1. INTRODUCTION
The Postgraduate M.Sc. programme in GIS and Remote Sensing offered by the Postgraduate Institute of Science of the University of Peradeniya, seeks to provide a sound theoretical and practical knowledge and comprehensive training in the Geographic Information systems (GIS) and Remote Sensing (RS). The goal of this M.Sc. course is to provide opportunity for the participants, a critical understanding and competence in developing systems and tools for the acquisition, processing, transformation, analysis, storage, presentation and use of geo-spatial information. In addition, skills are developed to enable the participants to design and undertake research and development projects in various fields and also to actively engage in multidisciplinary research and development projects.

GIS and RS are rapidly evolving towards becoming standard tools, influencing everyday decision-making particularly among professionals. Even though this has been described as “Geoinformatics” by some of the professionals, the Postgraduate Institute of Science decided to name it as “GIS and Remote Sensing” due to its popularity. As a multi-disciplinary programme, it includes courses in Geographical Information System, Remote sensing, numerical methods and algorithms in RS and GIS, Digital photogrammetry, GPS and its applications, digital image processing. In addition, there are courses in application of GIS in various disciplines such as Earth Sciences, Land use planning, Disaster Management, Natural resources Management, Agriculture, Forestry, Wild life, Transportation and supply network, Transmission and Telecommunication network will be included. The programme is designed for the students to use computers throughout the programme, enabling them to use the latest software available in the fields of GIS and Remote Sensing.

The programme includes a dissertation component and the students are required to select a suitable research topic in any of the fields mentioned above and submit a research report in the form of a dissertation. In this connection, the students are free to select an institution of their choice to conduct the research study. The Postgraduate Institute of Science would also help the students to find suitable institutions and topics for their research.

2. AIMS AND OBJECTIVES
This programme aims at developing human resources in the fields of GIS and Remote Sensing. The objectives of the programme are;

1. To train personnel in the fields of remote Sensing and Geographic Information Systems and the related aspects at postgraduate level.
2. To Provide an opportunity to improve existing skills in GIS and Remote Sensing.
3. To provide a necessary background knowledge for research in Remote Sensing and GIS applications.
4. To provide necessary skills for use of GIS and Remote Sensing in management of natural resources.
3. PROGRAMME ELIGIBILITY

This programme is designed to suit professionals and young graduates who do not have any previous experience in the use of GIS or Remote Sensing. Candidates should have a strong background in at least one of the following subject areas: Computer science, Physical and Biological Sciences, Earth and Natural Sciences, Geography, Agriculture, Engineering, Medicine or any other discipline that will be endorsed by the Board of Study in Earth Sciences of the PGIS.

The candidates who are employed and eligible for admission need to produce evidence of leave granted to follow the programme and a letter of release from the relevant Head of the Department/Institution.

4. PROGRAMME FEE

(N.B. The programme fees given below may be revised.)

<table>
<thead>
<tr>
<th>Country of Origin</th>
<th>M.Sc. Programme Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Candidates</td>
<td>Rs. 150,000</td>
</tr>
<tr>
<td>Foreign Candidates</td>
<td>Rs. 300,000</td>
</tr>
</tbody>
</table>

Programme fee shall be paid in two instalments (50% at registration and next 50% within six months from registration). Other payments including registration fee, medical fee, library subscription, examination fee and deposits (science and library) should be paid according to the procedure stipulated by the PGIS.

5. THE PROGRAMME STRUCTURE AND DURATION

This is a full-time programme consisting of course work and a research project. Course work will be conducted over a period of two semesters of 15 – weeks each. The taught courses will be conducted on Fridays, Saturdays and/or Sundays covering a total of 12 - 15 hours per week. The entire programme duration will be about 15 – 18 months inclusive of 3 - 6 months for the individual research project. Satisfactory completion of a minimum of 24 credits of course work (with a Grade Point Average - GPA of not less than 3.00) is required for the programme in addition to the six credits allocated for the full-time research project (If the student obtains a GPA in the range of 2.75 to 2.99, then he/she is eligible only for the award of the Diploma in GIS and Remote Sensing). Continuous attendance is compulsory during the period of research work. After successful completion of the research project, the student is eligible for the award of the M.Sc. Degree. Based on the performance by students in the taught courses and thesis, PGIS may upgrade the registration of such students to M.Phil. or Ph.D. programmes.

Each candidate will be assigned an academic advisor, whose advice should be sought when planning the M.Sc. Programme. The approval of the programme coordinator is necessary prior to the commencement of the programme. English will be the medium of instruction.

Programme Summary

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Description</th>
<th>Lecture hrs.</th>
<th>Practical hrs.</th>
<th>No. of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESR 501</td>
<td>Fundamentals of Geographic Information Systems (GIS)</td>
<td>25</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>ESR 502</td>
<td>Remote Sensing and Aerial Photography</td>
<td>25</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>ESR 503</td>
<td>Database Management Systems</td>
<td>20</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>ESR 504</td>
<td>GPS and its Applications</td>
<td>15</td>
<td>45</td>
<td>2</td>
</tr>
</tbody>
</table>
6. PROGRAMME CONTENTS

ESR 501: Fundamentals of Geographic Information Systems (GIS) (3 Credits)

Course Outline
Introduction to GIS, Definition, Overview, History and Concepts of GIS, Scope and Application areas, Purpose and Benefits of GIS, Functional elements of GIS, Required hardware and software for GIS, Required functions of GIS software, Installation of GIS, Mapping Concept – Map Elements, Map scales and representations, Map Projection, Geometric rectification, Data Structure – raster and Vector Data Structures, Input of geospatial data, Sources of data and input devices, Spatial database – concept of spatial database, Data Acquisition and Management Techniques, Data Manipulation and Analysis, Map Output Generation.

Laboratory Sessions
Spatial database development, Data input, Linking non-spatial and spatial database, database editing and updating, GPS data integration in GIS, Data manipulation and preprocessing, Spatial analysis, Map generation, Charting and tabular representation. Mini-project for GIS application.

ESR 502: Remote Sensing and Aerial Photography (3 Credits)

Course Outline
Overview and concepts of Remote Sensing technology, basics of photogrametry, practical uses of aerial photographs/satellite photographs in various disciplines, fundamental characteristics of electromagnetic radiation, interaction of radiation with matter refraction, absorption, diffusion, emission with radiometric terms and units, concepts of spectral resolution and detection, Remote Sensing platforms, Satellite System and sensors, active and passive sensing systems, visual-digital interpretation, overview of RS Applications, Introduction to RS image processing. Image enhancement, geometric correction. RS Image classification,

Laboratory Sessions
Visual interpretation of aerial photographs for land use, land pattern analysis, geological and structural analysis as well as manipulation and analysis of remote sensing images, Text Books and References:
ESR 503: Database Management Systems (2 Credits)

Course Outline
Introduction to databases, database management systems, hierarchical model, relational database, principles and technologies of object-oriented programming, object oriented database, Concept of spatial database, design of spatial database.

ESR 504: GPS and its Applications (2 Credits)

Course Outline

Laboratory Sessions
Hands on sessions with GPS equipments, Real-life case studies, location of a ground point with different coordinate systems, navigation, GPS survey, Electronic data downloading, conversion of GPS data to GIS.

ESR 505: Fundamentals of Space Technology (1 Credit)

Course Outline

ESR 506: Advanced Technologies in GIS (3 Credits)

Course Outline

Laboratory sessions
Database import and export using SQL, Statistical analysis, Regression analysis of spatial data, Advance data analysis, 3D modeling in GIS, Map algebra and cartographic modeling, Hotlinking, Automation and customization, Programming in GIS, Internet GIS.

ESR 507: Advanced Mapping Technology (2 Credits)

Course Outline
**Laboratory Sessions**
Introduction of Auto-2D System and Testing MM Operators, Pre-processing for Scanning Maps, Example of Contour Map and Cadastral Map Recognition

**ESR 508: Digital Photogrammetry** (2 Credits)

**Course Outline**

**ESR 509: Spatial Analysis and Modeling** (2 Credits)

**Course Outline**
Use of GIS in attribute and spatial queries, single and multilayer operations, geometric modeling, point pattern analysis, reclassification and coverage building, surface analysis, raster grid analysis, various types of overlay operations and spatial operations in GIS, Buffer analysis, fuzzy spatial analysis, Basic geostatistical components for spatial analysis, proximity analysis, connectivity analysis, diffusion modeling, establishment of objectives and criteria for analysis, data preparation for spatial operations, evaluation and interpretation of results.

**ESR 510: Application and Development of GIS and Remote Sensing** (3 Credits)

**Course Outline**
Application of GIS in Cartography and map making, geological mapping, Natural resources exploration and management, Environmental planning and management, Disaster management, environmental impact assessment, Geological and Hydrological modeling, coastal zone management, Irrigation system management, Agricultural planning and development, Forestry management, fishery and marine applications, Coastal zone management, Epidemics and Disaster Management and mitigation, Archeology, Planning and management of Transport networks, Telecommunication tower networks, Water supply and distribution networks, Electrical distribution networks, Navigation system development, GIS for business planning and managements etc.

Students are requested to compile a mini project report on the application of GIS in any selected discipline.

**ESR 511: Digital Image Processing in Remote Sensing** (2 credits)

**Course Outline**

**Laboratory Sessions**
ESR 512: Geostatistics in GIS (3 credits)

Course Outline
Methods of statistical learning theory, spatial statistics, and modeling, mapping distances, allocation, shortest path, accumulation surfaces, interpolating to Raster, terrain analysis, spatial prediction and risk analysis, spatial sampling and monitoring network design etc., Interfaces between geo-statistics and GIS, integration of geostatistics and GIS, mutual benefits, statistical problems of error propagation and uncertainty in GIS, etc., Application of geostatistical methods in the Earth and Environmental Sciences, in Agriculture and Forestry, Epidemiology and Health Sciences, Econometrics and Telecommunications, Interfaces between (geo-) statistical software systems, spatial database management systems and visualization and mapping software systems.

ESR 513: Application and Development of Web GIS (2 Credits)

Course Outline

Laboratory Sessions
The Laboratory session will provide hands on experience on using OSS for developing, managing and serving spatial and geo-referenced multimedia contents on the Web.

ESR 514: Numerical Methods and Algorithms in RS and GIS (2 Credits)

Course Outline

ESR 597: Seminar on Applications of GIS and Remote Sensing (1 Credit)

This seminar class is designed to provide graduate students with the opportunity to search information on current topics related to their project/thesis. All graduate students pursuing MSc degrees will be required to take this class and offer their findings, orally in a 30-minute presentation to the faculty members of the Postgraduate Institute of Science and students, six months prior to the completion of their program. This presentation will be followed by a question and answer session. Graduate students will also submit a written version of their presentations (or a hard-copy of their presentation slides) to the Course Coordinator.

ESR 599: Research Project on RS and/or GIS Applications (6 months duration - 6 Credits)

Each student is required to carry out an independent research project on a selected topic related to the development or applications of GIS and/or Remote Sensing, under the guidance of a supervisor and prepare a Project report. Report has to be compiled based on the guidelines stipulated by the Postgraduate Institute of Science.

7. PROGRAMME EVALUATION

Programme evaluation will be as stipulated in the PGIS Handbook 2002.
8. TEACHING PANEL

Dr. P.K. Champatiray, Senior Scientist, Indian Institute of Remote Sensing
M.Tech, PhD (ITC)

Mr. S.D.P.J. Dampegama, Institute of Surveying and Mapping, Diyatalawa
B.Sc. (Kelaniya), MSc (USA).

Dr. H.A. Dharmagunawardena, Department of Geology, University of Peradeniya
B.Sc. (Perad.), M.Sc. (Perad.), PhD (Denmark)

Dr. (Ms.) NDK Dayawansa, Department of Agricultural Engineering, University of Peradeniya
B.Sc. (Perad.), M.Sc. (AIT), PhD (New Castle)

Dr. Jayalath Edirisinghe, Department of Civil Engineering, University of Peradeniya
B.Sc. (Perad.), M.Sc. (Ehime), PhD (Ehime)

Dr. Jagath Gunatilake, Department of Geology, University of Peradeniya
B.Sc. (Perad.), M.Sc. (AIT), PhD (Saga)

Dr. K Jacobsen, Institute of Geoinformatics and Photogrammetry, University of Hannover,
Germany B.Sc., PhD

Dr. S.W. Nawaratna, Department of Geology, University of Peradeniya
B.Sc. (Perad.), M.Sc. (Canada), PG Dip (Austria), PhD (Austria)

Dr. Ranjith Premalal, Department of Agricultural Engineering, University of Peradeniya
B.Sc. (Perad.), M.Sc. (AIT), PG. Cert. (Italy), PhD (Cranfield)

Dr. Uditha Ratnayake, Department of Civil Engineering, University of Peradeniya
B.Sc. (Perad.), M.Sc. (AIT), PhD (AIT)

Dr. Lal Samarakoon, Director, GIS Application Center, AIT, Bangkok, Thailand
B.Sc (Kelaniya.), M.Sc. (Saga), PhD (Ehime)

Dr. Amara Satarasinghe, Director, Dept. of Census and Statistics, Colombo
BSc., MSc., PhD (Perad.)

Dr. Nitin K. Tripathi, Asian Institute of Technology, Bangkok
B.Tech (IIT), M.Tech (IIT), PhD (IIT)

Prof. P. Wickramagamage, Department of Geography, University of Peradeniya
B.A. (Perad.), PhD (UK)

Dr. R.L. Wijewardena, Department of Physics, University of Peradeniya
B.Sc. (Perad.), M.Sc. PhD

PROGRAMME COORDINATOR

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University of Peradeniya
Peradeniya
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077 7313063
E-mail: aajkg@yahoo.com