

# MSC DEGREE COURSE IN GEOINFORMATICS AN ITC PERSPECTIVE

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## ABSTRACT:

The International Institute for Geo-information Science and earth Observation established in 1950 under the name International Training Centre for Aerial Survey (hence ITC), is an autonomous organisation operating under the aegis of the Ministry of Education, Culture and Science and the Minister for Development Cooperation of the Netherlands and linked to the Technical University of Twente. It is the oldest and largest international higher education institute in the Netherlands, and seeks to promote the sound application of geo-information technology through programmes of research, education and project services. ITC's principal mission is aiming at capacity building and institutional development specifically in developing countries.

In order to achieve its mission, the ITC has established six educational programmes with different specialisations, each run by a small group of scientific departments. These educational programmes offer different specialisation courses at the Professional Master (PM) and Master of Science (MSc) levels.

The Master of Science (MSc) degree course in Geoinformatics, of 18 months duration, is thoroughly reported in this paper. Its objectives, structure, and curriculum are explained.

Furthermore the paper, elaborates on the accreditation and decentralisation of education strategy of ITC particularly on the MSc degree level, and describes some successful implementations of decentralisation of education at the MSc level in Geoinformatics. It also emphasise the point, that the option of full-time study in ITC's headquarters in the Netherlands is fully maintained.

## 1. INTRODUCTION

ITC is an internationally recognized centre of excellence in international education. It aims at capacity building and institutional development of professional and academic organizations and individuals specifically in countries that are economically and/or technologically less developed.

Six educational programmes have been established at ITC, each run by a small group of scientific departments, leading to Diplomas that their duration varies in the different educational programmes, to Professional Master (PM) of a duration of one year and to the Master of Science (MSc) of a duration of 18 months degrees:

- Geoinformatics (GFM)
- Geoinformation Management (GIM)
- Earth Resources and Environmental Geosciences (EREG)
- Natural Resources Management (NRM)
- Urban Planning and Land Administration (UPLA)
- Water Resources and Environmental Management (WREM)

## 2. MSC. DEGREE COURSE IN GEOINFORMATICS

Critical understanding of and competence in the development of systems and tools for the acquisition, processing, transformation, analysis, storage, presentation and use of

geoinformation are the major aims of the MSc degree course in Geoinformatics. Next to these is the development of skill so that participants are able to design and undertake research and development projects in various fields of geoinformatics and to participate in multi-disciplinary research and development projects.

### 2.1 Course objectives

It is expected that on completion of the course, participants should be able to:

- analyse a problem encountered in professional geoinformatics practice and develop an appropriate method to study and/or solve the problem;
- select and possibly develop appropriate methods for geospatial framework data collection and processing;
- use GI science and earth observation technology to generate, integrate, analyse and visualize spatial data;
- understand the principles of databases and data models and to use database query languages;
- apply research skills to formulate and carry out independent research in the general field of geoinformatics, possibly as part of a multi-disciplinary research and development project;
- communicate and defend findings of research work.

### 2.2 Duration and structure

All ITC courses begin simultaneously in early September each year. The MSc course, is of 18 months duration (12 months

course work and 6 months research period) and consists of a number of modules each module last three weeks and comprises theoretical lectures, practical assignments, seminars, tutorials, and in some cases group workshops.

The study load of the ITC degree programmes follow the European Credit Transfer System (ECTS) developed by the European Union in order to allow easy comparison of the study load of courses within Europe and as a means of improving academic recognition for study abroad.

At ITC, each module of three weeks duration has a study load of 5 ECTS. In ECTS, 60 credits represent the workload of an academic year of study.

The MSc course consists of 23 modules and three additional weeks of remedial teaching, catch-up activities and graduation ceremony, totalling 118 ECTS.

### 2.3 Course Curriculum

Participants in both courses in Geoinformatics (PM or MSc) are introduced to common concepts and theory of geoinformatics technology in the first seven modules.

After a general introduction in the first module the participants are expected to have a broad view of the field and to be able to appreciate their course objectives.

The following three modules are closely integrated, with the major elements being Geographic Information Systems (GIS) and remote sensing. These subjects are taught as core subjects in all the ITC PM and MSc educational programmes and the aim is to impart fundamental knowledge and to provide a basis for the rest of the course. In addition, especially for the Geoinformatics programme, much emphasis is placed on database principles in these modules.

The following three programme modules deal with the topics framework data generation, visualisation and dissemination of geospatial data and the design and operation of integrated GI production and dissemination systems.

The students of both courses take in addition two elective modules. The ITC scientific departments offer elective modules and students are allowed a free choice.

After the common geoinformatics technology modules, MSc participants continue deepening their knowledge in basic research skills, spatial information theory, sensor systems and information extraction and web technology for GIS and mapping, there are also follow one additional elective module.

During the modules mentioned, the course participants gain knowledge about Geo-informatics in the programme modules, related topics in the electives and they were trained in basic research skills.

The next module is the intermediate between those modules/topics and the research period.

In the first half of the module the participants will take a course in structured thesis production which will allow them to create, under the guidance of one or more supervisors, a research proposal, which will be the basis for the research that is executed in the last 6 month of the GFM MSc course. The proposal should be related to the research fields of the scientific departments which support the GFM programme, namely the Earth Observation Science and the Geoinformation Processing Departments.

By the end of this module the proposal will be presented and defended verbally.

Based on the final thesis research proposal its presentation and its defence, the Geoinformatics Programme Board will decide whether the participant will be admitted to the thesis part of the MSc programme.

For a period of approximately one week course participants take part in a study excursion to a number of chosen European organisation involved in geoinformatics. These may include National Mapping Organisations, commercial companies and research and development institutions.

The final stage of the MSc course is dedicated to the execution of the research project. Each participant works independently on the approved research topic.

During the project the students develop their research skills further and have to demonstrate that they have achieved the course objectives.

The co-ordinating staff will provide guidelines for the thesis work. Regular individual progress reports and progress meetings with the supervisors will monitor the progress on the thesis. The final outcome will be a report (hardcopy and CD-Rom) as well as an oral presentation and defence of the thesis.

Because of the great emphasis in the MSc degree course on the integration of all geoinformatics concepts and the time devoted to acquiring general research skills, there are no clear specializations in the MSc Degree course. However, the total of three elective modules and the six months of MSc research work provide ample opportunity to select topics of personal or organisational and national interest.

### 2.4 Persons involved and Participants

Professors for Remote Sensing, Photogrammetry and Geographic Information Systems and other ITC staff members teach the main subjects in the course. For special subjects lecturers from other Universities and Institutes as well as from the private sector are invited to contribute with their experience to the high international reputation of the course.

For admission to the MSc course applicants should have a BSc degree from a recognised university in a discipline related to the course that will follow, i.e. Geoinformatics.

The last five years statistics revealed the following facts:

Mean number of participants per course 16.

Percentage of female participants 38%

The courses have really an multinational flavor, typically, per course, there are participants with 10 different nationalities

From the total number of participants the statistics also illustrate the following distribution, according to the continents.

Africa 27%, America 11%, Asia 58%, Australia/Oceania 0% and Europe 4%.

## 3. ACCREDITATION AND DECENTRALISATION OF EDUCATION

Accreditation is on the international agenda as a result of the Bologna Declaration that aims : to create a European space for higher education in order to enhance the employability and mobility of citizens and to increase the international competitiveness of European higher education.

### 3.1 Accreditation

The ITC MSc degree courses have to maintain their high reputable place in the new Dutch and European higher education structure; accreditation procedures to ensure the quality of the offered courses have been already started under the official Dutch accreditation system, i.e. by the National Accreditation Organisation (NAO), that independently award accreditation to educational programmes and assures that the final judgement is formal and public.

### 3.2 Decentralization of education

ITC in order to address the increasing demand for flexibility in academic degree programmes is, among other things, on the line to decentralise parts of its educational programmes.

The term decentralisation is used to indicate the process of transferring components of ITC accredited educational programmes to partner organisations in countries or regions of course participants, conditional to continuous upgrading and quality control by ITC and the partner organisation.

Besides being implemented outside ITC's headquarters in Enschede the Netherlands, the actual implementation (i.e. including student acquisition, registration, guidance, lecturing etc) become largely the responsibility of staff of partner organisations.

ITC staff members are involved mainly to introduce new topics and for quality control purposes, including assessment. Staff of partner organisations is also involved in the implementation of the components at ITC in the framework of staff exchange and quality control.

Parallel to the decentralisation process the option of full-time study in ITC's headquarters in the Netherlands is fully maintained.

ITC has been involved in a number of decentralised courses, i.e. joint courses for some years now. The delivery of the joint courses was transferred (partly) to the staff of the partner institutes. One of the main challenges ITC has faced with these joint courses is to maintain quality standards at the level applied in the internal courses, to safeguard the interest of the students in external courses and to safeguard ITC's brand name in the world.

Since the start of the joint courses, ITC has worked hard on quality maintenance, during the development of the curricula, the training of trainers, the establishment of assessment criteria and the joint assessment of the final MSc thesis research.

Two successful implementations of decentralisation of education at the MSc level in Geoinformatics are given here.

The first is with decentralisation partners in Iran. In this case there are two decentralisation partners, the Research Centre resorting under the Ministry of Jihad-e-Sazandegi and the Khajeh Nasir Toosi University of Technology. The first stream started in July 2001 with 8 candidates. The second stream is likely to start in October 2004.

The second implementation is in India with decentralisation partner the Indian Institute of Remote Sensing (IIRS). The implementation of joint MSc course in Geoinformatics started in July 2002. Ten candidates graduated with an MSc degree in December 2003. The second stream is now running.

The implementation process of decentralisation of education consists of the following phases:

- Identification of potential partners and courses
- Pre-feasibility assessment
- Development of the collaboration and joint course
- Implementation and consolidation. Including a training of trainers component that will precede the start of actual implementation.

The above process phases have been already initiated for the identification of further potential decentralisation partners.

## 4. CONCLUSIONS

We have highlighted the MSc degree course in Geoinformatics of ITC, an institute that in the 55 years of its history was and is at the front line of Geoinformation Science and Earth Observation.

The goals of the MSc course are clearly pointed out, and can be summarised as being the critical understanding of, and competence in, developing systems and tools for the acquisition, processing, transformation, analysis, storage, presentation and use of geo-information. In addition skills are developed to enable participants to design and undertake research and development projects in various fields of Geoinformatics, as well as participate in multidisciplinary research and development projects.

The course of 18 months duration is composed of a series 23 modules of three-week duration each. The final stage of the MSc course of six months duration is dedicated to the execution of a research project on an individual basis, sometimes directly linked to the home country and/or the profession of the participant. Most of the time is linked to the ongoing research programmes of the two scientific departments which support the Master of Science Degree Course in Geoinformatics, namely the Earth Observation Science and the Geoinformation Processing Departments.

Special attention was also given to the two important issues of accreditation, and decentralization of ITC's MSc degree course in Geoinformatics.

Accreditation procedures to ensure the quality of the offered course and in order the course to maintain its high reputable place in the new Dutch and European higher education structure have been already started under the official Dutch accreditation system.

Furthermore, two successful implementations of decentralisation of education at the MSc level in Geoinformatics with partner organisations in Iran and in India are also summarised, whereas the phases of the implementation process of decentralisation of education are outlined.

Parallel to the decentralisation process the option of full-time study in ITC's headquarters in the Netherlands is fully maintained.

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