Module Specifications.

Current Academic Year 2024 - 2025

All Module information is indicative, and this portal is an interim interface pending the full upgrade of Coursebuilder and subsequent integration to the new DCU Student Information System (DCU Key).

As such, this is a point in time view of data which will be refreshed periodically. Some fields/data may not yet be available pending the completion of the full Coursebuilder upgrade and integration project. We will post status updates as they become available. Thank you for your patience and understanding.

Date posted: September 2024

Module Title	Probability II		
Module Code	MS232 (ITS) / MTH1044 (Banner)		
Faculty	Science & Health	**School**	Mathematical Sciences
Module Co-ordinator	Martin Venker		
Module Teachers	-		
NFQ level	8	**Credit Rating**	7.5
Pre-requisite	Not Available		
Co-requisite	Not Available		
Compatibles	Not Available		
Incompatibles	Not Available		

None
Array

Description

This module aims to introduce the students to the main techniques used when dealing with several random variables. It also offers an introduction to the limit theory of sequences of random variables. Students will attend lectures on the course material and will work, independently, to solve problems on topics related to the course material. The students will have an opportunity to review their solutions, with guidance, at weekly tutorials.

Learning Outcomes

1. express probabilities in terms of multible integrals and be able to evaluate such integrals
2. state selected definitions and theorems
3. solve problems that require the use of either one, several or infinitely many random variables
4. demonstrate an understanding of concepts by use of examples or counterexamples
5. explain arguments used to prove selected theorems

Workload	**Full-time hours per semester**	
Type	*Hours*	*Description*
Lecture	24	Students will attend lectures where new material will be presented and explained. Also attention will be drawn to various supporting material and tutorials as the course progresses.
Tutorial	12	Students will show their solutions to homework questions and will receive help with and feed-back on these solutions.
Independent Study	89	Corresponding to each lecture students will devote approximately

	one and a half additional hours of independent study to the material discussed in that lecture or to work on support material when attention is drawn to such in lectures. Before each tutorial students will devote approximately three and a half hours to solving homework problems which are to be discussed in that tutorial.
	Total Workload: 125

All module information is indicative and subject to change. For further information,students are advised to refer to the University's Marks and Standards and Programme Specific Regulations at:
http://www.dcu.ie/registry/examinations/index.shtml

Indicative Content and Learning Activities

RANDOM VECTORS:
Joint distribution, marginal distributions, conditioning on a random variable, transformation of random variables, independent random variables, convolution, characteristic function.

JOINTLY NORMAL RANDOM VARIABLES:
Equivalent characterisations of jointly normal random variables using mean vector and covariance matrix, densities, characteristic function or linear marginals. Linear transformations and conditioning.

LIMIT THEORY FOR SEQUENCES OF RANDOM VARIABLES:
Modes of convergence: almost sure convergence, convergence in L^p, in probability, in distribution. Relations between different modes of convergence. Tools for proving convergence: Chebyshev's and Markov's inequalities, Borel-Cantelli lemma, Levy's continuity theorem. Limit theorems: Weak and strong laws of large numbers, central limit theorem, Berry-Esseen's theorem.

Assessment Breakdown			
Continuous Assessment	20%	Examination Weight	80%

Course Work Breakdown

Type	Description	% of total	Assessment Date
Assignment	Students will submit solutions to exercises.	20%	As required

Reassessment Requirement Type

Resit arrangements are explained by the following categories:
Resit category 1: A resit is available for both* components of the module.
Resit category 2: No resit is available for a 100% continuous assessment module.
Resit category 3: No resit is available for the continuous assessment component where there is a continuous assessment and examination element.

* 'Both' is used in the context of the module having a Continuous Assessment/Examination split; where the module is 100% continuous assessment, there will also be a resit of the assessment

This module is category 3

Indicative Reading List

- **Grimmett, G.R. and Stirzaker, D.R.::** 1992, Probability and Random Processes,, Oxford University Press,
- **Ross, S.:** 2002, A First Course in Probability, Prentice Hall,

Other Resources

None

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