis of continua: total Lagrangian formulation. Small strain plasticity: Additive decomposition, flow rule, hardening laws, continuum and consistent tangents.

MEG 780 Mechatronics 780 (16 credits)
Sensors: mechanical and optical limit switches, encoders, thermocouples, strain gauges, CCD cameras, IR sensors, piezo-electric sensors, capacitive sensors, torque sensors, tactile sensors, gyroscope and ultrasonic sensors. Actuators: DC motors, stepper motors, AC motors, pneumatic actuators, hydraulic actuators, memory shape alloys. Signal conditioning: component interconnection, amplifiers, analogue filters, modulators and demodulators, analogue-digital conversion, sample-and-hold circuitry, multiplexers, software and hardware implementation of digital filters and Wheatstone bridge. Control: H-Bridge motor control, PWM motor control, control of stepper motors, non-linear control of hydraulic and pneumatic actuators, PLCs, SCADA systems, industrial Fieldbus, micro-processor control.

MEV 781 Vibration-based condition monitoring 781 (16 Credits)
Vibration measurement: conventional and optical technique, digital signal processing in vibrations, vibration monitoring: diagnostics and prognostics, artificial intelligence in vibration monitoring, human vibration. **Prerequisite**: A working knowledge of MATLAB/OCTAVE/Python

MHM 780 Advanced heat and mass transfer 780 (16 Credits)
Convection correlations: high speed flows, boundary layers, similarity, conservation equations, scale analysis. Thermal radiation: physics, exchange between surfaces, solar, directional characteristics, spectral characteristics, radiation through gasses. Convection, evaporation and boiling: film condensation, film evaporation, pool boiling, forced-convection boiling and condensation, flow regime maps, phase change at low pressures, heat pipes. Heat exchangers: types, regenerators, heat exchanger design. Mass transfer: Fick's Law, mass diffusion, mass convection, simultaneous heat and mass transfer, porous catalysts. High mass transfer rate theory. Mass exchangers. **Enrolment restriction:** Students that already obtained the MHM 420 undergraduate credit cannot enrol into MHM 780 for degree purposes.

MIC 780 Condition-based maintenance 780 (16 Credits)
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, standards.

MIL 780 Engineering Modeling 780 (16 Credits)
Modelling philosophies; background mathematics for modelling with data; modelling formulation; data representation and projections; model calibration; model selection; uncertainty quantification and computational tools.

MIP 780 Maintenance practice 780 (16 Credits)
Introduction to Asset Management, Mechanisms of Failure, Quantitative descriptions of Failure, Maintenance Policies/Strategies, Renewal Theory, Lubrication, Asset Management Strategy, Replacement Decision Making, RCM Principles, Maintenance & Failure Risk, A Business Case for Maintenance, Repairable Systems, Integrated Failure Data Analysis, Maintenance Profit Impact, Life Cycle modelling.

MIP 782 Maintenance logistics 782 (16 Credits)
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.

MIR 781 Reliability engineering 781 (16 Credits)
Definition of Reliability, History, Relationship with Quality, Coherent Systems Analysis, Lifetime Distributions, Parametric Lifetime Models, Competing Risks, Proportional Hazards, Accelerated Life, Repairable Systems, Lifetime Data Analysis, Parametric Methods, Nonparametric Methods, Model Adequacy.

MLD 780 Aerodynamics 780 (16 Credits)
Review of the fundamentals of thermodynamics. Introduction to compressible flows. Advanced topics in compressible flows: transonic flow and supersonic flow. Oblique shock waves, expansion waves, shock-expansion theory, wave interactions and wave drag. Linearized compressible-flow theory. Effects of heat and friction on gas flow. Design aspects of high-speed aeroplanes and viscous effects. Fundamentals of hypersonic flow and high temperature gas dynamics. On completion of this module the student will be able to understand the fundamental phenomena associated with compressible flow and competently apply analytical theory to compressible flow problems. **Prerequisite**: The student should have completed a fundamental undergraduate module in fluid mechanics.

MLD 783 Unmanned Aircraft Systems (UAS) technology 783 (16 credits)
Introduction to Unmanned Aerial Systems, applications and examples. System breakdown and major components. Airframe and systems. Core avionics, architecture, flight control, navigation, health monitoring. Mission systems, sensors, weapons and stores, electronic warfare. Aircraft installation and integration. Ground segment, control station, take off / launch support system, landing and recovery. Command and Control, data

and video link. Logistic support system. Safety and regulatory elements. **Prerequisite**: MLV 780 Flight Mechanics 780, working knowledge of MATLAB/OCTAVE/Python or similar, and basic knowledge of subsonic flow.

MLD 784 Avionics 784 (16 credits)
Introduction to the functions performed by the avionics system in modern aircraft; the way in which these functions are mapped to the avionics components, starting from a presentation of the major avionics function, and the associated equipment and technologies: Human / Machine Interface, Flight Sensing (attitude, altitude, airspeed), Navigation (INS, SATNAV, Radio Nav), Flight Control and Guidance (autopilot), Radio Communication, Engine Management, Mission Sensors (radar, optronics), Health and Usage Monitoring. The main engineering challenges in Avionics System design, system integration, flight testing, safety justification and certification.

MLR 780 Air conditioning and refrigeration 780 (16 Credits)
Comfort and indoor air quality. Psychometrics. System types and selection. Cooling and heating load calculations: conduction, radiation, convection, internal loads and thermal storage. Design of air handling unit, ducts, plant and reticulation. Control systems. Introduction to integrated system simulation.

MLV 780 Flight Mechanics 780 (16 credits)
Introduction to flight mechanics, flight dynamics, flying qualities and flight simulation of fixed wing aircraft. Review of aerodynamic fundamentals with a particular focus on aerodynamic coefficients and derivatives. Brief review of aircraft propulsion. Aircraft performance, longitudinal and lateral trim, stability and control. Aircraft equations of motion, axis transformations and state space modelling. Longitudinal and lateral transfer functions. Introduction to flying qualities, ratings, specifications, flight test and analysis techniques. Introduction to 6 degree of freedom flight simulation. **Prerequisite:** A working knowledge of MATLAB/OCTAVE/Python or similar and basic knowledge of subsonic flow.

MOO 780 Optimum design 780 (16 Credits)
Elements of optimisation, optimisation problem identification and classification, optimisation formulations for physics-based models, model identification, data-driven models, optimisation background mathematics, loss functions, regularisation, constrained and unconstrained real-parameter optimisation. Optimisation solution philosophies: minimisation, optimality criteria, non-negative gradient projection points. Optimisation algorithms: gradient-based, derivative-free, gradient-only. Compute using a high-level programming language. **Enrolment restriction:** Students that already obtained the MOO 420 undergraduate credit, cannot enrol into MOO 780 for degree purposes.

MSD 780 Dynamics 780 (16 Credits)
Planar multibody dynamics with special emphasis on the mathematical formulation of the equations of motion of a multibody mechanism that moves in a two-dimensional plane instead of in three-dimensional space. Numerical techniques for solving the equations of motion will also be applied.

MSF 780 Fracture mechanics 780 (16 Credits)
Historical development; Linear Elastic Fracture Mechanics (LEFM): Stress concentrations and singularities, stress intensity factor, stability of crack propagation; Elasto-plastic fracture mechanics: crack tip plasticity, small scale yielding, measurement of K_{ic}, J-integral; Fatigue crack growth: Paris Law; life prediction; combined mode fracture, strain energy density methods.

MSM 780 Numerical thermoflow 780 (16 Credits)
Fluid Mechanics refresher (governing equations, boundary conditions, application of inviscid, laminar and turbulent flow). Methods of weighted residuals (finite element, finite volume and difference methods). Mesh generation and boundary conditions: Types of mesh structured and unstructured mesh generation and application (inviscid flow, heat conduction etc.). Heat conductions: Governing equations, discretisation, finite approximation, solution methods (Gauss-Seidel, Tri-diagonal matrix algorithm) etc. This module is suited to postgraduate students doing research in thermofluids and who want to use available CFD codes or who want to write their own codes to solve fluid mechanics, heat and mass transfer problems.

MSM 781 Numerical thermoflow 781 (16 Credits)
The Efficient Solvers: Background, multigrid theory and detailed description of the algorithm. Finite Volume method: Understand the governing equations, general form of the transport equations, Gauss's theorem and the finite volume discretisation. Iterative solution algorithm: Pressure-velocity coupling, types of grids, unsteady flows, multiple phases. Finite Volume Discretisation: Diffusion term, convection term and source term for steady flows. Convection-diffusion problems: Boundary conditions, higher order discretisation, accuracy / stability. Solution Algorithm for Pressure-Velocity coupling: SIMPLE, SIMPLER, SIMPLEC & PISO. Laminar, transitional and turbulent flow: Background and theory. Turbulence modelling and examples: Definition of turbulence, turbulence modelling approaches, turbulence models (zero-equation models, one equation, two equation, Reynolds Stress Model (RSM), Large Eddy Simulation, wall function approach), turbulence modelling guidelines. Recent CS developments: Current state of the art in turbulence modelling etc. Viscous boundary meshes: Background and objectives, internal and external flow, turbulence modelling considerations. **Prerequisite**: MSM 780 Numerical thermoflow 780

MSS 732 Research study 732 (32 Credits)

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. The module is available in either the first or the second semester. The research study is the culmination of the Honours degree. **In order to register for this module, the student must have passed at least 3 Honours degree modules already.** The exception is students who have a supervisor who recommends an adjusted workload.

MSV 780 Fatigue 780 (16 Credits)
Fatigue principles addressing both elasticity and plasticity; notch effects; variable amplitude loading conditions; multi-axial fatigue and weld fatigue.

MSX 780 Fluid mechanics 780 (16 Credits)
Mathematical preliminaries: historical overview, scalar, vector and tensor algebra (in context of partial differential equations), Green's lemma and the Divergence theorem, Eularian/Lagrangian representations, derivative of a function, Reynolds transport theorem. Governing equations: viscous compressible and incompressible flow, derivation of conservation of mass, derivation of conservation of momentum, boundary conditions, mathematical characteristics, non-dimensionalisation. Viscous compressible and incompressible flow: derivation of conservation of mass, derivation of conservation of momentum, boundary conditions, mathematical characteristics, non-dimensionalisation

MSY 781 Specialised structural mechanics 781 (Aircraft design) (16 Credits)
Overview of the aircraft design process, the design phases, taking a system engineering approach. Review of aircraft design basics, fundamentals of aircraft design. Defining the mission objectives, performance objectives, doing mission analysis, deriving the design specifications. Initial sizing, review of existing designs, trade studies. Exploring aircraft configurations and layout choices. Giving the context for integrating flight mechanics, aerodynamics, aircraft propulsion and aircraft structures. **Prerequisite**: MLV 780 Flight Mechanics 780, working knowledge of MATLAB/OCTAVE/Python or similar, and basic knowledge of subsonic flow.

MTX 781 Advanced thermodynamics and energy systems 781 (16 Credits)
Fundamental concepts of thermodynamics, total flow exergy, restricted dead state and unconstrained equilibrium state, heat transfer, fluid flow and chemical irreversibilities, thermodynamic optimisation, irreversibility distribution ratio, lost exergy, application of entropy generation minimisation (EGM) technique to the fundamentals of power generation, solar power, wind power, and low temperature refrigeration.

MUA 782 Reactor coolant flow and heat transfer 782 (16 Credits)
Design of reactor coolant system, heat sources in reactor systems, heat transmission principles, heat transmission in systems with internal sources, temperature distribution along path of reactor coolant flow, heat transfer characteristics of fluids, heat transfer to boiling liquids, heat transfer characteristics of gasses. **Prerequisite**: MUA 783 Reactor engineering science 783 **Enrolment restriction:** Students that already obtained the MHM 420 or MHM 780 credit, cannot enrol into MUA 782 for degree purposes, since a large portion of these modules covers the same content. **In addition, note:** A student cannot earn 32 credits towards his/her honours degree for doing both the modules MUA 782 and MHM 780 concurrently.

MUA 783 Reactor engineering science 783 (16 Credits)
Atomic structure, nuclear energy and nuclear forces, nuclear fission, nuclear reactions and radiation, energy removal, nuclear reactor systems, radiation protection, radiation shielding, meteorology, reactor safety analysis.

MUA 784 Reactor physics 784 (16 Credits)
Probability concepts and nuclear cross sections, multiplication factor and neutron flux, slowing-down process in the infinite medium, diffusion theory the homogeneous one-velocity reactor, Fermi age theory: the homogeneous multi-velocity reactor, transport theory, reflected reactors, reactor kinetics, heterogeneous reactors, control-rod theory. **Prerequisite**: MUA 783 Reactor engineering science 783

MUA 785 Reactor materials engineering 785 (16 Credits)
Overview of the functions of the various classes of nuclear materials, elastic deformation, yielding and use of texture in nuclear components, atomic processes in plastic deformation and radiation damage, strength of engineering materials. **Prerequisite**: MUA 783 Reactor engineering science 783 (Concurrent registration)

MUA 786 Reactor materials engineering 786 (16 Credits)
Creep deformation, fracture processes and metallurgical fracture mechanics, fatigue fracture in nuclear materials, fabrication processes of nuclear materials. **Prerequisite**: MUA 785 Reactor materials engineering 785

MUU 781 Fossil fuel power stations 781 (16 Credits)

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, feedwater and circulating water systems, coal handling, ash handling, compressor plant, water treatment, the importance of HVAC, control and instrumentation, control philosophies and environmental considerations.

MVI 780 Vehicle dynamics 780 (16 Credits)
Tyres: Characteristics and tyre models used in simulation of ride comfort and handling. Road inputs: Classification of roads. Road profiles. Road roughness. Suspension components: springs, dampers. Controllable suspension systems. Modelling aspects. Human reaction: Human response to vibration. Driver models. Human reaction times. Vertical vehicle dynamics (ride comfort): Vibration levels in a vehicle. Simulation of ride comfort. Effect of seat characteristics on vibration levels. Test and evaluation procedures. Lateral vehicle dynamics (handling): Simulation of steady state and dynamic handling. Rollover propensity. Test procedures. Computer applications: Application of computer codes in the analysis of vehicle dynamics.

MWN 780 Numerical methods 780 (16 Credits)
Solving systems of linear algebraic equations using direct and iterative methods from small to large scale systems. Numerical solutions of nonlinear systems of equations. Solving eigenvalue problems. Numerical approximation strategies. Numerical differentiation. Numerical Integration. Numerical solutions to initial-value problems for ordinary differential equations. Numerical solutions to boundary-value problems for ordinary differential equations. Numerical solutions to partial-differential equations.

APPENDIX 1: ARRANGEMENTS FOR DISSERTATIONS AND THESES

The procedure in this appendix does not replace any official regulations and/or requirements and are simply intended as an aid to students. The responsibility however, still rests with students to familiarise themselves with the official regulations and procedures.

A1.1. Checking of dissertations and theses for possible plagiarism

Every year a Turnitin assignment is created in each of the year modules MIR 890, MIR 891, MIR 990 and MIR 998. It is expected that all master's and doctoral students in the department should be registered for one of these modules. Once registered the student should have access to the corresponding module clickUP page and Turnitin assignment, provided that these have already been created. The student may use the Turnitin assignment repeatedly to check his/her draft dissertation or thesis for possible plagiarism. The Turnitin submitted assignments are designed in such a way that the act of subjecting the draft document to this test, does not include the document in the Turnitin data-base, so that a later version of the document does not indicate plagiarism of an earlier version.

A1.2. Confidentiality of dissertations and theses

It is the policy of the faculty that dissertations and theses may not be confidential or classified. Deviation from this rule will only be considered under very exceptional circumstances by the Postgraduate Committee of the Faculty on the recommendation of the Head of Department. If a student wishes to submit a classified dissertation or thesis, the Postgraduate Committee of the Faculty must grant approval before the student registers for study. In such a case the student must still submit an article for publication.

A1.3. Registration of titles

The proposed title of a student's dissertation/thesis must be approved by the supervisor and co-supervisor, if applicable, and the Departmental Management Committee. In order to do the MEng, MSc and PhD, students in collaboration with their supervisors, must fill out a title registration form. An electronic copy of this form is available under the link "Departmental Title registration form" on the postgraduate web page (or see section 1). The Faculty Title and External Examiner Registration From, available electronically at the same location, must be used by the supervisor to suggest possible external examiners. The student is not permitted to see the copy of this form once the supervisor's recommendation with regards to external examiners has been completed. The final appointment of external examiners is administered by the Postgraduate Committee of the Faculty.

A1.4. Submission of dissertations/theses

The student must inform Student Administration (see Table 1) at least two months before submission of a dissertation/thesis of his/her intention to submit examination copies.

Examination copies must be submitted to Student Administration (see Table 1).

Further information is available under the Yearbook section of the UP website, at the following links for the MEng Mechanical Engineering and PhD Mechanical Engineering degrees.

APPENDIX 2: PUBLICATION POLICY

It is important to promote research in the department and to ensure that the department remains active in research. In this way the necessary infrastructure is created in which students may receive high quality education.

A2.1. Arrangements pertaining to master's and doctoral students

Because exposure to the free literature creates an atmosphere in which work of high quality can prosper, the department considers it important, and therefore the following arrangements are applicable to master's and doctoral research:

- All candidates for the master's degree must submit at least one article for publication in an ISI journal. This article must be based on research done for the dissertation, and must be approved by the supervisor. The degree will not be conferred before proof of receipt of the journal is submitted to the Student Administration.
- All candidates for the doctoral degree must submit at least two articles for publication in an ISI journal, before submission of the thesis. This article need not cover the whole field of the thesis or even the largest part thereof, but research for this specific part must be done in collaboration with the department. The degree will not be conferred before proof of receipt of the journal is submitted to the Student Administration.

A2.2. Arrangements with respect to authorship of publications

The name of the supervisor(s) must appear as co-author(s) on the publication unless the supervisor decides differently. To show that the work has been done in the department, the address of the authors must be indicated as the address of the department.

In determining the authorship of publications forthcoming from studies, the following guidelines will be followed:

- If the supervisor initiated the specific study project, i.e. identified the necessity and potential thereof and created the basic infrastructure and followed the development of the work on a regular basis, he/she must be an author and usually for the first publication forthcoming from the work, the main author.
- If the student initiated the project or certain aspects thereof and helped with the writing of the paper on his original input, he becomes the main author, while the supervisor becomes the co-author.
- If, after the student has completed his/her study, he/she is not interested in publishing certain publishable aspects of the work in collaboration with the supervisor, the university retains the right to publish this work. If the publication and its logic come directly from the report, the student will be approached as co-author, while the supervisor who writes the article will be the main author.
- Sometimes there are cases, which will not clearly fall in any of the above categories. Here the case will be decided at the hand of the following questions (in priority order):
  - Who initiated the project?
  - Whose idea was the publication?
  - Who thought out the logic of the publication?
  - Who wrote the publication?
  - Who did the project work?

Students are reminded that dissertations and theses are university documents, and where any publication is extracted from such documents (irrespective of where the research was done and who the author is) the publication must be approved by the department.

REGISTER OF MODIFICATIONS TO THIS DOCUMENT

Revision Number	Publication date	Changes
2	30 January 2025	Degree program offering updated to match University of Pretoria yearbook
3	19 June 2025	MLD 783 has been reactivated for 2026 –Table 2 Contact details for MOO 780 was updated – Table 2