UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Engineering, Built Environment and Information Technology

POSTGRADUATE BROCHURE 2017

Department of Mechanical and Aeronautical Engineering

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

Compiled by:
Prof NJ Theron
Ms Ilka Meyer

Revision 1

Date of this revision:
3 January 2017

Table of Contents

1. INTRODUCTION

As part of the postgraduate programme in the Department of Mechanical and Aeronautical Engineering, engineering students may register for the BEngHons, MEng and PhD degrees in Mechanical Engineering. Candidates with BSc, BTech or equivalent qualifications may register for the BScHons Applied Science Mechanics degree. This qualification allows the student to subsequently register for the MSc Applied Science Mechanics degree, which may be followed by the PhD Mechanics degree. Students who wish to register for modules for non-degree purposes may register for Engineering Special Postgraduate.

With this prospectus particulars pertaining to requirements, available modules and study arrangements are described in detail. The prospectus 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 at UP" menu.

This prospectus is a dynamic document that may change as we approach the year 2017, or while the year 2017 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, expand the "Academic Programmes" menu (click on the adjacent plus sign) and then select "Postgraduate".

1.1. Contact Information

Further enquiries with regard to postgraduate studies may be directed to the following persons:

Academic Arrangements (Department)		
Registration Module changes Administration enquiries	Ms Ilka Meyer	012 420 3105 mechpostgrad@up.ac.za
Coordinators for postgraduate studies; curriculum structure, all postgraduate degrees	Prof NJ Theron Dr DN Wilke	012 420 3309 nico.theron@up.ac.za 012 420 2861 nico.wilke@up.ac.za Note: during some periods of the year, either Prof Theron or Dr Wilke may experience such e-mail overload that they may not respond to e-mails. If this happens, students/applicants are advised to send queries to mechpostgrad@up.ac.za

General Administration (EBIT Student Administration, Eng I level 6)			
Applications & general admin: Honours	Ms M Motlhamme	012 420 5299	millie.motlhamme@up.ac.za
Applications & general admin: Masters, PhD-s	Ms S Steenberg	012 420 5315	stefanie.steenberg@up.ac.za
Theses/Dissertations	Ms S Steenberg	012 420 5315	stefanie.steenberg@up.ac.za

Financial Administration			
Students accounts	Ms M Frates	012 420 4061	matty.frates@up.ac.za
	Or contact the Client Service Centre		

Enquiries in connection with specific modules must, as far as possible, be directed to the lecturer concerned (see section 13 for contact details). Any enquiries that cannot be answered by the lecturer may be e-mailed to mechpostgrad@up.ac.za.

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 this section are to the degree descriptions in the University of Pretoria Year Book.

The Department awards the following taught honours degrees: the BEngHons Mechanical Engineering degree (degree code 12240052) follows on a BEng degree, and the BScHons Applied Science Mechanics degree (code 12243006) follows on a BSc, a BTech or equivalent. For all honours degrees the candidate must successfully complete modules that total 128 SAQA credits (1 credit represents 10 study hours). The minimum duration is one year of full time study. Except for one research module, 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.

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. The honours degree, and specifically the BScHons Applied Sciences Mechanics, **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/washington-accord/).

Postgraduate modules are presented in blocks or in periods, or some times something in between. 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. Further details are shown in table 1 and also in the time table in section 13.

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.

Note that, with the exception of the compulsory modules of the BScHons Applied Science Mechanics programme (see section 2.2), a student may repeat any module only once. No supplementary or special examinations are granted at honours degree level (see item v under "Examinations and pass requirements", under the "Programme information" tab of the BEngHons Mechanical Engineering year book page). 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.

Postgraduate modules are by default presented in English, unless all registered students and the lecturer agree that the lectures should be in Afrikaans. All students are entitled to participate in English or Afrikaans during contact sessions or answer tests or examinations in either one of these languages. All study material will usually be available in English only.

2.1. Compulsory module: Research study

In order to meet governmental requirements, all students who start with their honours degree in 2017 or later 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, for instance the literature study. This study must then 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 allowed to select a topic and corresponding supervisor from a list that will be made available in the beginning of the year.

A student may do this module in either the first or second semester or may also do it over a year (or two consecutive semesters). If a student selects to do this module over two consecutive semesters he/she needs to register for the module in the second of the two semesters in question. The module is assessed through 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 must select and do any one of the following four 32 credit module combinations, which start them off on the specialization indicated:

1. The combination of
   - MSV 780 Fatigue 780 (16 credits)
   - MWN 780 Numerical methods 780 (16 credits)

   for the Structural Mechanics specialization.
2. The combination of
   - MSX 780 Fluid mechanics 780 (16 credits)
   - MWN 780 Numerical methods 780 (16 credits)

   for the Thermoflow specialization.

3. The combination of
    - MIP 780 Maintenance practice 780 (16 credits)
    - MIR 781 Reliability engineering 781 (16 credits)

    for the Maintenance specialization.
4. The combination of
    - MLD 780 Aerodynamics 780 (16 credits)
    - MLV 780 Flight mechanics 780 (16 credits)

    for the Aeronautics specialization.

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; otherwise the student's registration will be terminated. When this has happened, the student will not at a later time 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 1 below. Students will be allowed to register for first semester modules without having passed the prerequisite module listed in table 1 provided that the student is concurrently registered for the prerequisite module.

3. MASTER'S DEGREES

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

The department awards two research based master's degrees, namely the MEng Mechanical Engineering degree (degree code 12250052), which follows on a BEngHons Mechanical Engineering, and the MSc Applied Science Mechanics degree (code 12253064), which follows on a BScHons Applied Science Mechanics. It is compulsory to complete the appropriate honours degree before admission to the master's degree will be considered.

Both master's degrees are awarded on the basis of 128 credits based on a dissertation and an examination covering the field of the dissertation.

Candidates must demonstrate a sound and fundamental knowledge in a specialised field of mechanical engineering science, which will normally have been formed by the focus of their honours degree course work. They will further be trained in the scientific method of work and thought processes, and have proven through supervised independent research, their ability to use scientific methods in scientific investigation.

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 ISI accredited journal (listed at http://science.thomsonreuters.com/mjl/index.html), 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 DEGREES

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

The PhD Mechanical Engineering (code 12263042) and the PhD Mechanics (code 12263172) degrees are each awarded based on grounds of a research thesis and an examination covering the field of the thesis. These two degrees follow on the MEng Mechanical Engineering and the MSc Applied Science Mechanics degrees, respectively. Generally the appropriate master's degree must be completed before admission to the doctoral degree will be considered.

Candidates for the doctoral degree must prove that they have an in-depth and fundamental but also wide ranging knowledge of a specialised field in science, are trained in the scientific method of work and thinking and have in particular demonstrated their ability to apply scientific methods in a scientific investigation through independent research, making an original contribution to science.

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 ISI accredited journal (listed at http://science.thomsonreuters.com/mjl/index.html). The research for this article must be done in collaboration with the department. Before submitting the article to the journal approval must be obtained from the supervisor (see Appendix 2).

5. ADMISSION TO POSTGRADUATE STUDIES AT THE UNIVERSITY OF PRETORIA

The procedure for admission of a student to the University of Pretoria is slightly different for South African citizen and for international applicants. International applicants are referred to section 5.2 below.

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 for admission to the University. This can be done either online or through mailing the completed application forms and the corresponding fees, called the "paper-based application". Details of both are available on the University's web site at this link or at http://www.up.ac.za, then select "Apply at UP" from the "Study at UP" menu. This brings one to the "New Students" page. On this page select "Apply at UP" from the list on the left. For a paper-based application the necessary forms and documentation may be downloaded from the University's web site at the link above or requested by e-mail from csc@up.ac.za, including the applicant's name, postal address and type of application form (postgraduate). The following postal address may also be used:

Client Service Centre
University of Pretoria
Private bag X20

Hatfield
0028

Applications close on 31 October of each year, for South African citizen students planning to commence with studies towards the BScHons Applied Science Mechanics degree in the first semester of the following year. For the BEngHons Mechanical Engineering degree an application closing date is not enforced, provided that the modules the student plans to do have not started at the time of application. Note that even though there is not a formal closing date for applications to the BEngHons Mechanical Engineering degree, the online application system does close for this degree during certain periods during the year. During such periods applicants can still submit applications using the paper-based application system. There is no closing date for master's and PhD degree applications.

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 requesting an internal application form from the Client Service Centre. This form needs to be filled in, signed and submitted for approval to one of the coordinators for postgraduate studies (see Contact Information). The form should then be submitted to Student Administration, 6th floor, Engineering Building I. An internal application can also be submitted on-line.

5.2. International applicants

Before registration, prospective international postgraduate students must apply for admission to the University. This can be done either online or through mailing the completed application forms and the corresponding fees, called the "paper-based application". Details of both are available on the University's web site at this link or at http://www.up.ac.za, then select "Apply at UP" from the "Study at UP" menu. This brings one to the "New Students" page. On this page select "Apply at UP" from the list on the left. For a paper-based application the necessary forms and documentation may be downloaded from the University's web site at the link above or requested by e-mail from csc@up.ac.za, including the applicant's name, postal address and type of application form (international). The following postal address may also be used:

Client Service Centre
University of Pretoria
Private bag X20
Hatfield
0028 SOUTH AFRICA

Applications close on 31 August of each year, for international students applying for honours degree studies and planning to commence with this 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 Students website at this link or at http://www.up.ac.za, then select "International students" from the "Study at UP" 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 an internal application (see the last paragraph of section 5.1 above), provided that the international office is consulted on this.

6. ADMISSION REQUIREMENTS

6.1. BEngHons Mechanical Engineering

To be admitted to the BEngHons Mechanical Engineering programme, the candidate must hold a BEng degree (or equivalent) that is accredited by the Engineering Council of South Africa (ECSA) for purposes of registration as professional engineer. 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/washington-accord/), 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 web site 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.

6.2. BScHons Applied Science Mechanics

To be admitted to the BScHons Applied Science Mechanics programme, the candidate must hold an appropriate bachelor's degree. Only applicants with exceptionally good academic records will be admitted. Typical examples of appropriate bachelor's degrees are a BTech degree in Mechanical Engineering 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 programme.

An applicant holding a BTech degree will not be admitted to this programme unless he/she has passed just the BTech degree (i.e., not counting the National Diploma) with an average of 75 % or higher.

6.3. MEng Mechanical Engineering

To be admitted to the MEng Mechanical Engineering programme, the candidate must hold a BEngHons degree (or equivalent), as well as meet the admission requirements for the BEngHons Mechanical Engineering degree (see section 6.1). This means that, 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.

6.4. MSc Applied Science Mechanics

To be admitted to the MSc Applied Science Mechanics programme, the candidate must hold a BScHons Applied Science Mechanics degree (or equivalent). Meeting this requirement, however, does not automatically secure admission to the MSc Applied Science Mechanics 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.

6.5. PhD Mechanical Engineering

To be admitted to the PhD Mechanical Engineering degree programme, the candidate must hold an MEng degree (or equivalent), as well as meet the admission requirements for the BEngHons Mechanical Engineering degree (see section 6.1). This means that, 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. Candidates holding a taught master's degree may apply, but additional admission requirements may be imposed on an ad hoc basis.

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.

6.6. PhD Mechanics

To be admitted to the PhD Mechanics degree programme, the candidate must hold an MSc Applied Science Mechanics degree (or equivalent). This means that the master's degree must have been a research-based degree. Candidates holding a taught master's degree may apply, but additional admission requirements may be imposed on an ad hoc basis.

Having obtained the MSc Applied Science Mechanics degree (or equivalent) does not automatically secure admission to the PhD Mechanics 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 and this is then 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 opens on the day that the University reopens after the Christmas – New Year recess. Details of the online registration process are available to students on the University web page (www.up.ac.za or, for 2017 at this link) and the student portal.

If a student chooses to register for a module(s) offered by another Department (see section 11.4), this must be approved in writing (typically by e-mail) by the other department as well as one of the coordinators for postgraduate studies (see Contact Information). In this case the student should first register on-line for all the other selected modules, then get the permission from the other department and then lastly request this approval by e-mail from Prof Theron or Dr Wilke, who will then, if he also approves, forward the 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

Especially in the case of the BScHons Applied Science Mechanics programme the online registration system does not prevent a student to register for modules for which he/she is not entitled to register. Some students are admitted to the BScHons Applied Science Mechanics programme in the maintenance specialization only. Such students are therefore allowed to select the MIP 780/MIR 781 combination only, as their compulsory modules (see section 2.2). If such a student selects any one of the other three combinations and this goes undetected, the student may forfeit all credit for all selected modules, even if he/she passes all registered modules. Similarly, if a BScHons Applied Science Mechanics student register for a module contrary to the prerequisite rules specified in tables 1 or 2 and passes the modules in question, he/she may forfeit the credits so earned. It is solely the student's responsibility to ensure adherence to all registration rules specified in this brochure.

7.3 Problems with online registration

If a student experience problems with the online registration system, he/she should contact Ms M Motlhamme at the EBIT Student Administration at Eng I level 6. Examples of such problems are:

- If the student submitted a late application he/she may not be able to register on-line.
- The online registration closes at some point in time in the first quarter. After that time Ms Motlhamme will assist 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 on-line.

7.4. 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 do 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.

Except for the BScHons Applied Science Mechanics programme, students may commence their studies in the second semester.

8. DURATION OF STUDY

A student registered for the honours degree must complete his/her study within 2 years in the case of a full-time student and in the case of an after-hours student (previously called a part-time student, i.e., 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 recommendation of the Head of Department, can be convinced that the progress was satisfactory.

9. PLAGIARISM

Students who commit plagiarism will lose all credits obtained in the plagiarised work. The matter shall also be referred to the Disciplinary Committee (Students) for a ruling. Plagiarism is regarded as a serious contravention of the University's rules and can lead to expulsion from the University. More detail is 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.
http://www.up.ac.za/en/about-up/article/2013249/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 web site, http://www.me.up.ac.za, expand the "Noticeboard" menu (click on the adjacent plus sign) and then select "notices", 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 e-mail list to send out e-mail messages to all postgraduate students. This list is compiled in the beginning of each year from all the e-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 e-mail address listed on the student administration system is current. This is especially important in the case where a master's or PhD student has completed his/her research work, has moved off campus and has gotten a new e-mail address, before 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 not receiving such an announcement or message when this was sent by e-mail to the student's address of preference as indicated on the University's student administration system, in the case of an individual e-mail message, or otherwise to all students on the postgraduate list.

10.2. Examination time table

The examination time table for June and November will be finalized at the beginning of the 1st and 2nd semesters, respectively, except:

- In the 1st semester, in the case of the module MSY 781 Specialized structural mechanics 781 (Inference problems in mechanical engineering), for which the examination will take place at the end of March, as indicated in section 13.2.
- In the 2nd semester, in the case of the modules that are presented simultaneously with the BEng final year elective modules (see Note 2 in section 13.1). For these modules the examination time table is fixed only about one month before the examination.
- In the 2nd semester, in the case of the module MLD 781 Missile aerodynamics and design 781, for which the examination will take place at the end of the two week period within which the module is presented.

The official examination time table for postgraduate modules, excluding MSY 781 Specialized structural mechanics 781 and MLD 781 Missile aerodynamics and design 781, will be published on the departmental notice board (separately from the undergraduate examination time table) whenever this becomes available.

10.3. Prescribed text books

All prescribed text books for all modules are supposed to be loaded on the Nevada system, which can be reached from the library's web site (http://www.library.up.ac.za/, select Nevada (SA Textbooks) from the My Library Space pull down menu). This system is at the time of publication of revision 0 of this brochure not fully operational and does not list the prescribed books for postgraduate modules. It is hoped that this will be rectified early in 2017.

10.4. 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 "Undergraduate students" from the "Study at UP" menu. This brings one to the "New Students" page. On this page select "Fees and funding" from the list on the left. On the "Fees and funding" page, expand "Postgraduate Fees" and then select "Tuition fees per faculty". The cost of a single 16 credit module is one eighth of the cost listed for the whole BEngHons degree, and that of a 32 credit module is one quarter. The registration fee is generally considered as a first payment of the tuition fees.

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 those published at the above link, as these students do not earn a subsidy from the SA government.

10.5. 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 to 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.

11. CURRICULA

11.1. General arrangements

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

- For either one of the two 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.
- A full time honours student may select any combination of credits between the two extremes of 96 credits in one semester and 32 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 get more preliminary research done towards his/her master's degree, during his/her honours year. Even though this research is done on an unofficial basis, it plays an important role in finishing up 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 2017 semesters in which these modules will be presented, is given in table 1. The syllabi for these modules are given in section 12. The lecturers responsible for these modules, with their contact information, are listed in the timetable in section 13.

In tables 1 and 2 the two numbered columns under the year heading indicate the two semesters. The first semester runs from end January to June and the second from July to 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. Both tables 1 and 2 also indicate for each module the concurrent registration prerequisite that applies in the case of BScHons Applied Science Mechanics students. These prerequisites do not apply to BEngHons students.

11.3. Aeronautical engineering programme

All the aeronautical engineering modules that are included in table 1 are separately listed in table 2. Aeronautical engineering students will typically select their modules primarily from the list in table 2, but may also select non-aeronautical–specific modules listed in table 1. Similarly, non-aeronautical BEngHons students may also select modules from table 2, but these students may in some cases lack background knowledge to perform well in these modules. In this regard it is suggested that non-aeronautical engineering students discuss their intention to do aeronautical modules with the respective responsible lecturers, see the module presentation time table in section 13 for the necessary contact information. BScHons Applied Science Mechanics students who have selected the Aeronautics specialization (see section 2.2) are allowed to do the modules listed in table 2 only. Likewise, non-aeronautical BScHons Applied Science Mechanics students are not allowed to select aeronautical-specific modules.

11.4. 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 coordinators for postgraduate studies in the Department of

Mechanical and Aeronautical Engineering (Contact Information). If a student registers for a module offered by another department, it is his/her own responsibility to in advance check with that department for any special conditions and work that needs to be done before the commencement of the module in question. Such students are urged to obtain the post-graduate brochures of the departments concerned. The following departments could be considered:

Industrial and Systems Engineering	Ms H Helm	012 420 5230
Electrical and Electronic Engineering	Ms H Gouws	012 420 2190
Department of Materials Science and Metallurgical Engineering	Prof. WE Stumpf waldo.stumpf@up.ac.za	012 420 3184
Engineering and Technology Management	Ms T Mvakali thuli.mvakali@up.ac.za	012 420 4605
Mathematics and Applied Mathematics	Ms Y McDermot	012 420 3550

Table 1: Modules offered by the Department of Mechanical and Aeronautical Engineering

Module	Code	2017		BScHons Applied Science Mechanics Prerequisite[1]
		1	2	
Advanced finite element methods 781	MEE 781	b		MSV 780 & MWN 780
Advanced fluid mechanics 781	MSX 781		p	MSX 780 & MWN 780
Advanced heat and mass transfer 780	MHM 780		p	MSX 780 & MWN 780
Advanced thermodynamics and energy systems 781	MTX 781		b	MSX 780 & MWN 780
Aerodynamics 780	MLD 780	p		None
Aeroelasticity 780	MAE 780		p	MLD 780 & MLV 780
Aeronautical structures 780	MLT 780		p	MLD 780 & MLV 780
Air conditioning and refrigeration 780	MLR 780	p		MSX 780 & MWN 780
Aircraft propulsion 780	MAY 780	p		MLD 780 & MLV 780
Avionics 784	MLD 784		p	MLD 780 & MLV 780
Condition-based maintenance 780	MIC 780	b		MSX 780 & MWN 780 or MSV 780 & MWN 780 or MIR 781 & MIP 780
Control systems 780	MBB 780	b		MSX 780 & MWN 780 or MSV 780 & MWN780 or MIR 781 & MIP 780
Experimental methods 782	MLD 782	p		MLD 780 & MLV 780

[1] The prerequisites listed here do not apply to BEngHons students. These are so-called concurrent registration prerequisites. This means that the 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. BScHons Applied Science Mechanics students may however not register for such a module contrary to their chosen specializations.

Module	Code	2017		BScHons Applied Science Mechanics Prerequisite[2]
		1	2	
Experimental structural dynamics 783	MSY 783	b		MSV 780 & MWN 780
Fatigue 780	MSV 780	b		None
Flight mechanics 780	MLV 780	p		None
Fluid mechanics 780	MSX 780	p		None
Fossil Fuel Power Stations 781	MUU 781		b	MSX 780 & MWN 780
Fracture mechanics 780	MSF 780		b	MSV 780 & MWN 780
Maintenance logistics 782	MIP 782		b	MIR 781 & MIP 780
Maintenance practice 780	MIP 780	b		None
Mechatronics 780	MEG 780		p	MSX 780 & MWN 780 or MSV 780 & MWN 780 or MIR 781 & MIP 780
Missile aerodynamics and design 781	MLD 781		p	MLD 780 & MLV 780
Numerical methods 780	MWN 780	b		None
Non-destructive testing 780	MCT 780		b	MSV 780 & MWN 780 or MIR 781 & MIP 780
Numerical thermoflow 780	MSM 780	p		MSX 780 & MWN 780
Numerical thermoflow 781	MSM 781		p	MSX 780 & MWN 780

[2] The prerequisites listed here do not apply to BEngHons students. These are so-called concurrent registration prerequisites. This means that the 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. BScHons Applied Science Mechanics students may however not register for such a module contrary to their chosen specializations.

Module	Code	2017		BScHons Applied Science Mechanics Prerequisite[3]
		1	2	
Optimum design 780	MOO 780		p	MSX 780 & MWN 780 or MSV 780 & MWN 780 or MIR 781 & MIP 780
Reactor coolant flow and heat transfer 782	MUA 782		p	MSX 780 & MWN 780
Reactor engineering science 783	MUA 783	b		MSX 780 & MWN 780
Reactor materials engineering 785	MUA 785	b		MSX 780 & MWN 780
Reactor materials engineering 786	MUA 786		b	MSX 780 & MWN 780
Reactor physics 784	MUA 784		b	MSX 780 & MWN 780
Reliability engineering 781	MIR 781	b		None
Research study 732	MSS 732	Either or both semesters, no formal contact sessions		MSX 780 & MWN 780 or MSV 780 & MWN 780 or MIR 781 & MIP 780 or MLD 780 & MLV 780
Specialized structural mechanics 781 (Inference problems in mechanical engineering)	MSY 781	b		MSV 780 & MWN 780 or MIR 781 & MIP 780
Unmanned Aircraft Systems technology 783	MLD 783		p	MLD 780 & MLV 780
Vehicle dynamics 780	MVI 780	b		MSV 780 & MWN 780
Vibration-based condition monitoring 781	MEV 781	b		MSV 780 & MWN 780 or MIR 781 & MIP 780

[3] The prerequisites listed here do not apply to BEngHons students. These are so-called concurrent registration prerequisites. This means that the 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. BScHons Applied Science Mechanics students may however not register for such a module contrary to their chosen specializations.

Table 2: Postgraduate modules in Aeronautical Engineering

Module	Code	2017		BScHons Applied Science Mechanics Prerequisite[4]
		1	2	
Aerodynamics 780	MLD 780	p		None
Aeroelasticity 780	MAE 780		p	MLD 780 & MLV 780
Aeronautical structures 780	MLT 780		p	MLD 780 & MLV 780
Aircraft propulsion 780	MAY 780	p		MLD 780 & MLV 780
Avionics 784	MLD 784		p	MLD 780 & MLV 780
Experimental methods 782	MLD 782	p		MLD 780 & MLV 780
Flight mechanics 780	MLV 780	p		None
Missile aerodynamics and design 781	MLD 781		p	MLD 780 & MLV 780
Research study 732	MSS 732	Either or both semesters, no formal contact sessions		MLD 780 & MLV 780
Unmanned Aircraft Systems technology 783	MLD 783		p	MLD 780 & MLV 780

[4] The prerequisites listed here do not apply to BEngHons students. These are so-called concurrent registration prerequisites. This means that the student either needs to be registered for the prerequisite concurrently, or should have passed it earlier.

12. SYLLABI

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

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.

MSX 781 Advanced fluid mechanics 781 (16 Credits)
Review (Mathematics, Governing Equations and Boundary Conditions), Exact solutions: Potential flow, Couette flow, Poiseuille flow and combined Couette-Poiseuille flow, laminar boundary layers, Stability of laminar flows: introduction, linearize stability, transition to turbulence, approximate prediction of transition. Turbulent flow: Reynolds averaged equations, two-dimensional turbulent-boundary-layer equations, velocity profiles, turbulent flow in ducts, flat plate flow, flow through Porous media. The module includes a group semester project.

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, heatpipes. 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.

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.

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.

MAE 780 Aeroelasticity 780 (16 Credits)
Lagrange's equation, Rayleigh–Ritz method, Modal basis analysis, Structural Dynamics, Steady and unsteady aerodynamics, Panel methods, Static and dynamic aeroelasticity, Laplace transform, Convolution, Solution of the aeroelastic equation of motion.

MLT 780 Aeronautical structures 780 (16 Credits)
Principles of stressed skin construction. General loads on aircraft. Static analysis of structures. Behaviour of aircraft materials. Basic Theory of elasticity. Energy methods & principles of virtual work. Stress analysis of thin-walled structures with and without thermal effects. Analysis of idealised semi-monocoque structures, boom-skin models of stiffened structures such as fuselage and wings, shear flow of idealised thin-walled sections. Fibre-reinforced composites of laminates subjected to bending and extensional stresses, thin walled composite beams. Column buckling with local instabilities, Johnson-Euler, beam columns. Plate buckling (shear, compression & bending), buckling of curved plates, skin effective width, Inter-rivet buckling, flange stability, lateral stability, crippling, inelastic buckling, buckling interaction.

MAY 780 Aircraft propulsion 780 (16 Credits)
Review of thermodynamic cycles applicable to aircraft propulsion with emphasis on turbocharged piston cycles and gas turbine cycles. Optimisation of gas turbine cycles, 2D and 3D turbomachinery design and fluid mechanics and loss mechanisms in gas turbines.

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.

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.

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.

MBB 780 Control systems 780 (16 Credits)
Introduction to state space methods, full state feedback design, disturbances and tracking systems, linear observers, compensator design by the separation principle, linear quadratic optimum control, Kalman filter, linear quadratic Gaussian compensator.
Prerequisite: A working knowledge of MATLAB/OCTAVE/Python

MLD 782 Experimental Methods 782 (16 credits)
Terminology, Data analysis, Uncertainty, Displacement, Strain, Pressure, Flow measurements Temperature measurements. Emphasis will be placed on the experimental process from calibration through to analyses. Different experimental techniques will be covered to showcase the process.

MSY 783 Experimental structural dynamics 783 (16 Credits)
Spatial, modal and response models of structures, frequency response functions and the relationships between spatial, modal and response models for single degree of freedom systems and multi-degree of freedom systems, modal analysis, operational modal analysis, updating finite element models.
Prerequisite: A working knowledge of MATLAB/OCTAVE/Python

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.

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

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.

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.

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.

MIP 782 Maintenance logistics 782 (16 Credits)
Introduction to logistics, systems engineering and supportability analysis, inventory, aspects of logistical design, LEAN Production, Facility Layout, Job Design and Work Measurement, Logistics from the development to the retirement phase, planning and scheduling, project management.

MIP 780 Maintenance practice 780 (16 Credits)
Failure characteristics and analysis. Maintenance economics – Budgeting and cost control. Life cycle partnering and maintenance contracting. Legal aspects and case study. Performance measurement and benchmarking. Maintenance programming – Network analysis. Variability analysis. Maintenance strategy, plan, and protocol design – a new look at RCM. Maintenance tactic selection techniques. Introduction to condition-based maintenance. Tribology and contamination control presented with case studies. Maintenance Maturity Indexing and Variable Relationships development.

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.

MLD 781 Missile aerodynamics and design 781 (16 credits)
The aerodynamic discipline of missiles or slender bodies and general configuration design concepts, submarine, airship and munition development. Slender body theory, aerodynamics of bodies, aerodynamics of low aspect ratio wings, vortices, wing body interference, downwash, the wake and wing tail interference, aerodynamic controls, drag, stability derivatives, design considerations, performance, manoeuvering flight, store carriage and separation. Prerequisites for the course are aircraft design, subsonic and supersonic aerodynamics (including the concepts of potential flow, vortex theory, thin aerofoil theory, finite wing theory, compressible gas dynamics and shock wave theory) and flight dynamics.

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.

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.

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

MOO 780 Optimum design 780 (16 Credits)
Introduction to design and elements of computer aided design. Optimum design problem formulation. Optimum design concepts. Linear programming methods. Integer programming. Numerical methods for unconstrained and constrained optimum design. Model reduction. Interactive and practical design optimisation.

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
Note: A student cannot earn 32 credits towards his/her honours degree for doing both the modules MUA 782 and MHM 780, since a large portion of these modules covers the same content.

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 785 Reactor materials engineering 785 (16 Credits)
Overview of the functions of the various classes of nuclear materials, elastic deformation, yielding and use of texturein 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)
Module content: 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

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

MIR 781 Reliability engineering 781 (16 Credits)
Introduction to probabilistic distributions, computation of system reliability, building reliability models and optimisation of system reliability; Fault Tree Analysis; Failure Modes, Effects and Criticality Analysis (FMECA), Monte Carlo Simulation; probability-based design.

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. A student may also do this module spread over two consecutive semesters. In such a case the student should register the module for the second of these semesters.

MSY 781 Specialized structural mechanics 781 (Inference problems in mechanical engineering) (16 credits)
The course deals with deterministic and probabilistic inference problems in mechanical engineering. **Overview of data analysis tools and data compression techniques**, **deterministic inference (inverse identification methods)**, principal component regression, partial least square regression, Radial basis function approximation, **probabilistic inference (probabilistic inverse methods)**, Gaussian distributions, Maximum likelihood estimation, regularization, cross-validation, Bayesian model calibration, sampling methods, Bayesian model comparison, Gaussian process, **Bayesian optimization**.

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.

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.

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

13. MODULE PRESENTATION TIMETABLE

13.1. Notes

1. It is expected that the student will come prepared to the first contact session. 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 do a module but have not yet registered for the module two weeks before the module starts, should contact the relevant lecturer to determine what preparatory work needs to be done.
2. Four second semester honours degree modules, namely MHM 780 Advanced heat and mass transfer 780, MUA 782 Reactor coolant flow and heat transfer 782, MEG 780 Mechatronics 780 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 cases of MEG 780 and MOO 780 these three periods fall on a single week day. For these three modules there will be two semester test weeks, when there will be no lectures. The dates for these modules will not be indicated in the time table below, only the times and day(s) of the week will be indicated. **All information in this note pertains only to these four modules.**
3. For the examination time table please refer to section10.2.
4. If venues are not yet indicated in the time table below shortly before a contact session, please consult the responsible contact person or look for a possible announcement on the clickUP pages of the module in question.

13.2. First semester 2017

MODULE	CODE	CONTACT PERSON	VENUE	TIME/DATE
Advanced Finite Element Methods	MEE 781	Prof S Kok 012 420 5809 schalk.kok@up.ac.za		**08:30-15:30** 1 Feb 1 March 7 April 3 May
Aerodynamics 780	MLD 780	Ms B Huyssen 012 420 6316 Barbara.Huyssen@up.ac.za		**08:30 – 11:30** 24 Feb The following to be negotiated with students: 2, 9, 15, 23 March 9, 19 May
Air conditioning and refrigeration 780	MLR 780	Dr J Dirker 012 420 2465 jaco.dirker@up.ac.za		**16:30 – 18:30** 1, 8, 15 Feb 1, 8, 22 March 5, 12, 19 April 17, 24 May
Aircraft propulsion 780	MAY 780	Dr G Snedden 012 841 3094 GSnedden@csir.co.za		**08:30 – 11:30** 31 Jan 9, 23 Feb 16 March 6, 13 April 18 May
Condition-Based Maintenance 780	MIC 780	Mr G Harley 012 420 2781 george.harley@up.ac.za		**08:30 – 16:30** 9 Feb 16 March 4 May

FIRST SEMESTER: 2017				
MODULE	**CODE**	**CONTACT PERSON**	**VENUE**	**TIME/DATE**
Control Systems 780	MBB 780	Prof NJ Theron 012 420 3309 nico.theron@up.ac.za		**08:30 – 16:30** 16 Feb 30 March 11 May
Experimental methods782	MLD 782	Dr Dwain Dunn 012 841 3622 ddunn@csir.co.za		**08:30 – 11:30** 8, 21 Feb 1, 14, 29 March 5, 19 April
Experimental structural dynamics 783	MSY 783	Prof PS Heyns 012 420 2432 stephan.heyns@up.ac.za		**08:30 – 16:30** 3 Feb 19 May (3rd session to be arranged)
Fatigue 780	MSV 780	Mr Francesco Pietra 012 807 0600 pietra.francesco@gmail.com		**08:30-16:30** 10 Feb 26 April 26 May
Flight mechanics 780	MLV 780	Dr Bennie Broughton 012 665 4056 bbroughton@iadsystems.co.za		**08:30 – 11:30** 10, 17 Feb 10, 17 March 21 April (tentatively) 12, 26 May
Fluid mechanics 780	MSX 780	Dr G Mahmood 012 420 6822 gazi.mahmood@up.ac.za		**10:30 – 12:30** 7, 22, 28 Feb 7, 22, 28 March 4, 11, 18 April 2, 16, 23 May

FIRST SEMESTER: 2017				
MODULE	**CODE**	**CONTACT PERSON**	**VENUE**	**TIME/DATE**
Maintenance practise 780	MIP 780	Prof JL Coetzee 016 932 1629 jasper.coetzee@m-tech.co.za		**08:30 – 11:30** 30 Jan **08:30 – 14:30** 27 Feb 20 March 15 May
Numerical methods 780	MWN 780	Prof S Kok 012 420 5809 schalk.kok@up.ac.za		**08:30 – 15:30** 6 Feb (tentatively) 3 March 20 April (tentatively) 5 May
Numerical thermoflow 780	MSM 780	Prof K Craig 012 420 3515 ken.craig@up.ac.za		**16:30-18:00** 6, 13, 20, 27 Feb 6, 13 March 10, 24 April 8, 15, 22, 29 May
Reactor engineering science 783	MUA 783	Prof J Slabber 012 420 2193 johan.slabber@up.ac.za		To be arranged
Reactor materials engineering 785	MUA 785	Prof WE Stumpf 012 420 3184 waldo.stumpf@up.ac.za		To be arranged

FIRST SEMESTER: 2017				
MODULE	**CODE**	**CONTACT PERSON**	**VENUE**	**TIME/DATE**
Reliability engineering 781	MIR 781	Prof JL Coetzee 016 932 1629 jasper.coetzee@m-tech.co.za		**08:30 – 16:30** 13 Feb 13 Mar 10 April
Specialized structural mechanics 781 (Inference problems in mechanical engineering)	MSY 781	Dr E Asaadi 012 420 4570 Erfan.Asaadi@up.ac.za		Contact sessions: **08:30 – 16:30** 8, 21 Feb 14 March Exam: 08:30 –11:30 on 31 March
Vehicle dynamics 780	MVI 780	Prof PS Els 012 420 2045 schalk.els@up.ac.za		**08:30 – 16:30** 20 Feb 24 April 8 May
Vibration-based condition monitoring 781	MEV 781	Prof PS Heyns 012 420 2432 stephan.heyns@up.ac.za		**08:30 – 16:30** 2 Feb 3 April 18 May

13.3. Second semester 2017

MODULE	CODE	CONTACT PERSON	VENUE	TIME/DATE
Advanced Fluid Mechanics 781	MSX 781	Dr G Mahmood 012 420 6822 gazi.mahmood@up.ac.za		
Advanced Heat and Mass Transfer 780	MHM 780	Dr M Mehrabi		
Advanced Thermodynamics and Energy Systems 781	MTX 781	Dr W le Roux 012 420 2446 willemleroux@gmail.com		
Aeroelasticity MAE 780	MAE 780	Dr Louw van Zyl 012 841 2715 LvZyl@csir.co.za		
Aeronautical structures 780	MLT 780	Mr A Cardoso 011 927 3392 AlcinoC@denelaero.co.za		
Avionics 784	MOLD784	Mr Pierre Thivend 011 266 7600 pierre.thivend@gmail.com		

SECOND SEMESTER: 2017				
MODULE	**CODE**	**CONTACT PERSON**	**VENUE**	**TIME/DATE**
Fossil Fuel Power Stations 781	MUU 781	Mr G Harley 012 420 2781 george.harley@up.ac.za		
Fracture mechanics 780	MSF 780	Dr H Inglis 012 420 3125 helen.inglis@up.ac.za		
Maintenance logistics 782	MIP 782	Prof JL Coetzee 016 932 1629 jasper.coetzee@m-tech.co.za		
Mechatronics 780	MEG 780	Dr TR Botha 012 420 3289 trbotha@tuks.co.za		
Missile Aerodynamics and Design 781	MLD 781	Dr Sean Tuling Sean.Tuling@uwe.ac.uk		
Non-destructive testing 780	MCT 780	Dr M Johannes 012 841 2522 mjohannes@csir.co.za		

SECOND SEMESTER: 2017				
MODULE	**CODE**	**CONTACT PERSON**	**VENUE**	**TIME/DATE**
Numerical Thermoflow 781	MSM 781	Prof K Craig 012 420 3515 ken.craig@up.ac.za		
Optimum Design 780	MOO 780	Dr N Wilke 012 420 2861 nico.wilke@up.ac.za		
Reactor coolant flow and heat transfer 782	MUA 782	Prof J Slabber 012 420 2193 johan.slabber@up.ac.za		
Reactor materials engineering 786	MUA 786	Prof WE Stumpf 012 420 3184 waldo.stumpf@up.ac.za		
Reactor physics 784	MUA 784	Prof J Slabber 012 420 2193 johan.slabber@up.ac.za		
Unmanned Aircraft Systems technology 783	MLD 783	Mr Patrick Barrier 011 266 7600 pbarrier@iafrica.com		

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. 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. Where 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.

A1.2. 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 this MEng, MSc and PhD students in collaboration with their supervisors must fill out a title registration form. An electronic version of this form is available and must be used - www.me.up.ac.za - Lecturer's Notice board. The Faculty form with the title “Proposals with regard to titles of theses/dissertations, supervisors and external examiners”, also available on the Lecturer’s Notice board, 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.

A1.3. Submission of dissertations/theses

The student must inform Ms S Steenberg, Student Administration at least two months before submission of a dissertation/thesis of his/her intention to submit examination copies.

Examination copies must be submitted to Ms S Steenberg, Student Administration.

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

APPENDIX 2: PUBLICATION POLICY

It is important to advance research in the department and to ensure that the department remains active in research. In doing so 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 by 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 by 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
0 (Original)	20 December 2016	
1	3 January 2017	• MLD 780: possibility for changes in dates • MSX 780: additional contact session • Reactor engineering modules (nuclear engineering) added to 2017 curriculum; see table 1 and section 13. • New responsible lecturers announced for various modules; see section 13.

`