COURSE DETAILS
Course Code: F78AB
Full Course Title: Actuarial and Financial Mathematics B
SCQF Level: 8
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes  Postgraduate Taught: No  Postgraduate Research: No

COURSE AIMS
To introduce the student to more advanced mathematical models of cashflows accumulated or discounted at interest, and to develop skill in applying these models to real financial contracts and transactions.

LEARNING OUTCOMES – SUBJECT MASTERY
On completion of this course the student should be able to:

- Describe and calculate nominal rates of interest.
- Know how to value and accumulate continuously-payable cash flows and how to calculate internal rates of return for transactions with such cash flows.
- Be able to define the duration and convexity of a cash flow sequence and illustrate how these may be used to estimate the sensitivity of the value of the cash flow sequence to changes in the rate of interest.
- Know how duration and convexity are used in the immunisation of a portfolio of liabilities.
- Show an understanding of the term structure of interest rates and of the main factors influencing this structure.
- Be able to calculate the delivery price and the value of a forward contract, using arbitrage-free pricing methods and to explain what is meant by hedging in the case of a forward contract.
- Know how to calculate the value of various types of forward contracts at any time during their duration.
- Be able to explain the concept of a stochastic interest rate model.
- Be able to calculate the mean value and the variance of the accumulated amount of a single premium for a stochastic interest rate model in which the annual rates of return are independently and identically distributed (and also do this for other simple models).
- Be able to calculate the mean value and the variance of the accumulated amount of a level annual premium for a stochastic interest rate model in which the annual rates of return are independently and identically distributed.
- Understand how an appropriate inflation index (such as the RPI) may be used to measure changes in the value of money with time.
- Understand how an appropriate index may be used to increase the monetary amounts of the future cash flows associated with a given `index-linked' investment and, in particular, how the RPI is used to determine the future payments of interest and capital associated with index-linked government securities.
- Know what, in relation to a given inflation index, is meant by the `real yield' for a particular investment and be able to calculate such yields.
- Use an appropriate computer package to apply the methods introduced in this course.

LEARNING OUTCOMES – PERSONAL ABILITIES
- Interpreting problems from commercial practice in terms of relevant mathematical models
Independent recognizing and applying appropriate mathematical techniques to solve problems
• Interpreting solutions expressed mathematically in terms of the original problem
• Communicating the solutions to complex problems in the financial services sector

SYLLABUS

• Nominal rates of interest
• Force of interest and continuous cash flows
• Duration and Redington's theory of immunization
• The term structure of interest rates
• Inflation indexing and index-linked bonds
• Forward contracts
• Stochastic interest rate models

COURSE RELATIONSHIPS

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LOCATION AND ASSESSMENT METHODS

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