Stellenbosch University Faculty of Engineering

Module Framework

This document should be read with the following documents:

- ***Stellenbosch University Calendar Parts 1 and 11.***
- ***Faculty of Engineering Assessment Rules***
- ***Faculty of Engineering General Stipulations for Undergraduate Modules[1]***

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

Module: 46779-344 **Systems and Signals 344** 2026	Lecturer(s): Prof RP Theart; Room E3020 rptheart@sun.ac.za Internal moderator: Prof DJJ Versfeld	Approved by Programme Coordinator: Date: 14/7/2026

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

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

w_{AF} = 15%; w_{A1} =35%; w_{A2} =50%

AF = average (Tutorial Tests)

Assessment format:

- Major assessments (A1, A2 and A3) will be **closed book,** invigilated sit-down examinations
- Formative assessments contributing to AF will be the **weekly tutorial tests** which will also be closed book.
- Your single weakest tutorial test mark will be removed before calculating AF.

2 Notional Hours

You should spend 10 notional hours per credit on this module over the course of the semester.
It is envisaged that these hours will be allocated as follows:

Activity	**Contact Hours**	**Self-study Hours**
Lectures	36 x 0.83h (50 minutes each) = 30	30
Tutorials	27	15
Practicals	9	4
Assignments	0	0
Main assessments	5	30
Total (for this 15-credit module)	**150**	

3 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 or the "General Information" block on STEMLearn for the particulars.

4 Module Objectives

Aim: Mastering the basic concepts of probability theory.

A student who has successfully completed this module can:

- Apply and understand one- or more-dimensional random variable and the accompanying concepts of expected values, moments, distribution functions and probability density functions.

- Apply Bayes' theorem, conditional, joint and marginal/total probabilities, density functions and distribution functions, as well as understand the inter-relationships between them.
- Understand statistical independence and apply it to simplify problems.
- Be familiar with various probability distributions including the binomial, Poisson, uniform, exponential, and Gaussian distributions.
- Apply moment generating functions to determine moments and density functions.
- Apply and understand the central limit theorem.
- Understand random processes in terms of more-dimensional distribution and density functions.
- Determine and understand the auto- and cross-correlation functions of random processes in terms of moments.
- Evaluate a random process in terms of the various forms of stationarity.
- Determine the spectral characteristics of a random process by using the correlation functions.
- Translate every day and engineering problems in terms of probability theory.

Prior knowledge required:
This module is part of the Systems and Signals module chain. It relies on knowledge obtained in previous modules in this chain.

Proceeding application:
The knowledge developed in this module is applied further in Systems and Signals 414 and Data Analytics 414, among others.

5 Module Content and Schedule

Prescribed textbook(s): R.D. Yates and D.J. Goodman, *Probability and Stochastic Processes* (Third Edition), Wiley, 2015.

Week	Topic	Assignment
1	Foundations of probability, including sample spaces, events, sets and basic probability rules	Tutorial 1
2	Conditional probability, total probability, Bayes' theorem and counting methods	Tutorial 2
3	Discrete random variables, probability mass functions, cumulative distribution functions and expectation	Tutorial 3
4	Discrete probability distributions and computational practice in Python	Tutorial 4* (not for marks)
5	Continuous random variables, probability density functions and continuous distributions	Tutorial 5
6	Joint random variables, marginal distributions, dependence, covariance and correlation	Tutorial 6
	TEST WEEK	
7	Derived random variables and conditional probability models	Tutorial 7
8	Random vectors and multivariate probability models	Tutorial 8
9	Sums of random variables, moment-generating functions, the sample mean and the central limit theorem	Tutorial 9
10	Estimation of a Random Variable	Tutorial 10
11	Random Processes	Tutorial 11
12	Stationary random processes, correlation functions and spectral characteristics.	Tutorial 12

* Due to Wednesday, 12 August following Monday Time Table, there is no tutorial. However, it will still be given out for you to complete in your own time for practice.

In the schedule above:

- All lectures will be presented face-to-face as scheduled on the Timetable.
- Lecture Videos will be made available, either from this year or a previous year.
- Tutorials will be related to all the lecture content preceding the tutorial (including the same day as the tutorial).
- The precise sequence and timing of the lectures may deviate from this plan
- **Tutorials will always be accompanied with a Tutorial Test at the end of the session (unless otherwise indicated).**

6 ECSA Knowledge Area Credits

Mathematical Sciences	Natural Sciences	Engineering Sciences	Design and Synthesis	Complementary Studies
10	0	5	0	0

Mathematical Science:

Content: Mathematical description of and calculations on probability, random variables and random processes.

Assessment: Formal tests.

Engineering Science:

Content: Description and solution of engineering problems using probability theory.

Assessment: Formal tests.

7 ECSA Graduate Attribute(s)

This module is not used to assess any ECSA Graduate Attributes.

8 Other Module Specific Information

- Attendance of **all lectures, tutorials and practical** sessions are compulsory for all students, including repeaters, unless explicit exemption is made by the lecturer. If a student does not attend a tutorial or practical session the student will be marked as absent from the session.
- Students who miss any assessment opportunity (e.g. tutorial, practical, report, project, test, etc.) and do not submit an acceptable excuse to the lecturer within **seven** days of the assessment will receive a mark of zero. If a student misses more than half of the tutorials without a valid excuse, the lecturer may, at their discretion, assign an **incomplete** for the module.
- The course planning allows for students to work on the practical or tutorial tasks outside class time, but within the allotted 12 hours per week for Systems and Signals 344.
- Only **pocket calculators** approved by the Engineering Faculty for the first- and second-year students' test and examinations, may be used during assessments.