

Course Brief and Outline – 2022

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1 Course Background

The Electrical/Information Engineering Design II is one of two 'capstone' courses at the culmination of the BSc(Eng) Programme. Successful performance in this course calls for the synthesise of knowledge acquired by the student during the BSc(Eng) Programme to solve a scoped complex engineering problem that is either convergent or divergent in nature and the effective communication of findings as well as the expected impacts of the solution. This work requires engineering knowledge and problem solving, using analysis, synthesis and performance evaluation methods. An emphasis is placed on the social, economic or environmental implications of the project as well as sustainability.

The course requires the student to work effectively as an individual, in all stages of the project. The course has two deliverables:

- a long technical report, in a specified format, reporting on the engineering activity in the project, of the student as an individual and the group
- a short non-technical report on impacts of an engineering solution and improvements in reducing the negative impacts.

2 Course Objectives

On successful completion of this course, the student will have met of the following ECSA graduate attributes as indicated in Table 1:

Table 1: Descriptions of Graduate Attributes (GAs) as defined ECSA.

GA	Description of the GAs
3	Design a component, system, product or process, the achievement of which requires engineering knowledge and constitutes a complex engineering problem.
1	Solve problems using analysis, synthesis and evaluation at various levels, including complex engineering problems.
2	Use specialist and fundamental engineering knowledge, supported by mathematics and natural sciences, in the solution of engineering problems, including a complex engineering problem.
5	Select, use effectively and evaluate the results produced by appropriate tools and methods for the problem at hand.
7a	Identify and address social, economic or environmental impacts during the course of engineering activity.
7b	Identify, analyse, and evaluate the sustainability of an engineering solution.
8a	Work effectively as an individual in the planning and execution of a project.
6a	Report on an engineering activity in the form of a long technical report or paper that meets stated format requirements.
6b	Communicate with non-technical and affected parties on impacts of an engineering solution and amelioration of negative impacts in a short report.

3 Course Outcomes

On successful completion of this course, the student is capable of:

- completing under limited instruction and supervision a significant engineering design project (GAs 3 and 8a).
- applying in scrupulously rigorous manner specialist and fundamental engineering knowledge to identify and address social, economic or environmental impact and sustainability of the proposed design (GAs 2, 7a and 7b).
- communicating the approach taken as well as use of methods and tools to reach meaningful findings at a level and form expected of an entrant in the engineering profession (GAs 6a and 6b).

The design project is to be carried out in a context similar to an engineer at the entry level to the engineering profession performing and reporting to an experienced engineer who would take decisions based on the report. Professional engineering values apply.

4 Course Content

This course requires students to undertake a significant engineering study under limited supervision, involving aspects such as background research, planning, assessment of project requirements, modelling, appropriate use or development of supporting tools, testing, critical analysis and the communication of the findings and results of the study.

5 Prior Knowledge Assumed

Some of the projects may have additional pre-requisite conditions. The prerequisites and co-requisites to register for this course are defined in the current *Rules & Syllabuses: Faculty of Engineering and the Built Environment*.

6 Assessment

The design project is assessed through written components. The report is an individual effort from each student and should be reporting on an original design. The design project report is the only assessment component of this course. The marking grid used in assessing the project report is available on the course website and may be distributed to the students as a separate document.

Each student should produce the following for assessment:

- an **individual** and **original technical report**, reflecting the student's own work, except where contributions of others are incorporated and duly acknowledged.
- an **individual** and **original non-technical report** to attach as Appendix A, communicating the findings and potential impacts of the design to a non-technical audience; this may take the style and form of a newspaper article.

Each project report is independently assessed by the internal examiner and an external examiner. All necessary material for assessment is made available to the both examiners for this process. Finally, a third moderating process is used to achieve a final mark for each individual student. Students will be required to make use of an engineer's notebook.

6.1 Formative Assessments Elements

This is a capstone course and therefore has no formative elements.

6.2 Summative Assessment

Table 2: Summative assessment contributions.

Summative Assessment Contributor	Duration h	Component Yes/No	Method & Weight %	Calculator Type 0/1/2/3	Permitted Supporting Material
Design report (long technical and non-technical report/Appendix A)	240	No	100%	3	Unlimited

6.2 Assessment Methods

The student will be assessed on their design project through a technical and non-technical report that is produced for submission. A rubric which assesses all the GAs is listed in Table 1 will be used to form the marking grid. The student performance on each GA will be rated as either, deficient, acceptable, good and excellent. The final mark will depend on all the provided ratings for each GA. The four ratings are described in Table 3. A deficient rating for any GA will result in an failed component and therefore a failure in the course.

Table 3: Description of the rating method for the GAs.

Rating	General Interpretation
Deficient	One or more major flaws.
Acceptable	No more than minor flaws, otherwise complete; no distinguishing features.
Good	Shows insight; some distinguishing feature(s).
Excellent	Exceptional insight and multiple distinguishing features.

7 Satisfactory Performance (SP) Requirements

Rule G.13 and the School's documents entitled Application of Rule G.13 and Calculator Requirements and the School's Red Book (see the School notice board) apply.

To meet SP requirements, students are required to:

- submit topic choices (initial phase):
 - choice of preferred topics (with correct application of pre-requisites),
 - within the given timeframe, and
 - that choices follow the format of instruction.
- meet weekly with their project supervisors to:
 - provide regular feedback on progress of their project;
 - obtain guidance during the project;
 - attend lectures and activities associated with the project as required by the supervisor;
 - record minutes and progress in an engineer's notebook.

Students must make use of an engineer's notebook throughout the duration of the project to record notes during meetings held with their project supervisors.

All students should be available **full-time** during the complete period of the project and are required to attend all meetings of the course. Failure to do so will be deemed a failure to meet satisfactory performance. A student repeating the course should take particular note of this.

7.1 Late Submission Policy

This policy will be enforced with regards to late submissions of course deliverables.

All submissions are made online through the course homepage on the University's eLearning system. The server time is used as the master time for deadlines.

If any submission is marked as “late”, or no submission is received, SP is immediately revoked, and a formal letter is sent to the student. The onus is on the student to appeal the SP revocation, in writing, to the Head of School by the specified date contained in the letter.

If the Head of School decides to permit with a set of conditions, at most, the new submission date will be exactly one week. The submission will be assessed without prejudice. However, the mark for the submission will be capped at 50%.

8 Teaching and Learning Process

The course offers a variety of design topics in the specialist fields associated with electrical and information engineering. The initial set-up phase of the projects will occur early in the year (Block 1), where topic selection and allocated is completed. The commencement of the projects will occur in a teaching block within the second semester. Refer to the *Key dates for 4th years – 2022* for timelines.

Project topic allocation will be based on the following criteria:

- election of preferred topics based on the student's pre-requisite training and interest (first, second and third choice)
- maximum number of participants per project topic (students electing topics earlier may have the advantage in obtaining top choices).

A student allocated to a project topic will interact with the corresponding project supervisor for the duration of the course in the designated timeframe. The project supervisor will also serve as the internal examiner for the project report. Refer to the *Key dates for 4th years – 2022* for timelines of topic selection and topic allocations.

8.1 Teaching and Learning Approach

The students will meet with their project supervisor on a weekly basis and report on weekly progress. Refer to the *Key dates for 4th years - 2022* document published by the School for important dates and deadlines related to this course.

8.2 Information to Support the Course

There is no prescribed textbook for this course. The project supervisor will advise on essential reading and provide design specifications, requirements, standards and guidelines where necessary. Students are also expected to read and consult as widely as possible under their own initiative.

Report Details:

Please follow the basic guideline for report writing in the School's Blue book. A clear cover page must indicate project title, the student name, student number and submission date. There is a zero tolerance on plagiarism – this includes incorrect paraphrasing of source material.

- The *long technical report* must be a standard one column report with a maximum of 15 pages (excluding cover page, table of contents pages, references and appendices or supporting material), with a font size of 11. Supporting material should appear after Appendix A.
- The *short non-technical report* may **not exceed 2 pages**, font size of 11. This should be affixed to the long technical report as Appendix A.

Submission Details:

The final report should be submitted under the appropriate link on Ulwazi. Students should refer to the *Key dates for 4th years - 2022* document for the submission deadline. Submission of the engineer's notebook may be requested by the project supervisor.

Late submission carries a heavy penalty as detailed in Section 7.1.

Consultation:

Students may send an e-mail to the course coordinator(/s) to arrange a consultation time.

9 Course Home Page

Further information and announcements regarding the course are posted on the course home page on Ulwazi:

- <https://ulwazi.wits.ac.za/>

All students are expected to consult the course home page at regular intervals.