# Course Specification Form

## Department of: Mathematics  
### Academic Session: 2008-9

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Value</th>
<th>Status (ie: Core, or Optional)</th>
<th>Optional (exception: core for GF13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT2220</td>
<td>0.5</td>
<td>Optional</td>
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</tbody>
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<tr>
<th>Course Title</th>
<th>Availability (state which teaching terms)</th>
<th>Term 1</th>
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<tbody>
<tr>
<td>Vector Analysis and Fluids</td>
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<tr>
<th>Prerequisites</th>
<th>Recommended</th>
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<tr>
<td>MT1710 and MT1720</td>
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### Aims:
- To study the integration and differentiation of vectors and scalars defined at points in space, introducing the concepts of scalar and vector fields;
- To familiarize the student with the use of general orthogonal curvilinear coordinates and the evaluation of differential operators;
- To introduce integral theorems and demonstrate their usefulness;
- To show how simple partial differential equations may be solved by the technique of separation of variables;
- To show how the acquired concepts can be applied in the field of dynamics of inviscid fluids.

### Learning Outcomes:
On completion of the course students should be able to:
- Identify scalar and vector fields;
- Calculate the gradient of a scalar field and the divergence and curl of a vector field;
- Use general orthogonal curvilinear co-ordinates and, in particular, cylindrical and spherical polar co-ordinates;
- Use the divergence theorem and Stokes’ theorem;
- Recognize when and how variables separate in a partial differential equation;
- Apply the equations of continuity and motion for an inviscid fluid and use Bernoulli’s equation;
- Use velocity potential and apply it to examples of irrotational flow.

### Course Content:

**Partial differential equations:** Laplace’s equation, the diffusion equation and the wave equation in Cartesian coordinates. Separation of variables, used in plane polar and spherical coordinates.

**Dynamics of inviscid fluids:** equation of continuity. Velocity and acceleration. Equation of motion. Bernoulli’s equation. Irrotational flow and velocity potential. Examples of potential flow of incompressible fluids.

### 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:
  Library Ref. 515 STE
  Library Ref. 515.34 BOU

### Formative Assessment & Feedback:
Formative assignments in the form of 10 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

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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.