# F79SP Stochastic Processes

## COURSE DETAILS
- **Course Code:** F79SP
- **Full Course Title:** Stochastic Processes
- **SCQF Level:** 9
- **SCAF Credits:** 15
- **Available as Elective:** No

## DELIVERY LEVEL
- **Undergraduate:** Yes
- **Postgraduate Taught:** Yes
- **Postgraduate Research:** No

## COURSE AIMS
To introduce fundamental stochastic processes which are useful in insurance, investment and stochastic modelling, and to develop techniques and methods for analysing the long term behaviour of these processes.

## LEARNING OUTCOMES – SUBJECT MASTERY
After studying this course, students should be able to:

- Understand and use the Markov property
- Write down equations for the stationary distribution of a Markov chain and use, wherever possible, additional structure to solve them
- Write down first step equations and use them to compute the time to death, probability of absorption etc.
- Apply Markov chain modelling in several problems
- Understand long term behaviour and stationarity of a Markov chain
- Classify states in terms of the topological properties of the intercommunications graph and in terms of the actual transition probabilities.

## LEARNING OUTCOMES – PERSONAL ABILITIES
At the end of the course, students should be able to:

- Demonstrate the ability to learn independently
- Manage time work to deadlines and prioritise workloads
- Present results in a way which demonstrates that they have understood the technical and broader issues of stochastic processes

## SYLLABUS
- Review of independence
- Sequences of random variables and the Markov property
- Review of matrix algebra
- Review of summation notation and other useful concepts
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- Using the Markov property
- Absorbing Markov chains with finite state space
- First step (backwards) equations
- Basic examples
- Stationarity problem for finite state space chains
- Tricks for the computation of the stationary distribution
- State classification
- Periodicity
- Convergence to stationarity
- Frequencies
- Markov chains with infinite but countable state space
- Recurrence and transience
- Examples
- Basic relations between exponential, gamma, Poisson and uniform distributions
- Simple point processes, Poisson and compound Poisson processes
- Continuous time Markov processes
- Numerical solution of the Kolmogorov Forward Equations for a time-inhomogeneous Markov process
- Examples
- Simulation of Markov Chains, Markov Processes

**COURSE RELATIONSHIPS**

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<th>Course Code</th>
<th>Level</th>
<th>Title</th>
<th>School</th>
<th>Type</th>
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<td>Probability and Statistics A</td>
<td>School of Math and Comp Sci.</td>
<td>Pre-Requisite</td>
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<td>Probability and Statistics B</td>
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<td>Survival Models</td>
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**LOCATION AND ASSESSMENT METHODS**

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