

## UNDERGRADUATE AND POSTGRADUATE PROGRAMMES IN REMOTE SENSING AT UNIVERSITI TEKNOLOGI MALAYSIA

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### Abstract

The Faculty of Geoinformation Science and Engineering at Universiti Teknologi Malaysia has been offering B.Sc programmes in land surveying and property management since 1972. However, with the increasing needs for professionals in other fields such as remote sensing, geoinformatics and land administration & development, the Faculty now offers three more new courses, namely (1) B.Sc (Remote Sensing), (2) B.Sc (Geoinformatics), (3) B.Sc (Land Administration & Development). The Faculty also has been offering postgraduate programmes related to geomatic engineering, remote sensing, geoinformatics, GPS surveying, hydrography, property management and land administration & development. This paper presents an overview of the undergraduate and post graduate programmes in remote sensing at the faculty.

### INTRODUCTION

Education in remote sensing and related technologies has its roots from the undergraduate programme in land surveying at the Faculty of Surveying and Real Estate (now called geomatic engineering at the Faculty of Geoinformation Science & Engineering). Remote sensing has been taught as compulsory subject as well as an optional subject in this course. However, with the increasing importance given to remote sensing in order to fulfil the human resource development needs of the country, a four-year undergraduate programme was started in May 1997 at the Faculty leading to B.Sc (Hons) Remote Sensing degree. The postgraduate programmes in remote sensing have been offered since 1988.

### COURSE STRUCTURE AND CURRICULUM

#### Undergraduate Programme

This programme which consists of 127 credit hours emphasis on basic sciences, core and main core remote sensing, computer science and mapping science. The distribution of credits are given in Table 1. The curriculum for the course is given in Appendix 1 and the descriptions of the subject areas is given in Appendix 2.

Subject Areas	No. of Subjects	No. of Credits *	Percentage
Main core	6	24	18.7
Core	15	45	35.2
Mapping Science	2	6	4.7
Computer Science	3	9	7.0
Maths, Physics, Statistics	4	12	9.4
Optional subjects (3)	3	9	7.0
University subjects	12	23	18.0
Total	45	128	100

- Note : One (1) credit hour equivalent to one (1) hour lecture per week. Three (3) credit hours make up of two (2) hours lecture and two (2) hours laboratory or four (4) hours field practicals per week.

**Table 1** : Subject areas and distribution of credits

#### **Master and PhD Programme**

The Master programme is offered in 3 ways :

- Master through taught course
- Master through taught course and research
- Master by research

The total number of credits for the course is 30 with the duration ranging from 1-2 years. The course work requirements for a Master degree in Remote Sensing can be satisfied through the following subjects :

- Basics of Remote Sensing
- Atmospheric Physics
- Satellite Orbits and Instrumentation
- Digital Image Processing
- Ground Observations in Remote Sensing
- Advanced Digital Image Processing
- Applications of Remote Sensing
- Radar Remote Sensing

The PhD programme is a full research programme of 90 credits to be completed in a duration of 3-4 years. Master through research and PhD candidates are encourage to formulate their own research topics to suit their interest or experience. Below are some past research works completed by postgraduate students and academic staff :

- Bathymetry from clear and turbid waters
- Sea bottom features mapping
- Suspended sediment concentration studies
- Vegetation index mapping
- Sea surface temperature studies
- Heat island mapping
- Seagrass and coral reef mapping
- Urban hydrology applications
- Land use studies

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- Radar remote sensing for land applications
- Topographic mapping from satellite stereo data
- Digital elevation model generation
- Software development

### **ENTRY QUALIFICATIONS**

The entrance requirements for the course are as follows :

- a] B.Sc Programme  
Pass the Sijil Pelajaran Malaysia (equivalent to Cambridge O-Level exams) with credits in stipulated subjects
- b] Master Programme  
Posses a relevant bachelor degree recognised by the University
- c] Doctoral Programme  
Possess a relevant Master degree recognised by the University

### **EMPLOYMENT OPPORTUNITIES**

Graduates with the B.Sc degree in remote sensing can seek employment in the public and private sector as managers in remote sensing and GIS projects, System Analyst un image-based Information System, programmers for image-based Information System and research officers in remote sensing and GIS organisations.

Similarly, graduates with a Master and PhD degree can also obtaine employment in the public and private sectors as researchers or managers in remote sensing and GIS organisations as well as in academic instutitions.

### **LABORATORY FACILITIES**

The Centre for Remote Sensing is well equipped to support research and consultation activities. Amongst the facilities available are :

- Ten units PCI EASI/PACE Digital Image Analysis System, connected to LAN
- Ten units of ILWIS Integrated Image Processing and GIS System, connected to LAN
- ERDAS Images Integrated Image processing and GIS System, connected to LAN
- ARC-INFO GIS System, connected to LAN
- Five units of ARCVIEW GIS System, connected to LAN
- Five units of ERMAPPER Digital Image Analysis System, connected to LAN
- Five units of MAPINFO Geographic Information System, connected to LAN
- Digital Photogrammetric Workstation DMS
- Magellan hand-held Global Positioning System (GPS)
- Radiometer and integrated sphere for supporting radiometric works

- Other supporting softwares such as MODTRAN , PcGiant, AutoCAD and QuickSurf

Other relevant equipment are also available at the Centre for Geographic Information & Analysis, Centre for Hydrographic Studies, Centre for Geodetic & Geodynamic Studies and Photogrammetry & Cartography Laboratories

### SUMMARY

The undergraduate and postgraduate programmes in Remote Sensing at Universiti Teknologi Malaysia have been described. The course structure, curriculum, admissions entrance, and employment opportunities for the graduates have also been highlighted in the paper. The first batch of the B.Sc (remote sensing) candidates will be graduating in May 2001.

<u>Main Core</u>	<u>Core</u>	<u>Maths, Physics &amp; Statistics</u>
Basic Principles of Remote Sensing Remote Sensing Data Processing Sensor and Remote Sensing Instrumentation Field Observations & Data Gathering Remote Sensing Spatial Analysis Remote Sensing Data Analysis	Introduction to Geoinformation System Introduction to Physical Geography & Oceanography Remote Sensing database Atmospheric Physics Technical Writing Microwave Remote Sensing RS for Earth Resources Management RS for Environmental Applications RS Satellite System & data Transmission Legal Aspects & Policies of Remote Sensing Undergraduate project	Mathematics I Mathematics II Physics I Physics II Statistics
<u>Mapping Science</u>	<u>Computer Science</u>	<u>Optional Subjects</u>
Surveying & Mapping I Surveying & Mapping II Cartography for Remote Sensing Photogrammetry and Image Interpretation	Computer Graphics for RS Computer Programming Database System for Remote Sensing Remote Sensing File System & Data Structure	Minimum of three (3) subjects can be chosen from any inter-department/faculties subjects.

Description of Subject Areas

**B. Sc. (Remote Sensing ) Curriculum**

Year 1, Semester 1	Credits	Year 2, Semester 3	Credits	Year 3, Semester 5	Credits	Year 4, Semester 7	Credits
Surveying & Mapping	3	Intro. To Comp. Info. Syst.	3	Sensors & RS Instr.	4	RS for Envi. Applic.	3
Mathematics I	3	Cartography for RS	3	Database Syst. for RS	3	RS Spatial Analysis	4
Physics I	3	Intro. to Pys. Geog. & Ocea.	3	Atmospheric Physics	3	RS Data Analysis	4
English Language I	2	Computer Graphic for RS	3	File System & Struc. for RS	3	Sat. Syst. & Data Trans.	3
Philosophy of Science	2	Philosophy of Science	2	Philosophy of Science	2	Optional subject I	3
Co-curriculum	1	English Language III	2				
<b>Total Credits</b>	<b>14</b>	<b>Total Credits</b>	<b>16</b>	<b>Total Credits</b>	<b>15</b>	<b>Total Credits</b>	<b>17</b>
Year 1, Semester 2	Credits	Year 2, Semester 4	Credits	Year 3, Semester 6	Credits	Year 5, Semester 8	Credits
Surveying & Mapping II	3	Intro. to Geoinfo. System	3	Technical Writing	2	Legal Asp. & Policies for RS	2
Photog. & Image Inter.	3	Statistics for RS	3	Microwave Remote Sensing	3	RS Project Manag.	3
Mathematics II	3	Basic Principles of RS	4	RS Data Processing	4	Undergraduate Project	5
Physics II	3	Computer Programming	3	RS for Earth Resour. Manag.	3	Optional subject II	3
English Language II	2	Malaysian Studies	2	Ground Obs. & Data Gather.	3	Optional subject III	3
Malaysian Studies	2			Malaysian Studies	2		
Co-curriculum	1						
<b>Total Credits</b>	<b>17</b>	<b>Total Credits</b>	<b>15</b>	<b>Total Credits</b>	<b>17</b>	<b>Total Credits</b>	<b>16</b>

**Total Credits : 127**