

Stellenbosch University Faculty of Engineering

Module Framework

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This document should be read with the following documents:

- Stellenbosch University Calendar Parts 1 and 11.
- Faculty of Engineering Assessment Rules¹
- Faculty of Engineering General Stipulations for Undergraduate Modules¹

Project (E) 448 46795-448 2017, Sem 2	Lecturer(s): Module coordinator: Prof MM Botha, Room E414, mmbotha@sun.ac.za Module lecturers: All full-time E&E Eng academic staff employed at the time of the second semester of 2017. Internal moderator: Prof P Meyer	Approved by Programme Coordinator:  Date: 2/8/2017
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1 Assessment Details

- Major assessment dates and venues are provided at firga.sun.ac.za and my.sun.ac.za
- Method of assessment as indicated in the Calendar Part 11
- Note that awarding a pass mark is subject to meeting each the ECSA Exit Level Outcomes assessed in this module, as stated in Faculty of Engineering's Assessment Rules

Calculation of final marks (according to formulas in the Faculty of Engineering's Assessment Rules):

Project assessment: final mark awarded after evaluation of project report, presentation and poster session.

2 Language of Tuition

- The language of tuition in this module is according to the Faculty's approved Language Implementation Plan. Please refer to the website of the Engineering Faculty for the particulars.

3 Module Objectives

Aim: To complete an individual project involving project planning, problem identification, problem solving, design, implementation, evaluation and documentation. See the listed ECSA outcomes for further details.

A student who has successfully completed this module can:

- Take responsibility for planning a project and for independent learning
- Identify engineering problems and solve them
- Apply scientific and engineering knowledge
- Design engineering solutions
- Design and conduct investigations and experiments and analyse results
- Use appropriate engineering methods, skills and tools
- Document and communicate methods and results

See the listed ECSA outcomes for further details.

¹ Available on SUNLearn for modules offered by Faculty of Engineering, in the block titled "General Programme Information" on the side of the screen

4 Module Content and Schedule

Prescribed textbook(s): NA		
Week	Topic	Contact Session/Assignments
1--12	Project work.	Each student must regularly meet with their project study leader.
Oct 30, 12:00	Project report hand in deadline. Hand in to Mrs Kleyn in room E316a. Penalty for late submission is 5% per half day.	NA
Oct 31— Nov 14	Oral evaluations.	NA
Nov 15, PM	Project open day.	NA

5 ECSA Knowledge Area Credits

Mathematical Sciences	Natural Sciences	Engineering Sciences	Design and Synthesis	Complementary Studies
0	0	0	38	7
<u>Design and Synthesis:</u> A project involving design and synthesis must be completed.				
<u>Complementary Studies:</u> The work involves project planning, documentation and presentation.				

6 ECSA Exit Level Outcomes

Students are required to complete individual projects, each supervised by a staff member. The problems are varied and contain convergent and divergent aspects, and are of a higher level of complexity than that of Design 314. No structured problem solving method is enforced in a group context. Each project topic is certified by the supervisor and a departmental committee as of sufficient scope to enable achievement of the outcomes listed below, by the student.

ELO 1. Problem solving: Identify, formulate, analyse and solve complex engineering problems creatively and innovatively.

How is the Outcome Assessed?	Assessment is based on a comprehensive written report, an oral examination and a poster presentation. In the written report, the student is required to explicitly indicate how he has complied with this outcome by referring to the relevant parts of his report. Based on this indication, two internal examiners and one external examiner must indicate explicitly on the evaluation forms that the candidate has complied with the required outcome. A full oral examination is carried out by two internal examiners under supervision of a chairman. A poster is presented on an open-day to both the general public and the external examiners.
What is Satisfactory Performance?	Using the assessment material and opportunities, the student must show that he/she applied a systematic problem solving method to a complex engineering problem which required specialized engineering knowledge at a level consistent to that which a graduate would participate in an employment situation shortly after graduation. In his approach, the student must show that he/she understands and can follow a systematic technique which includes the following steps: <ul style="list-style-type: none"> • analysis of the problem; • identification of the criteria for an acceptable solution, necessary information, and required engineering skills and knowledge; • generation and formulation of possible approaches to the solution of the problem; • modelling, analyses and evaluation of possible solution(s), and selection of the best solution • formulation and presentation of the solution in an appropriate form.
What is the consequence of unsatisfactory performance?	If the candidate has not achieved the outcome, he/she cannot pass.

ELO 2. Application of scientific and engineering knowledge: Apply knowledge of mathematics, natural sciences, engineering fundamentals and an engineering speciality to solve complex engineering problems.

How is the Outcome Assessed?	Assessment is based on a comprehensive written report, an oral examination and a poster presentation. In the written report, the student is required to explicitly indicate how he has complied with this outcome by referring to the relevant parts of his report. Based on this indication, two internal examiners and one external examiner must indicate explicitly on the evaluation forms that the candidate has complied with the required outcome. A full oral examination is carried out by two internal examiners under supervision of a chairman. A poster is presented on an open-day to both the general public and the external examiners.
What is Satisfactory Performance?	Using the assessment material and opportunities, the student must show that he/she has applied mathematical, scientific and engineering knowledge systematically to a problem at a level consistent to that which a graduate would participate in an employment situation shortly after graduation. The student must show that he/she: <ul style="list-style-type: none"> • used mathematical techniques and/or numerical analysis and/or statistical knowledge and

	<p>methods on engineering problems by:</p> <ul style="list-style-type: none"> ○ applying formal analysis and modelling of engineering components, systems or processes; ○ communicating concepts, ideas and theories with the aid of mathematics; ○ reasoning about and conceptualising engineering components, systems or processes using mathematical concepts; ○ and/or dealing with uncertainty and risk through the use of probability and statistics. <ul style="list-style-type: none"> • used physical laws and knowledge of the physical world as a foundation for the engineering sciences and the solution of engineering problems by: <ul style="list-style-type: none"> ○ applying formal analysis and modelling of engineering components, systems or processes using principles and knowledge of the basic sciences; ○ reasoning about and conceptualising engineering problems, components, systems or processes using principles of the basic sciences. • used the techniques, principles and laws of engineering science at a fundamental level and in at least one specialist area to: <ul style="list-style-type: none"> ○ identify and solve open-ended engineering problems; ○ identify and pursue engineering applications; ○ and/or work across engineering disciplinary boundaries through cross disciplinary literacy and shared fundamental knowledge.
What is the consequence of unsatisfactory performance?	If the candidate has not achieved the outcome, he/she cannot pass.

ELO 3. Engineering Design: Perform creative, procedural and non-procedural design and synthesis of components, systems, engineering works, products or processes.

How is the Outcome Assessed?	Assessment is based on a comprehensive written report, an oral examination and a poster presentation. In the written report, the student is required to explicitly indicate how he has complied with this outcome by referring to the relevant parts of his report. Based on this indication, two internal examiners and one external examiner must indicate explicitly on the evaluation forms that the candidate has complied with the required outcome. A full oral examination is carried out by two internal examiners under supervision of a chairman. A poster is presented on an open-day to both the general public and the external examiners.
What is Satisfactory Performance?	Using the assessment material and opportunities, the student must show that he/she has performed design and synthesis of components or systems at a level consistent to that at which a graduate would participate in an employment situation shortly after graduation. The student must show that he/she: <ul style="list-style-type: none"> • Identified and formulated the design problem to satisfy user needs, applicable standards, codes of practice and legislation; • Planned and managed the design process – focusing on important issues, while recognising and dealing with constraints; • Acquired and evaluated the requisite knowledge, information and resources, applied correct principles, and evaluated and used design tools; • Performed design tasks including analysis, quantitative modelling and optimisation; • Evaluated alternatives and preferred solutions, exercised judgment, and tested implementation ability; • Assessed impacts and benefits of the design in terms of social, legal, health, safety, and environmental aspects (in the case of Project 448); • Communicated the design logic and information.
What is the consequence of unsatisfactory performance?	If the candidate has not achieved the outcome, he/she cannot pass.

ELO 4. Investigations, experiments and data analysis: Demonstrate competence to design and conduct investigations and experiments.

How is the Outcome	Assessment is based on a comprehensive written report, an oral examination and a poster presentation. In the written report, the student is required to explicitly indicate how he has complied with this outcome
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Assessed?	by referring to the relevant parts of his report. Based on this indication, two internal examiners and one external examiner must indicate explicitly on the evaluation forms that the candidate has complied with the required outcome. A full oral examination is carried out by two internal examiners under supervision of a chairman. A poster is presented on an open-day to both the general public and the external examiners.
What is Satisfactory Performance?	Using the assessment material and opportunities, the student must show that he/she has designed and conducted investigations and experiments at a level consistent to that which a graduate would participate in an employment situation shortly after graduation. The student must show that he/she: <ul style="list-style-type: none"> Planned and conducted investigations and experiments; Conducted a literature search and critically evaluated material; Performed necessary analyses; Selected and used appropriate equipment or software; Analysed, interpreted and derived information from data; Drew conclusions based on evidence; Communicated the purpose, process and outcomes verbally (in Design 314) or verbally and in a technical report (in Project 448).
What is the consequence of unsatisfactory performance?	If the candidate has not achieved the outcome, he/she cannot pass.

ELO 5. Engineering methods, skills and tools, including Information Technology: Demonstrate competence to use appropriate engineering methods, skills and tools, including those based on information technology.

How is the Outcome Assessed?	Assessment is based on a comprehensive written report, an oral examination and a poster presentation. In the written report, the student is required to explicitly indicate how he has complied with this outcome by referring to the relevant parts of his report. Based on this indication, two internal examiners and one external examiner must indicate explicitly on the evaluation forms that the candidate has complied with the required outcome. A full oral examination is carried out by two internal examiners under supervision of a chairman. A poster is presented on an open-day to both the general public and the external examiners.
What is Satisfactory Performance?	Using the assessment material and opportunities, the student must show that he/she has designed and conducted investigations and experiments at a level consistent to that which a graduate would participate in an employment situation shortly after graduation. The student must show that he/she: <ul style="list-style-type: none"> Used methods, skills or tools effectively by appropriate selection, proper application and critical assessment of the results Created computer applications as required.
What is the consequence of unsatisfactory performance?	If the candidate has not achieved the outcome, he/she cannot pass.

ELO 6. Professional and technical communication: Demonstrate competence to communicate effectively, both orally and in writing, with engineering audiences and the community at large.

How is the Outcome Assessed?	Assessment is based on a comprehensive written report, an oral examination and a poster presentation. In the written report, the student is required to explicitly indicate how he has complied with this outcome by referring to the relevant parts of his report. Based on this indication, two internal examiners and one external examiner must indicate explicitly on the evaluation forms that the candidate has complied with the required outcome. A full oral examination is carried out by two internal examiners under supervision of a chairman. A poster is presented on an open-day to both the general public and the external examiners.
What is Satisfactory Performance?	Using the assessment material and opportunities, the student must show that he/she can generate a long professional project report (10000-15000 words) and can defend the quality of his/her work during an oral examination. <ul style="list-style-type: none"> For written work, the student must provide evidence of: <ul style="list-style-type: none"> The use of appropriate structure, style and language for purpose and audience; The use of effective graphical support; Application of technologically advanced methods of providing information; Meeting the requirements of the target audience. For oral work, the student must provide evidence of:

	<ul style="list-style-type: none"> ○ The use of appropriate structure, style and language; ○ The use of appropriate visual materials; ○ Fluent delivery; ○ Meeting the requirements of the intended audience.
What is the consequence of unsatisfactory performance?	If the candidate has not achieved the outcome, he/she cannot pass.

ELO 9. Independent Learning Ability: Demonstrate competence to engage in independent learning through well-developed learning skills.

How is the Outcome Assessed?	Assessment is based on a comprehensive written report, an oral examination and a poster presentation. In the written report, the student is required to explicitly indicate how he has complied with this outcome by referring to the relevant parts of his report. Based on this indication, two internal examiners and one external examiner must indicate explicitly on the evaluation forms that the candidate has complied with the required outcome. A full oral examination is carried out by two internal examiners under supervision of a chairman. A poster is presented on an open-day to both the general public and the external examiners.
What is Satisfactory Performance?	Using the assessment material and opportunities, the student must show that he/she has developed the ability to acquire knowledge in an independent fashion, apply such knowledge, and take responsibility for learning requirements. The student must show that he/she can: <ul style="list-style-type: none"> • Reflect on own learning and determine learning requirements and strategies; • Source and evaluate information; • Access, comprehend and apply knowledge acquired outside formal instruction; • Critically challenge assumptions and embraces new thinking.
What is the consequence of unsatisfactory performance?	If the candidate has not achieved the outcome, he/she cannot pass.

7 Other Module Specific Information

7.1 Lecturer/student agreement and responsibilities

The candidate makes an appointment with the project leader within one class week after the announcement of the project allocations. At this meeting the aims, requirements and planning of the project are discussed. The final project proposal is summarised in the form of an agreement (made available via the module website) between the project leader and the candidate, where the expectations and responsibilities of both parties are clearly stated. The agreement must be completed by the end of the first week of the semester and submitted to the Project Coordinator for filing, via a departmental administrative officer. The project leader and the candidates also agree on the time for their weekly appointments.

The project study leader must give guidance to the candidate by:

- Making the candidate aware of the departmental policy with regard to the course module;
- Honouring the weekly appointments with the candidate;
- Verifying on a continuous basis that the candidate has clarity with regard to the aims of the project, and that the planning of the project is a true reflection of the aims;
- Monitoring the progress of the project, and encouraging the student to have a critical approach to the problem;
- Explanation of new concepts to the candidate;
- Spelling out the consequences of plagiarism;
- Explanation of the importance of effective communication;
- Emphasising the importance of verification that all the outcomes were satisfied.

During the execution of the project the candidate must:

- Adhere to the policy with regard to the course module, and ensure that all due dates are honoured.
- Attend the weekly appointments with the project leader;
- With the exception of field measurements and report writing, work in the buildings of the Faculty as much as possible;
- Verify that all the ECSA outcomes are satisfied;
- Compile a planning schedule (Appendix A in project report) for the project. The candidate must present a preliminary planning schedule by the second week of the semester to their study leader.

7.2 Evaluation

The final mark is determined by evaluation of the following:

- Project report
- Oral presentation
- Poster presentation

The internal examiners determine whether all the claimed outcomes, as well as the complementary study aims, were achieved. The external examiner is responsible for the final mark. He/she has access to the evaluation reports of the internal examiners, as well as the project reports. In the case of any queries, he/she is also free to question the students during the poster session. The final mark is verified by the external examiner by his/her signature. That is the final certification that all the claimed outcomes, as well as the complementary study aims, were achieved.

The mark awarded by the external examiner is final. All marks are verified by the Departmental Executive.

7.3 Project report

Every candidate must submit one complete bound hardcopy of the project report at the venue specified in the module schedule table above. In addition, an electronic copy (PDF) must be submitted via the module website. Both submissions must be done by the due date and -time as specified in the module schedule above. The latter will be used to detect plagiarism, through Turnitin. Please format the file name of your uploaded file as follows:

(studentnumber)_(surname)_(initials)_skripsie(year).pdf

eg: 1234567_Bloggs_PJ_skripsie2015.pdf

The required report format is as follows:

- Typed on A4 paper with 12 point font.
- Maximum length of the body of the report (measured from the first page of the Introduction to the last page of the Conclusion), as follows:
 - 40 pages at 1.5 line spacing, or
 - 30 pages at single line spacing.
 - 10% will be deducted from the final mark for an over-length report.
- Bound with thin carton back cover and a clear, transparent front cover.
- All tables, graphs, diagrams and photos must be numbered and have captions.
- Margins: left 3 cm, right 2 cm, top and bottom 2.5 cm.

The required report sections are:

- Title page, with the following:
 - Name of project.
 - Name of candidate.
 - Student number of the candidate.
 - The words "Report submitted in partial fulfilment of the requirements of the module Project (E) 448 for the degree Baccalaureus in Engineering in the Department of Electrical and Electronic Engineering at the University of Stellenbosch".
 - STUDY LEADER: (Name of lecturer(s)); DATE: (Month and Year).
- Page with acknowledgements.
- A page with the official SU plagiarism declaration, signed.
- Page with summaries in Afrikaans and English, each maximum of 150 words.
- Table of Contents.
- Lists with figures, tables and symbols.
- Chapter 1: Introduction, where the background to the project and the project aims are described. A short summary of the report can also be given.
- Chapters 2..n-1: Body of the report, and results. Be precise and concise.
- Chapter n: Conclusions and recommendations.
- Literature references using IEEE or Harvard format.
- Appendix A: Project planning schedule.
- Appendix B: Outcomes compliance. State explicitly how each of the relevant ECSA outcomes were achieved during the execution of the project.
- Appendices, that may include circuit diagrams, measured data, derivations, programs, printouts, etc. Be aware that examiners will mostly look at the main body in evaluating your work.

7.4 Oral evaluation

The oral examination is used in conjunction with the main report to determine the extent to which the candidate was able to satisfy the outcomes of the module. For interest, the evaluation forms used will be made available on the module website ahead of the oral sessions.

The Project Coordinator appoints two examiners, consisting of the project leader and another lecturer, as well as a convenor for the oral. The Project Coordinator gives a copy of the main report to each of the examiners.

The format for the oral examination is as follows:

- The evaluation is chaired by the convenor of the oral.
- The candidate has 10 minutes for his/her oral presentation. The use of the provided projector is advised.
- The examiners can ask questions to determine the extent to which the candidate has mastered the work and the candidate is excused.
- The study leader gives an indication of the extent of the guidance that was required by the candidate.
- The preliminary reports from the two main examiners, with a preliminary mark allocation, are handed to the presiding convenor. The evaluations are based on the evaluation form and ensure that all the required outcomes, and complementary study goals, were considered in awarding the preliminary mark.
- The mark is finalised after discussion. The following recommendations are possible (subject to the verification of the external examiner):
 - The candidate passes with $PP \geq 50\%$.
 - The candidate fails with $PP < 50\%$. The course module must be repeated with a different topic. Note that there is no option for improvement of the work/report after examination.
 - In the case where the examiners cannot reach consensus, the project is referred to the Departmental Executive for a decision.
- In order to assist the external examiners, summarising commentary from examiners and the convenor during the oral, on the evaluation form is encouraged.
- Afterwards, it is the responsibility of the Convenor to hand over the two preliminary evaluation forms and the convenor report form containing the recommended final mark, to the Project Coordinator, via a departmental administrative officer.

7.5 External examination

The external examiners visit the department after completion of the internal evaluation process. The Project Open Day is scheduled to coincide with their visit. Every candidate must prepare a poster that is presented at the Project Open Day. The poster (A1 size) must give an overview of the scope of the project, as well as the main results. The candidate must also prepare a short oral presentation (3 minutes maximum) to give the external examiners an overview of the project.

The external examiner decides upon a final mark and verifies that all the claimed outcomes, as well as the complementary study aims, were achieved. The final mark is verified by the signature of the external examiner. For interest, the evaluation form used by the external examiner will be made available on the module website ahead of the open day.

The final verification of the claimed outcomes and the complementary study aims cannot take place in the absence of the candidates, and attendance of the Project Open Day is therefore compulsory. Non-attendance will lead to an incomplete for the module.

7.6 A note on project assignment

This happens during the first semester. The Project Coordinator asks for project topics from lecturers during the first semester. The list of topics and an individual preference data collection facility is provided via the module website and a cut-off date for students to submit their preferences is communicated via the website. Based on the preference data, students are assigned topics through a global optimization procedure. The assignments are verified by the Departmental Executive before being made known before the end of the examination period of the first semester. Students are required to make an appointment with their project leaders before the start of the July vacation in order to be able to make preliminary preparations during the vacation period.