## COURSE SPECIFICATION FORM

<table>
<thead>
<tr>
<th>DEPARTMENT OF: Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Code: MT4470</td>
</tr>
</tbody>
</table>

### Course Title: Advanced Financial Mathematics

### Availability: Term 2

### Prerequisites: MT3470

### Recommended:

### Aims:
- To investigate the validity of various linear and non-linear time series occurring in finance;
- To extend the use of stochastic calculus to interest rate movements and credit rating;

### Learning Outcomes:
On completion of the course, students should:
- make use of some of the ARCH (autoregressive conditionally heteroscedastic) family of models in time series;
- appreciate the ideas behind the use of the BDS test and the bispectral test for time series.
- understand the partial differential equation for interest rates and the assumptions that lead to it;
- be able to model forward and spot rates;
- see how to model the prices for certain exotic options.

### Course Content:
- **Financial time series:** Linear time series: ARMA and ARIMA models, stationarity, autoregressions. Testing of linearity, using spectral analysis. ARCH and GARCH models.
- **Structure of financial series:** The random walk model, trend and volatility, moments. Comparison with chaotic systems, dimensionality and memory effects in financial series. The nearest neighbour algorithm and the BDS test.
- **Interest rate analysis:** Revision of ideas in stochastic calculus. Modelling of interest rates, the bond pricing equation. Bond derivatives. The Heath-Jarrow-Morton model.
- **Exotic options:** Asian and barrier options.

### Teaching & Learning Methods:
- 33 hours of lectures and examples classes.
- 117 hours of private study, including work on problem sheets and examination preparation. This may include discussions with the course leader if the student wishes.

### Key Bibliography:
- P. Wilmott Introduces Quantitative Finance – P Wilmott (Wiley 2007)  
  Library reference 332.632 WIL
  Library reference 330.0151 TSA

### Formative Assessment & Feedback:
- Formative assignments in the form of 8 problem sheets. The students will receive feedback as written comments on their attempts.

### Summative Assessment:
- **Exam (%)** Four questions out of five in a two-hour paper: 100%
- **Coursework (%)** None

### Deadlines:
- n/a

The information contained in this course outline is correct at the time of publication, but may be subject to change as part of the Department’s policy of continuous improvement and development. Every effort will be made to notify you of any such changes.