## SCHEME OF EXAMINATION

and

# SYLLABUS

of

### PG Programme in

### APPLIED GEOINFORMATICS

### (Programme Code:......)

For

### Academic Session 2025 - Onwards
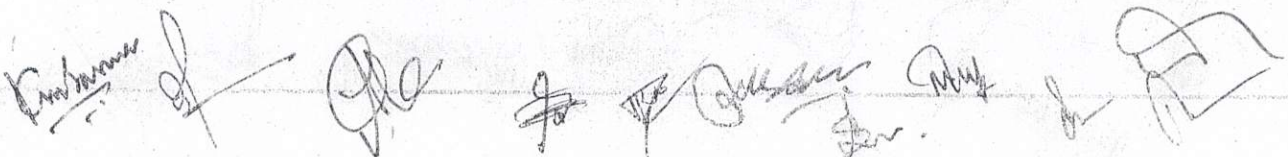
Based on

### LOCF (Learning Outcome Based Curriculum Framework)

### GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY
### Sector 16C, Dwarka
### New Delhi 110078

*Fg. 1 ||Scheme of Examination and Syllabus passed through BOS meeting held on 27.12.2024*

**Programme Code:** .......

**Title of the Programme:** Master in Applied Geoinformatics

**Approval of APC and SRC meeting on** 26.12.2024

**Approval of BOS meeting on 27.12.2024**

**Academic Council's Approval:** _____

**University School of Studies of the Programme:** University School of Environment Management (USEM)

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## GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY
### Sector 16C, Dwarka
### New Delhi- 110078 (India)
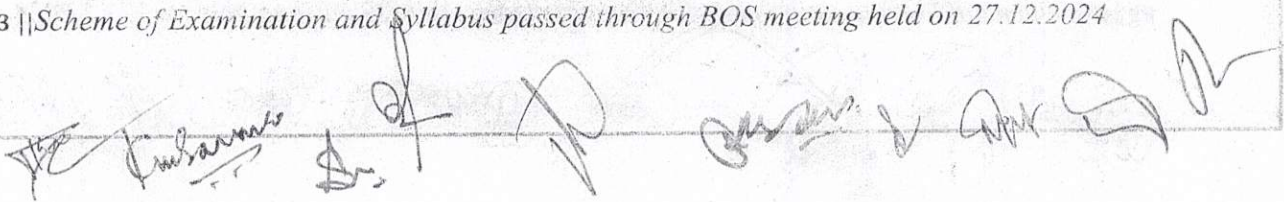
## Master in Applied Geoinformatics

### Introduction

The application of geoinformatics holistically supports the decision making and management of resources in a human-environment system. The large availability of the spatial information of the resources are conveniently operated by the imminent technology of the geoinformatics. Subsequently, the technology transforms the resources' data into key outputs to facilitate the visualization and thus, steering rapid and accurate decision making. As an extended branch of information technology, geoinformatics enables the applicability of remote sensing, digital image processing, GPS, programming, and many more. It uses geospatial analysis and modelling, geospatial databases, geo-computation, geo-visualization and information systems for creating a structured database that handles the geospatial queries and provide insights for relevant problems. Its benefits continual in the numerous arenas for instance urban planning, land use management, in-car navigation systems, environmental modelling and analysis, military, transport network, planning and management, agriculture, meteorology and climate change, oceanography, business location planning, telecommunications, crime simulation, aviation and maritime transport.

The dedicated suite of geoinformatics encompasses Remote Sensing (RS), Geographical Information Science (GIS), Global Navigation Satellite System (GNSS) and Information and Communications Technologies (ICT). The knowledge and skills of geoinformatics offer incredible capacity building and tremendous job prospects in India and abroad. The trained personnel are easily absorbed in the field of Urban Planning, Rural Development, Infrastructure Development such as Power, Irrigation, Roads, Railways, Waterways departments, defence & law enforcing agencies and other government offices. Its application is also beneficial under research and development such as soil and agriculture scientists, marine engineers, environmentalists and many NGOs on the other.

### Outcomes of the course

The importance of the geoinformatics based spatial dimension in assessing, monitoring and modelling various issues and problems related to sustainable management of natural resources is recognized all over the world. At the end of the Geoinformatics course, students will have acquired a comprehensive set of skills and attributes that are crucial for tackling complex spatial data challenges. They will be proficient in using advanced geographic information systems (GIS)
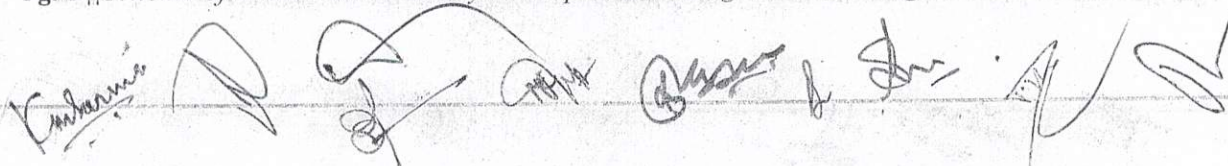
tools and remote sensing technologies to analyse and interpret spatial data. Students will also demonstrate a strong understanding of geospatial data management, data visualization techniques, and the ability to apply statistical and analytical methods to solve real-world problems. Additionally, they will possess critical thinking abilities, problem-solving skills, and a solid grasp of the ethical considerations involved in the collection and use of geospatial data. Overall, students will be prepared to work in interdisciplinary teams and contribute effectively to projects that require the integration of geospatial knowledge with other fields. Therefore, at the completion of the course, students will have acquired the following attributes:

- Disciplinary Knowledge and Interdisciplinarity
- Quantitative Competence
- Critical Thinking
- Problem Solving
- Communication
- Multicultural competence
- Moral and ethical awareness/reasoning
- Collaboration and Team work
- Lifelong learning

## Scope of the Course

The scope of the Geoinformatics encompasses a wide range of topics that provide students with the technical and analytical skills required to work with geospatial data and technologies. The course covers foundational concepts such as geographic information systems (GIS), remote sensing, and spatial data analysis, offering students an understanding of the tools and techniques used to collect, manage, and analyse geospatial information. Students will explore various applications of geoinformatics across multiple sectors, including environmental management, urban planning, disaster management, agriculture, transportation, and natural resource management. The curriculum also delves into advanced topics like spatial modelling, geospatial data visualization, and the integration of GIS with other technologies, such as GPS and big data analytics. This domain is technology driven and the new advances related to big data, artificial intelligence and machine learning, cloud computing etc. are being used for timely processing, handling, & managing geospatial data so as to make informed decisions. With a strong emphasis on both theory and practical skills, the course strengthens students to solve real-

world problems by leveraging geospatial data in innovative and effective ways.

A recent career in geoinformatics can be applied in varied discipline that ensures highly paid opportunities in several domains such as in the field of land resource management, integrated emergency management, water management, disaster management, risk assessment, transportation, urban planning, environment, hydrology, forestry, agriculture, military, mining, business, health, defense, space research, and geology. The recent advancement of geoinformatics in space technology is a well-known secure place where post graduate holders in Geoinformatics can apply for the post of Jr. Scientist, Scientist, Project Coordinator, Project Scientist, Scientific /Technical Assistant, GIS Programmer, Research Scholar, etc. Beside this several GIS thriving companies such as ESRI, Rolta, Intergraph, Wipro, TCS, Infosys, TomTom, Genesys and others welcoming the recruitments as Project Manager, Sr. System Executive, System Analyst, GIS Engineer, Image Analyst, GIS Programmer etc. The geo-professional is in demand in foreign countries like Thailand, Malaysia, Australia, Canada, France, Germany, Netherlands, China, etc. The field has also numerous opportunities for developing entrepreneurship and offers an indispensable tool in evolving science and technology in the field of environment, biodiversity conservation, forestry, landscape studies, water management, health, etc.

## Choice-Based Credit System

University follows Credit System of Syllabi and Examination. UGC has recently given guidelines for Post Graduate Courses (NEP 2020) based on choice-based credit system with a defined nomenclature for designing scheme of examinations and syllabus of different courses. In view of this, Scheme of Examinations and Syllabus have been designed in accordance with the new UGC Guidelines (2023) and the courses have been divided into the following categories:

a. Major Course
b. Minor Course
c. Skill Enhancement Course (SEC)
d. Value Addition Course (VAC)
e. Generic/Core Elective (GE)
f. Open Electives (OE)

Students have been given wide choice in selection of Generic Elective and Open Elective. A student may choose open elective either from the open electives floated by the School or may

opt from the open electives offered by other University School of Studies. However, Generic/Core Elective is to be chosen from the Generic Elective Courses offered by the University School of Environment Management.

## Examination

The University has adopted the semester system for this programme. In addition to the End Term Examination, there is a continuous evaluation of student's performance throughout the academic programme. The Odd Semester Examinations are conducted in the months of December-January and the Even Semester Examinations are conducted in the months of May-June every year.

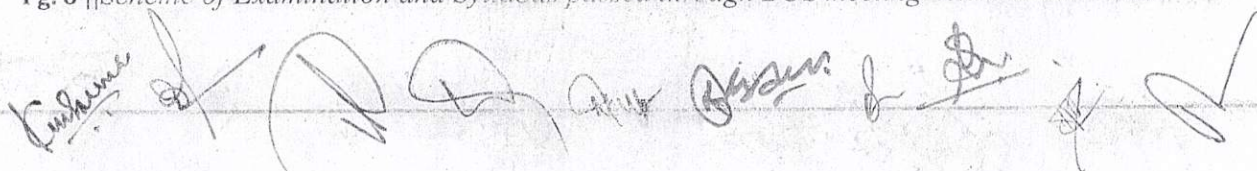## Industrial and Field Visits, Summer Training and Dissertations

The syllabus covers enough field exposure to students for the interactions with outside world through educational field excursions, summer training and dissertations. All these components are evaluative and supervised by experienced faculty members. In the process students can get first hand and practical knowledge through such activities for which credit weightages are given in the scheme.

## Evaluation and Award of Degree

The overall weightage of a course in the syllabi and Scheme of Examination is determined in terms of credits assigned to the course. Obtaining a minimum of 40% marks in aggregate in each course including the End Term Examination and teacher's continuous evaluation is essential to earn the assigned credits. A student who secures less than 40% of marks in a course is, therefore, deemed to have failed in that course. A student is eligible for the award of University degree, if he/she has registered himself/herself, has undergone the regular course of studies, completed the project report/dissertation specified in the curriculum of his/her programme within the stipulated time, and has secured the minimum number of credits as prescribed for the award of concerned degree.

## Broad Guidelines for Question Paper

The question papers are key tools in assessing student learning process. Question papers are very meticulously planned so as to spread over the entire syllabus and possibly imbibe all

components of assessment such as:

1. Knowledge
2. Comprehension
3. Application
4. Analysis & Evaluation
5. Synthesis
6. Creativity & Innovation
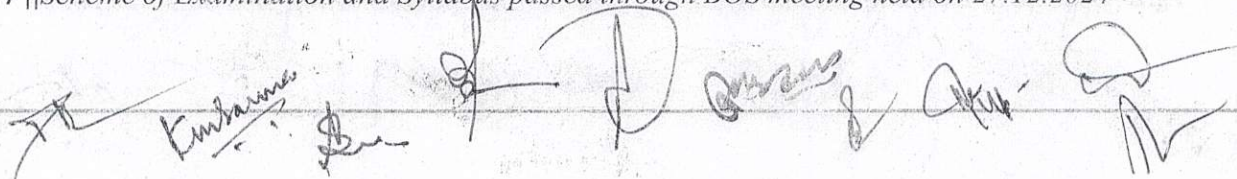
**Instructions to Paper Setter**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions.

2. Apart from the question no.1 rest of the paper shall consist of four units as per the syllabus. Every unit should have at least one question. Student will have to attempt only 1 question from each unit. Each question will carry equal marks.

**Summer Training**

1. After 2nd semester students will undergo summer training for six weeks in different industries/institutes.

2. The summer training reports will be evaluated in two parts. The Corporate Executive; under whose guidance the summer training project would be completed, shall award marks out of 50. An internal Board of Examiners will evaluate the work for 50 marks recommended by the Dean.

3. Evaluation will be based on the report and their presentations in the presence of the faculty members of the School.
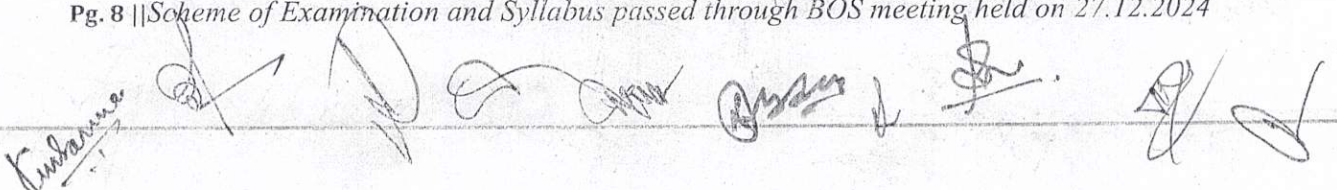
**Dissertation**

1. Each student shall carry out a study for dissertation in the 4th Semester either in a research institution and or Govt./ NGOs/ Private Organization that specializes in area relevant to the applications of Geoinformatics or in-house at USEM.

2. The student will submit a synopsis at the beginning of the semester for approval from the department committee in a specified format. The student will have to present the progress of the work through seminars and progress reports. Students will be allotted external and internal supervisors with whom they will complete their dissertation. As per the given format the dissertation report should be submitted by the student after due approval from

the faculty guide (s). Evaluation of dissertation will be based on thesis and viva/voce by the Board of Examiners comprising the External Expert & Internal Examiner.

**Credit Requirement**

1. The student will require to earn a minimum of 100 credits for the award of the degree (Ref. GGSIPU/SMS/2000/1850, minutes of the joint Meeting of the Curriculum Development Committee)

2. The student will not have the option to drop any major course covered in the scheme of examination. He/she will be required to register for all the courses listed in the scheme of examination.

**Master of Applied Geoinformatics**

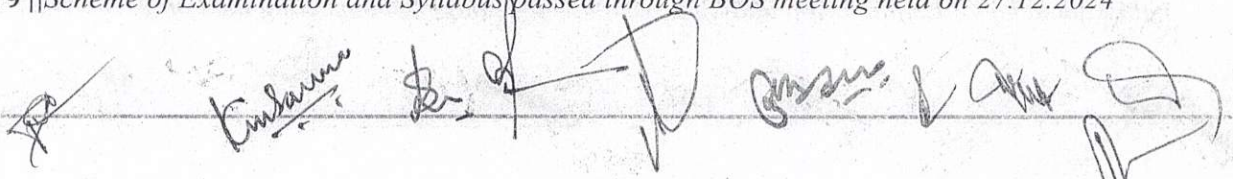## TEACHING METHODOLOGY AND SYSTEM OF INTERNAL ASSESSMENT FOR THEORY

Pedagogy to be followed

1. Lectures
2. Individual Assignments/ Group Assignments
3. Field/ Industry/ Internet-Based Project
4. Case Studies
5. Role Plays
6. Quizzes
7. Video Lessons

System of Internal Assessments:

1. Attendance, Assignments, Quiz and participation of the School activities:  20 Marks
2. Mid-Term Examination:  20 Marks
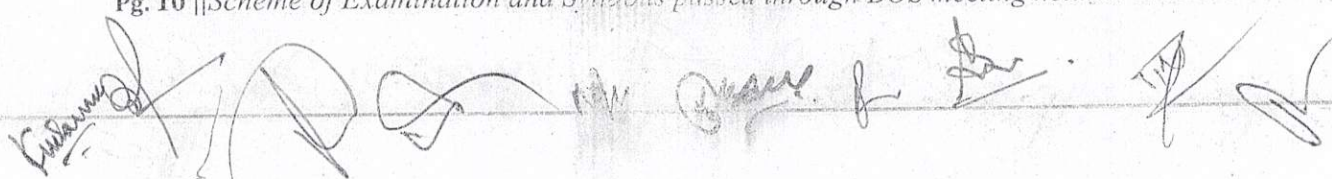
**Total Marks  40 Marks**

## MASTER OF APPLIED GEOINFORMATICS

**Semester 1**

| Course Code | Course Title | Credit |
|---|---|---|
| EMGI 601 (Major Course) | Fundamentals of Remote Sensing and Photogrammetry | 4 |
| EMGI 603 (Major Course) | Fundamentals of Geographic Information System | 4 |
| EMGI 605 (SEC) | Cartography and Satellite Based Navigation System | 4 |
| EMGI 607 (Major Course) | Overview of Geoinformatics Applications | 4 |
| EMGI 609 (Major Course) | Digital Image Processing | 4 |
| | **Practical** | |
| EMGI 651 | Basic GIS Laboratory | 2 |
| EMGI 653 | Image Processing and data analysis Laboratory | 2 |
| EMGI 655 | Topographic Map and Image Interpretation | 2 |
| | **Semester Credits** | 26 |

\* One-year PG programme will be introduced from academic session 2026-27.

**Semester 2**

| Course Code | Course Title | Credit |
|---|---|---|
| EMGI 602 (Major Course) | Research Methodology and Project Management in Geoinformatics | 4 |
| EMGI 604 (SEC) | Introduction to Geospatial programming | 2 |
| EMGI 606 (Minor Course) | Spatial Analysis and Modelling | 3 |
| EMGI 608 (Major Course) | Applied Statistics for Geoinformatics | 3 |
| EMGI 610 (VAC) | Human values and Ethics | 2 |
| EMGI 612 (Major Course) | Education Tour/ Field visit – Presentation/Preparation of Report | 2 |
| EMGI 614 | Seminar and Term Paper –NUES* | 2 |
| | **Generic/ Core Elective (Any one)** | |
| EMGIGE 616 | Geoinformatics for Hydrological applications and Integrated Watershed Management | 4 |
| EMGIGE 618 | Geoinformatics for Agriculture | 4 |
| EMGIGE 620 | Geoinformatics for Environmental Impact Assessment | 4 |
| EMGIGE 622 | Geoinformatics for Ecosystem and Natural Resources Management | 4 |
| EMGIGE 624 | Geoinformatics for Biodiversity, Wildlife conservation and Management | 4 |
| EMGIGE 626 | Geoinformatics for Geoscience | 4 |
| | **Practical** | |
| EMGI 652 | Applied Statistics | 2 |
| EMGI 654 | Spatial Data Analysis and GPS Applications | 2 |
| EMGI 656 | Basic Geospatial Programming | 2 |
| | **Semester Credits** | 28 |
| | Summer Internship (6 to 8 Weeks) | |

*NUES: Non–University Examination System

**Semester 3**

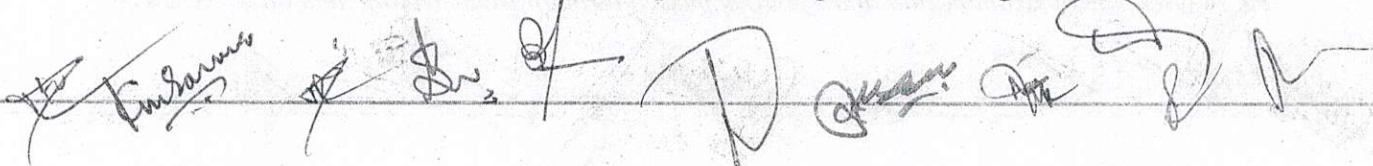| Course Code | Course Title | Credit |
|---|---|---|
| EMGI 701 (Major Course) | Advances in GIS and GNSS | 4 |
| EMGI 703 (Major Course) | Advances in Remote Sensing and Image Processing Techniques | 4 |
| EMGI 705 (Minor Course) | Open-Source Geospatial Tools and WebGIS | 3 |
| EMGI 707 (VAC) | Entrepreneurial Mindset | 2 |
| EMGI 709 (SEC) | Introduction to Artificial Intelligence and Machine Learning in Geoinformatics | 2 |
| EMGI 711 (Major Course) | Summer Training: Presentation and Preparation of Report | 2 |
| **Open-Electives (Any one)** | | |
| EMGIOE 713 | Geoinformatics for Climate Change Resilience | 4 |
| EMGIOE 715 | Geoinformatics for Forestry | 4 |
| EMGIOE 717 | Geoinformatics for Regional and Urban Planning | 4 |
| EMGIOE 719 | Geoinformatics for Disaster Risk Reduction and Management | 4 |
| EMGIOE 721 | Geoinformatics for Atmosphere and Air Pollution | 4 |
| EMGIOE 723 | Radar and Hyperspectral Remote Sensing Applications | 4 |
| **Practical** | | |
| EMGI751 | Cloud Computing and Open-Source Software | 2 |
| EMGI753 | AI and Machine Learning in Geoinformatics | 2 |
| EMGI755 | Soil/water/rock/vegetation analysis | 2 |
| | **Semester Credits** | **27** |

**Semester 4**

| Course Code | Course Title | Credit |
|---|---|---|
| EMGI 702 (Major Course) | Dissertation Based Seminar and Progress Report | 4 |
| EMGI 704 (Major Course) | Dissertation and Viva Voce | 22 |
| | **Semester Credits** | **26** |

Total Credits: **107**

Students need to earn at least 100 credit points to get the degree.

Those students who exit at the end of 1$^{st}$ year shall be awarded Postgraduate Diploma in Applied Geoinformatics. After completion of 2 years student will be awarded Masters degree in Applied Geoinformatics. There shall be one exit point for the programme as per UGC Guidelines.