|  |
| --- |
| **Cape Peninsula University of Technology** |
| **Faculty** | Engineering |
| **Department** | Electrical, Electronic and Computer Engineering |

|  |
| --- |
| **Qualification information** |
| **HEQSF Qualification type & title** | Master of Engineering in Satellite Systems and ApplicationsMEng (Satellite Systems and Applications) |
| **Total number of SAQA credits** | 180 |
| **NQF level (exit)** | 9 |

|  |
| --- |
| **Subject information** |
| **Level of study****e.g. Year 1, 2, etc.** | **Name of subject****Consult CPUT Subject naming convention (2014)** | **SAQA credits** | **NQF level** | **Compulsory/elective subject** |
| 5 | Engineering for Space Environment | 21 | 9 | Compulsory |
| **Description of subject content****Provide a short description of the subject content to be covered – NOT a list of topics only, but a narrative explaining the nature, purpose and focus of the subject and its relationship with other subjects at the same level of study.** |
| The space environment is a branch of astronautics, aerospace engineering and space physics that seeks to understand conditions that exist in space and the impact that these conditions have on the design and operation of spacecraft.Aspects of the space environment important for spacecraft engineering are discussed. The aim of this course is to explore the methods and techniques used in designing space-borne systems, operating in aerospace and the space environment. The course will cover mechanical load analysis and various techniques resulting in a robust design.The required physics will be covered as part of the course, followed by several simulation tools exercises. |
| **Learning outcomes of subject****Consult the SAQA level descriptors and Blooms’ taxonomy to define the learning outcomes to be achieved by students.** | **Associated assessment criteria****Use the CPUT guidelines on how to write learning outcomes and associated assessment criteria.****A learning outcome may have more than one assessment criterion.** |
| 1. Understand the importance of the space environment and analyse the effects of space weather and radiation.
 | * Identify a range of relevant and reputable resources for further information including textbooks and journal articles.
* Critically review the information on space weather and radiation and provide an analysis of the complexities associated with the effects of space weather and radiation.
 |
| 1. Have a basic understanding of attitude measurement principles and the sensors used as well as satellite attitude control actuators.
 | * Understand the complexities of attitude measurements principles and the sensors used.
* Understand the complexities of satellite attitude control actuators.
* Present the information coherently.
 |
| 1. Be able to analyse mechanical load (thermal, thermal vacuum, vibration and acoustic).
 | * Understand the complexities that the mechanical loads imposed on the system.
* Apply techniques to analyse mechanical load.
* Understand thermal concepts, its effects and thermal vacuum testing.
* Understand mechanical vibration, its effects and acoustics.
 |
| 1. Conduct a reliability analysis and FMEA analysis
 | * Identify a range of relevant and reputable resources for further information including textbooks and journal articles.
* Understand the theories on reliability and FMEA.
* Critically review information gathered on reliability and FMEA.
* Conduct a reliability analysis reflecting critically on the methods used.
* Conduct a FMEA analysis reflecting critically on the methods used.
* Supply evidence for all analytical work.
 |
| 1. Conduct a FDIR analysis and have an understanding of Software mission safety.
 | * Identify a range of relevant and reputable resources for further information including textbooks and journal articles.
* Understand the theories on FDIR and software mission safety.
* Critically review information gathered on reliability and FDIR.
* Conduct a FDIR analysis reflecting critically on the methods used.
 |
| **Prescribed books****Include a short list of prescribed books/reading material. Use the Harvard referencing system for this purpose. Use the latest editions of these publications.l** |
| Prölss, G. (2004). *Physics of the Earth’s Space Environment An Introduction*. Springer-Verlag Berlin Heidelberg. |
| **Teaching & learning strategy for subject****Include details about the teaching-learning methods that will be adopted on this subject.** |
| * A number of teaching and learning strategies will be used in this course. Emphasis has been placed on spreading the learning strategies over as many learning categories as possible.
* Direct instruction will form part of the teaching strategy through formal lectures, slide presentations, explicit teaching, guided and shared reading as well as the use of multimedia.
* Interactive instruction will be incorporated in the form of debate, peer assessment, class discussion, tutorials and team-based learning.
* Indirect learning instruments will also be used in the form of case studies, problem-solving, reflective discussion, concept formation and concept mapping.
* A portion of the course will be left for independent study, where students will have to make use of journals, research projects, assigned questions and self-assessment.
* Experimental learning will be facilitated by computer simulation and analysis of results obtained.
* The content has been developed in such a way as to give students ample opportunity to practice monitoring their learning and adapting as necessary.
 |
| **Assessment strategy****Include details about the assessment strategy (assessment methods & techniques, etc.)** |
| **Provide details on formative and summative assessment methods** |
| * **Methods of assessment:**

Class tests, assignments, integrated projects, practical work, tutorials, presentations.* **Formative:**

Here the feedback provided supports the expected learning.There will be no grading for the formative evaluations.* + Students will develop appropriate processes of information gathering. These will be assessed on an ongoing basis when used in defence of chosen methods in group discussion and one-on-one discussions.
	+ Students will present their results and findings in class, communicating their own ideas and opinions, to be questioned and critiqued by fellow students with the lecturer providing oversight and feedback.
	+ There will be ongoing assessment and appraisal of project progress where students will be guided through group discussion until completion of the project.
	+ The student must critically discuss concepts individually and as part of a group.
* **Summative:**

Here we want to assess the extent to which the student has achieved curricular objectives. The grade will form part of the overall grade at the end of the study unit.* + A variety of assessments including assignments, simulation work, tutorials and projects will be used to assess the student’s ability to apply their knowledge and practical skills.
	+ A final written theoretical assessment will evaluate key concepts in line with the outcome objectives for this course.
 |
| **Provide details on assessment techniques (e.g. written test) and assessment tasks** |
| The students will be assessed using assignments, integrated projects, practical work, tutorials and written evaluations.**Class Tests:**These are short evaluations assessing a smaller component of the course at the end of an outcome or range of outcomes, but does not span all outcomes.**Assignments:** Students have to consult a range of prescribed resources in order to solve the posed problem. A formal foundation will be laid in class via formal lectures, but students then have to expand on these concepts by applying them in familiar and unfamiliar situations.**Written assessments**. Here the emphasis is placed on the theoretical component of the courses. The heavier weighting of the assessments reflects the volume of material that will be assessed.**Practical work:**Practical work is based on simulations and analysis of results. Skills must be developed in using the software packages and how to apply the software tool to achieve a particular objective.**Tutorial:**Tutorials will be a series of short questions assigned to the student throughout the delivery of the subject content. Tutorials are done under supervision and with group participation.**Presentation and Integrated Project:**The student will decide on a component of a major project. Each students project contribution will slot into the formation of the final major project. The project progress will be evaluated on an ongoing basis. On completion, the project will be presented and defended to an audience of peers and guests.

|  |  |  |
| --- | --- | --- |
| **Assessment Type** | **Assessment Weight** |  |
| Class Tests (2) | 10% | Two written class tests. One for outcomes 1-2, the other evaluating outcomes 3-4 |
| Assignments (3) | 15% | Three assignments. |
| Practical work | 15% | Ongoing laboratory sessions for simulation work resulting in a particular objective being met. |
| Tutorials | 0% | A series of short tutorials will be provided throughout the subject delivery. |
| Presentations + Integrated Project | 10% | Students will decide on a component of an integrated project. On completion of the project, the students will present their work to an audience of peers. |
| FISA | 50%  | A written evaluation assessing the strong theoretical component of outcomes 1-5. This evaluation spans all objectives. |
| Total | 100% |  |

 |

**Please note: The subject information should be completed for each subject of the qualification. Copy and paste the master template with the subject information for the number of subjects in the programme.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NAME OF SUBJECT/COURSE** | **THIRD ORDER CESM** | **SAQA CREDIT** | **HEMIS CREDIT** | **NQF LEVEL** |
| **MEng:Satellite Systems and Applications** |   |   |   |   |
| YEAR 1 - Compulsory modules |   |   |   |   |
| Satellite Applications | 080901 | 18 | 0.100 | 9 |
| Satellite Mission Analysis and Design | 080101 | 18 | 0.100 | 9 |
| Engineering for Space Environment | 080101 | 21 | 0.116 | 9 |
| Satellite Subsystems | 080101 | 18 | 0.100 | 9 |
| Research Methodology | 0899 | 15 | 0.083 | 9 |
|  |  |  |  |  |
|  |  |  |  |  |
| YEAR 2 - Compulsory module |   |   |   |   |
| Mini Thesis | 080101 | 75 | 0.417 | 9 |
|   |   |   |   |   |
| Student can elect either group 1 or group 2 |   |   |   |   |
| ***Elective group 1*** |   |   |   |   |
| General History of Africa | 200302 | 7.5 | 0.042 | 9 |
| Gender and Human Rights | 120107 | 7.5 | 0.042 | 9 |
| ***Elective group 2*** |  |  |  |  |
| Management of Space Technology | 040199 | 15 | 0.084 | 9 |
|   |   |   |   |   |
| **Total MEng** |  | **180** | **1.000** |   |