MPHIL in GEOGRAPHICAL INFORMATION SYSTEMS AND REMOTE SENSING

1.	**Awarding body**	University of Cambridge
2.	**Teaching Institution**	University of Cambridge
3.	**Accreditation Details**	None
4.	**Name of Final Award**	Master of Philosophy
5.	**Programme Title**	Geographical Information Systems and Remote Sensing
6.	**UCAS Code**	None
7.	**Benchmark Statement**	None
8.	**Qualifications Framework Level**	M
9.	**Date of production**	January 2007

Educational Aims of Programme

This course is intended for students who have a substantial background in geography or a related field with a good first degree. It aims to provide:

i)   rigorous advanced theory and method training in the fields of geographical information systems (GIS) and remote sensing;
ii)   in-depth study of research level applications using GIS and remote sensing:
iii)   experience of doing advanced research;
iv)   transferable employment skills including research management skills by completing a research thesis under academic supervision and guidance.

The first and second aims are met through modules taught principally (but not exclusively) by members of staff in the Department of Geography.

The third aim is met through students undertaking a dissertation. This requires the student to design, execute and write up a research project that they have specified themselves. The fourth aim is met through seminars, where students make presentations, group working, course work and project management.

There is an alternative pathway through the programme (pathway B) which has received ESRC research training recognition. This version of the course aims to provide i) to iv) above but with a focus on GIS:

v)   broad-based training in geographical research, its philosophical backgrounds and debates and interpretation of geographical literature;
vi)   broadly based training in social science and geographical research methods.

The above aims are met through modules taught departmentally and on a Faculty wide basis as part of the generic social science and departmental research training programmes.

Programme Outcomes

The course is oriented towards giving the students in the first term a rigorous understanding of key theoretical issues and methodologies in GIS and remote sensing as well as the practical skills to implement them. Practical skills training is covered in compulsory modules including: Foundations of integrated GIScience; Image processing; Multivariate statistics for GIS and image processing; Spatial data analysis for GIS and image processing; Building a GIS.

The applications modules in the second term provide linkage between methodology on the one hand and societal and environment problems and their interaction on the other. This gives students an understanding of the importance of these tools for scientific and policy-related research as well as general problem solving. Substantive research-led application modules using GIS and remote sensing include Spatial and environmental epidemiology; Spatial analysis in health services and crime research; Biosphere – Landscape ecology and environmental modelling; Archaeological remote sensing and cultural resource management; Environmental hazards: Cryospshere; Earth system, atmosphere and volcanoes.

Pathway B focuses 50% on the GIS elements of the programme, including those elements of remote sensing that are relevant to social scientists. The other 50% is on generic social science training in research methods (quantitative and qualitative) and the philosophical background to debates in the geographical literature.

This generic social science and contemporary human geography component of research training seeks the following learning outcomes:

i)   that students are familiar with an appropriate range of intellectual and methodological traditions within geographical research and the social sciences, and understand the significance of alternative epistemological positions that provide the context for research;
ii)   that students become critical and skilled readers of geographical and other research publications;
iii)   that students develop their capacity to frame research questions, to derive appropriate research designs, and develop awareness of alternative approaches;
iv)   that students develop a competence and confidence in using a range of both qualitative and quantitative methods for gathering, analysing and interpreting evidence;
v)   that students develop their skills in presentation of research-based evidence and arguments;
vi)   that students develop a capability to manage research, including data management, conducting and disseminating research, working in a team, and understanding codes of research practice and research ethics;
vii)   that students gain practical experience of managing geographical research through conducting a research project.

Pathway B offers a firm foundation for doctoral students because of the balance between subject-specific and generic skills training and research. For students registering for either pathways, support is given to a range of innovative dissertation projects by staff who are themselves highly research active in the areas covered by the course. Extensive theoretical training is designed to give students the understanding and confidence to tackle unfamiliar problems from first principles. The dissertation forms a critical element in the course and an important opportunity for students to test their research skills.

Transferable skills relevant to research employment in a wide range of walks of life or as the first stage of a PhD thesis are obtained through those numerous elements of the course that deal with database construction and management, statistical and computational method, verbal argument and verbal presentation, project proposal writing including project design and project management.

Programme Structure

December	Submission of 1st essay	Marked and feedback given
February	Submission of 2nd essay	Marked and feedback given
April	Submission of 3rd essay	Marked and feedback given
May	Exam and submission of 4th essay	Marks given
August/September	Submit Thesis, Oral Examination	Degree Awarded

Requirements for the award of the degree:

The assessment of all Cambridge M.Phils is under the formal control of a Degree Committee, which in our case is the Degree Committee of the Faculty of Earth Sciences and Geography.

Assessment of the course consists of:

- **A single written paper:** The paper will last for three hours. Candidates are required to answer **three** questions from a **choice of ten** which will examine all of the taught modules in the course. The written paper will account for 25% of the examination.

- **four essays or other exercises:** Each essay must not exceed **4000 words** excluding a bibliography and appendices. Students must complete **one** essay related to **each** of the following three titles:
  - i) A technique for or application of image processing;
  - ii) A technique for or application of GIS;
  - iii) A technique or application of **either** remote sensing **or** geographical data acquisition, visualisation and/or analysis.

Each essay <u>must</u> incorporate a significant component of practical work, address issues of research design, and demonstrate familiarity with the general field of literature with which it is concerned. The titles above are intended to be broad and students should select an appropriate **specific** topic for each. The first essay submitted must be either (i) or (ii) above and be based upon the material taught in the modules given in the Michaelmas Term emphasising some aspect of the technical material covered in relation to the chosen application. The later essays should place greater emphasis on application.

- **4th Essay**: The fourth essay/exercise requires a **concise technical report** concerned with the student's dissertation project. This should outline the aims and objectives of the project, the background rationale, the methodology to be employed, any preliminary results, and the research plan. The report may be in the form of a conventional essay or as a NERC Small Grant Application. This will be followed by a 15-minute **oral presentation** on the dissertation topic at a graduate forum organised for **all** the GIS and Remote Sensing M.Phil. students. Each essay will account for 6.25% of the examination marks.

- **The Dissertation:** The dissertation must be of **not more than 15,000** words excluding tables, bibliography and appendices. It must contain evidence of both theory and practical work in GIS and/or Remote Sensing. The dissertation will account for 50% of the examination marks.

For students following pathway B, generic training counts for 10% of the final marks, the dissertation 50% whilst the combination of written paper (15%) and essays (25%) complete the assessment.

Requirements for the Award of the Degree

In order to be awarded the Degree of Master of Philosophy in GIS & Remote Sensing, candidates must achieve a score of at least 60%. Furthermore, candidates are expected to pass the two examination components (Component 1: written paper, essays; Component 2: dissertation) by achieving a score of at least 60% of the marks allocated to the component. In the event that a candidate scores a marginal fail in one component of the examination, this may be offset by a compensating pass in another component.

Candidates may be called for a *viva voce* examination in either June or September. The viva in June will be based upon the essays and written examination. The viva in September will be based upon the dissertation.

No aggregate numerical mark for the entire M.Phil is awarded.

The overall result in the MPhil is either Pass or a Fail. There is no 'distinction' or other grade within the Pass category.

Indicators of Quality

The MPhil course in GIS and Remote Sensing was included in the Department of Geography's TQA review of 1995 and received excellent. Pathway B was recognised by ESRC in the 2001 exercise. The Department's was awarded 5 in the last Research Assessment Exercise.

Learning Support

All students are members of a College as well as the Faculty and have access to learning support from both College and University. Each student has an overall supervisor who gives advice on planning the year's work. Individual specialists may also help with preparation for essays.

Progress is monitored through the submission of papers and essays. The College Tutor for graduates will also play a role in induction, support and guidance. An MPhil Handbook is available for all MPhil students as well as a Handbook specific to the MPhil. The Department's learning resources include a library which constitutes the main working collection for MPhil students; computer facilities for graduate students, laboratories, and a drawing office.

The MPhil students benefit from a dedicated teaching laboratory (inaugurated in late 1999) which houses a wide range of computing hardware and software dedicated to capture, processing, printing and archiving of image and non-image datasets. Available hardware includes a dedicated network of high-specification PCs, UNIX workstations, a TDS large format digitising tablet, an A3 high resolution colour scanner, several colour printers, and assorted CD-ROM and DAT, and input/output devices. Software supported includes Arcview, Arc-Info, ERDAS Imagine, S+, ERDAS Orthomax Pro, PCI, Mapviewer, Minitab and WinBilko. The Department of Geography hosts the University's Automated Cartography Unit and has close links with the Unit for Landscape Modelling. The course is supported by a computer technician.

All students in Cambridge enjoy access to the exceptional bibliographic resources of University and Departmental libraries. The Department of Geography itself contains one of the country's largest Geography libraries in addition to an extensive map collection. Additionally, the Departmental physical geography laboratories permit a wide range of physical and chemical measurements that can support dissertation work. These include facilities for chemical and physical analysis of soil, sediment and water samples (wet chemistry, atomic absorption and flame emission spectroscopy, UV-visible spectrophotometry, pH, ion sensitive electrodes and electrical conductivity, laser particle analyser,

and highly accurate balances). The Department also has a flume tank, a variety of sieves, shakers and pulverisers, and a magnetic susceptibility meter. Pollen preparation and analysis and general microscopy are carried out in the Quaternary Palaeoenvironments labs.

Evaluating and Improving the Quality and Standards of Learning

The Department of Geography participates in the University's quality assurance and enhancement system:

- External Examining: The MPhil in GIS and Remote Sensing has an external examiner who submits a report which is considered by the Degree Committee (responsible for graduate matters) and Faculty Board of Earth Science and Geography. Action in response to reports includes, where appropriate, the revisions or adjustments to the programme and its delivery;
- Course approval: the Department through the Faculty is required to obtain the approval of the Board of Graduate Studies and the General Board's Education Committee before any significant changes to courses are made;
- General Board Internal Review: all the Department's activities, including the M Phil were reviewed by the University's General Board in 2001;
- A representative from the GIS and Remote Sensing MPhil students is a member of the Departments Graduate/Staff Consultative Committee where students can raise any issues of concern and improvements to facilities and the course can be considered and acted on.

Employment and careers

The list below gives a flavour of the subsequent employment of course graduates:

- Photogrammetricist, British Antarctic Survey
- PhD, Nottingham; then US Dept. of Agriculture, Hydrology Lab, Maryland
- PhD, Dept. of Geography, Cambridge (hydrology)
- GIS specialist, Geomatics Nigeria Ltd., Ibadan
- English Heritage, GIS specialist, Stonehenge-Avebury World Heritage Site
- Risk Management Solutions, Inc. (Europe) - GIS specialist, Cambridge
- PhD, Dept. of Archaeology, Cambridge (visualisation of geophysical data)
- PhD, Scott Polar Research Institute, Cambridge (environmental impact of pollution, Siberia)
- PhD, Dept. of Archaeology, Cambridge (megalith sites in France)
- GIS consultant for Autodesk, Nicosia, Cyprus
- IT group, Shell, London
- PhD, Plant Sciences, Cambridge (plant genetics, Belize)
- PhD, Dept. of Geography, Cambridge (eutrophication, Malta)
- PhD, Dept. of Geography, Cambridge (land use mapping, Italy)
- GIS specialist, Urban planning office, San Francisco