

Combined Programs in Mathematics

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Outline

- 1 The national perspective
- 2 Masters programs
- 3 Doctoral programs
- 4 Inter-disciplinary initiatives

Acknowledgements:

Chris Budd/LMS Education Officer

Robert Scheichl, Director of Studies, Modern Applications in Mathematics

Tony Robinson, Admissions Tutor for Masters Programs

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Constants and Variables

- Some things change and some stay the same...
- Value placed on mathematics graduates — and postgraduates
 - Capacity for analysis and synthesis
 - Capacity for applying knowledge in practice
 - Problem solving
 - Capacity to learn
 - [Tuning Maths Group, 2002]
- But employment phase is changing:
 - Lifelong learning starts to impact
 - Increasing demand for “applied” maths

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UK First Degrees

- BSc first degree:
 - 3 years (180 ECTS)
 - 2 years + $\left\{ \begin{array}{c} 1 \text{ year placement} \\ \text{OR} \\ 1 \text{ year abroad} \end{array} \right\}$ + 1 year (240 ECTS)
- MMath first degree:
 - 4 years (240 ECTS)
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 - Difference from BSc:
 - annual progression criteria and
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UK Higher Degrees

- Taught higher degree:
 - MSc in Mathematics: uncommon, typically linked to a specialization:
 - For example: finance, biology, ...
 - Inter-disciplinary links
 - 1 calendar year (90 ECTS)
 - 2 × semester taught courses + 3 month dissertation
- Research higher degree:
 - 1–2 years research \rightsquigarrow MPhil
 - 3+ years research \rightsquigarrow PhD
 - 1 year taught + 3+ years research \rightsquigarrow MSc+PhD (details later)

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Recruitment

- Undergraduate

- Applications down overall
- Viability of some departments in question
- Impact varies across country

- Taught postgraduate (= Masters)

- Rising interest/choice amongst overseas students
- UK degree attract (FEE) UK students
- Competition against abroad

- Research postgraduate (= Doctorate)

- Stable numbers fall of international market especially
- Growth of PhD interest widely reported
- Some promising competition with other disciplines

Recruitment

- Undergraduate
 - Applications down overall
 - Viability of some departments in question
 - Impact varies across country
 - Taught postgraduate (= Masters)
 - Higher interest in the sciences/engineering courses
 - More UK overseas students (EU/UK) students
 - Higher international fees
 - Research postgraduate (= Doctorate)
 - Higher international fees / international student recruitment
 - Higher quality of PhD training
 - Higher international student recruitment

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 - Rising interest/niche market/refresher courses
 - Growing market (EU/US) students
 - Demand for research
- Research postgraduate (= Doctorate)

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Specialized MSc programs

- Mathematical sciences: traditionally small, increasing interest in discrete maths and modelling
- Simulation and scientific and parallel computing: *Oxford, Sussex, Manchester, Bath*
- Mathematical modelling: *Oxford, Bath*
- Mathematical biology: *Warwick, Oxford, Bath*
- Financial mathematics: *Oxford, Imperial, Exeter*
- Actuarial mathematics and statistics: *Heriot-Watt*
- Operational research: *Warwick, Southampton, Heriot-Watt*
- Materials science (nano fabrication)
- Earth sciences, weather and climate
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Masters programs at Bath

- Recruitment up year-on-year over past 3 years: 2005-6: 13, 2006-7: 18, 2007-8: 25+
- Increasing (but still small) numbers of overseas students
- More mature students, students with non-math first degrees, students from lower ranked maths departments
- Destinations:
 - 100% employment for the national sector
 - 100% employment for research projects
 - 100% employment for industry
 - 100% employment for interdisciplinary topics
- (Modern Applications of Mathematics MSc) Industrial advisory board: 12 companies represented; input on course content; lectures; projects
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Integrated PhD program

- Mathematics or statistics
- Personalized program:
 - Year 1: MSc registration, MSc program of taught courses, exit or progress
 - Year 2: Transfer to PhD, 30% taught courses (4 units)
 - Year 3-6: Research, transfer to 1 PhD
- Permits long term evaluation

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Engineering Doctorate program

- **Vocationally oriented doctorate in engineering**
- Initiated 1992, first graduates 1997
- Operates through designated centres
- Time spent 25% at university, 75% at collaborating company
 - Personalized program of taught courses
 - Management + specialist subjects
 - Projects designed jointly by academics and industry
 - Joint supervision
 - Project work must be integrated with company activity
- Funds: EPSRC → Collaborative Training Accounts → students

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European Study Groups for Industry

- Training ground for “applied” mathematics
- Fits with MSc and EngD objectives
- Several events each year
- Typical format:
 - Monday: presentation of problem from industry
 - Tuesday–Thursday: dedicated working groups
 - Friday: presentation of solutions/results
- Sample participants: Airbus, Schlumberger, British Energy, Norsk Hydro, British Telecom (BT), Unilever, Motorola, ...
- More information: <http://www.maths-in-industry.org>

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Complexity Science

- Emerging inter-disciplinary topic:
 - Sciences: physics, mathematics, chemistry, biology, computer science
 - Engineering: materials science, bio-mimetics, architecture
 - Humanities: economics, social policy, management
- Centres:

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 - Warwick Institute for Complex Systems (WICS)
 - Bristol Institute for Complex Systems (BICS)
 - Bath Institute for Complex Systems (BICS)

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 - Exit after 12 months (180 ECTS) with MRes
 - Candidates from all areas of natural sciences
 - Taught: courses, projects, summer schools, seminars, workshops
 - Taught content: non-linear dynamics, control theory, statistics, emergent behaviour, self-organization
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Complexity Science

- Emerging inter-disciplinary topic:
 - Sciences: physics, mathematics, chemistry, biology, computer science
 - Engineering: materials science, bio-mimetics, architecture
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Questions?