BANGALORE UNIVERSITY
Jnanabharathi Campus
Bengaluru-560 056

Structure & Detailed Syllabus NEP-2020 & CBCS

Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc) in Geography with Specialization:

1. Geoinformatics and
2. Natural Disaster Management

Department of Geography

Effective from 2022 - 2023

Composition of Curriculum Draft Committee

For Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of Geoinformatics and Natural Disaster Management

1	Dr. Ashok Hanjagi Professor, Bangalore University, Bengaluru	Chairperson
2	Dr. B. Chandrashekara Professor, University of Mysore, Mysuru	Member
3	Dr. A. A. Mulimani Professor, Karnatak University, Dharawad	Member
4	Dr. S. M. Hurkadli Professor, Rani Channamma University, Belagavi	Member
5	Dr. Ramu Professor, Center for Geoinformatics Technology, University of Mysore, Mysuru	Member
6	Dr. L. T. Nayak Associate Professor, Karnatak Science College, Dharawad	Member
7	Dr. M. R. Hugar Associate Professor, GFGC, Khaza Colony, Vijayapura	Member
8	Dr. Rajashekaran D Associate Professor, Govt. Arts College, Bengaluru	Member
9	Dr. Gangadhar Sheeli Associate Professor, KLE Lingaraj College, Belagavi	Member
10	Dr. K Prasanna Kumar Special Officer, Karnataka State Higher Education Council	Member Convener

FOREWORD

New Education Policy (NEP) 2020 seeks to transform the Higher Education System in India by introducing the exit and entry options to the students. Selecting courses of choice will improve the education quality of the students. A creative combination of disciplines like Core, Open Elective, Vocational and Elective courses with multi-disciplinary nature is one key recommendation.

I am delighted to present "curriculum structure and syllabus of Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of Geoinformatics and Natural Disaster Management with multiple exit and entry with skills and job opportunities at every point of exit".

The multiple exit and entry options in the Higher Education System would remove rigid boundaries and create new possibilities for students to choose and learn the courses of their choice anywhere in India can pave the way for improving student progress. A formal system of credit recognition, credit accumulation, credit transfers and credit redemption is a praiseworthy recommendation in the education system.

Apart from providing understanding for the advanced learning, the IMSc syllabus has to ensure that the theory and practical is sufficiently bridged, skills are imparted for autonomous learning and enable MNCs opportunities. Thus, flexibility in the five-year IMSc program has been provided, so that students depending upon their interests can choose courses of their liking including skill-based courses. The IMSc in Geography has enabled an individual to study Geography, Geoinformatics and Natural Disaster Management areas at a deeper level, while at the same time building character, ethical and constitutional values, intellectual curiosity, spirit of service and capabilities across disciplines including sciences, social sciences, arts, humanities as well as professional, technical and vocational crafts. The important ones include innovation and improvement in course-curricula, introduction of paradigm shift in learning and teaching pedagogy and evaluation in IMSc in Geography. The IMSc curriculum focused on creativity and innovation, critical thinking and higher order thinking capacities, problem solving abilities, team work, communication skills and more in-depth learning.

I hope that the curriculum structure and syllabus will pave the way for overall development of the students. I ensure that student community will procure the benefits at large.

Date: 19th September 2021

Place: Bengaluru

Prof. Ashok Hanjagi
Chairman
Geography & Geoinformatics
Syllabus Framing Committee
Karnataka

ACKNOWLEDGEMENT

The Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with Geoinformatics and Natural Disaster Management with multiple exit and entry options offered in higher education institutions have been prepared with the help of Expert Committee Members formed by Karnataka State Higher Education Council, Bengaluru.

My special thanks to Prof. B. Thimme Gowda, Hon'ble Vice Chairman, Karnataka State Higher Education Council, Bengaluru for his continuous direction and guidance to prepare the program.

My special gratitude to Prof. K.R. Venugopal, Hon'ble Vice Chancellor, Bangalore University, Bengaluru for his great inspiration to initiate the five-year integrated program in the University.

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I would like to extend my special thanks to my committee members Prof. B. Chandrashekar, University of Mysore, Mysuru; Prof. A.A. Mulimani, Karnatak University, Dharwad; Prof. S.M. Hurakadli, Rani Channamma University, Belagavi; Prof. Ramu, Centre for Geoinformatics Technology, UoM, Mysuru; Dr. L.T. Nayak, Karnatak Science College, Dharwad; Dr. M.R. Hugar, Govt. First Grade College, Vijayapura; Dr. Rajashekaran D., Govt. Arts College, Bengaluru; Dr. Gangadhar Sheeli, KLE's Lingaraj College, Belagavi and Dr. K. Prasanna Kumar, Special Officer (Member Convener), Karnataka State Higher Education Council for their valuable inputs for the curriculum design and content development for Five-Years Integrated M.Sc. Degree Program in Geography and Geoinformatics & M.Sc Geography and Natural Disaster Management.

I express my sincere thanks to all the BOS Chairmen and Members of various Universities in Karnataka state for their help in designing the syllabus.

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I would like to acknowledge and appreciate the efforts made by Mr. Sushant Sawant for preparing the tabular formats and typewriting the whole document.

Date: 19th September 2021

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National Educational Policy 2020

The approval of the National Education Policy (NEP) by the Ministry of Human Resource Development, Government of India has been well deliberated as discussed since 2015. The advent of the industry 4.0 scenario has rendered our current system of education outdated. Hence, the NEP is designed to contemplate the current skill requirements. The Indian education system with its earlier policies on education has greatly led to creation of fragmented system of education. However, bringing the whole system under one large umbrella is one of the best recommendations. The current NEP has attempted to rectify the same by removing stand-alone institutions, affiliated institutions, proposed formation and up- gradation of institutions to offer multidisciplinary education. Multidisciplinary education system with flexibility for undergraduate students is a key highlight of the NEP. It focuses on promoting and building vocational and skill enhancement courses, right from the entry level, which can ease the burden on the employment opportunities and supply of a proficient / talented workforce.

Vision of NEP-2020

- An education system that contributes to an equitable and vibrant knowledge society, by providing high-quality education to all.
- Develops a deep sense of respect towards the fundamental rights, duties and Constitutional values, bonding with one's country, and a conscious awareness of one's role and responsibilities in a changing world.
- Instills skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen.

This National Education Policy 2020 aims to address the many growing developmental aspirations of our country. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirations & Goals of 21st century education, including Sustainable Development Goal-4, while building upon India's traditions and value systems.

NEP aims to have an education system, which is interdisciplinary in nature by 2030 with equitable access to the highest-quality education for all learners regardless of their social or economic background and seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all within the time-frame.

It is with this vision that the Department of Geography, Bangalore University proposes to launch and introduce innovative and holistic programmes that address to both the changing and developing area of Geography as well as to the need for skilling India by imparting a flexible and up to date syllabus to the students.

Bangalore University
Department of Geography

Regulations Governing the Choice Based Credit System Semester Scheme with Multiple Entry and Exit Options for the Five-Year (Ten Semester) Integrated B.Sc. and M.Sc. (IMSc.) Programs in Geography with specialization of:

1. **Geoinformatics and**
2. **Natural Disaster Management**

(Framed under Section 44 (1) (c) of the KSU Act 2000)

In keeping with the mandate of the NEP 2020 and the guiding principles of a holistic approach to both knowledge and skills the Department of Geography has proposed the following programs.

i. IMSc. Geography and Geoinformatics

ii. IMSc. Geography and Natural Disaster Management

Upon successful completion of Integrated (IMSc.) programme above, the student will be awarded the B.Sc. (after three years) and the M.Sc. degrees.

If the student desires to exit after completing three / four years, he/she will be awarded the B.Sc. / B.Sc. (Hons.) Degree awarded which is equivalent to the B.Sc. / B.Sc. (Hons.) degree awarded by any other recognized State / Central University in the country for deciding eligibility to enable the student to pursue higher education, seek career and job opportunities etc.

The Integrated M.Sc. degree awarded with specialization of **Geoinformatics** and **Natural Disaster Management** (upon completion of five years) is equivalent to the M.Sc. degree awarded by any other recognized State / Central University in the country for purposes of deciding eligibility for students to pursue further study (ICCR / JRF / NET / SET examinations, Ph.D.), appear for competitive exams (Public Service Commissions of Union or respective State Governments, BSRB etc.) or to appear for job interviews etc. throughout the country.

The Five-Years Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of **Geoinformatics** and **Natural Disaster Management** with multiple exit and entry options will be run by the Department of Geography, Bangalore University.

The Salient Features of the Five-Year Integrated M.Sc. Programs:

- The program is CBCS and under Semester Scheme has multiple exit and entry.
- The programs comprise of about 50% Discipline Specific Core Courses as Major subjects, 20% Discipline Specific Elective Courses / Multi-Discipline Specific Courses as Minor courses, and remaining 30% Ability Enhancement Compulsory Courses, Skill Enhancement Courses along with Open Elective Courses.

- The relative weightage and importance of Courses of the study is measured in terms of credits.
- The program permits horizontal mobility in course selections and vertical growth in the core courses.
- The students shall take part in value-based activities.
- The declaration of result is based on Aggregate Percentage of marks obtained and Cumulative Grade Point Average (CGPA) earned.
- The candidate has an option to exit after 3rd and 4th year of the program and shall be awarded B.Sc. Degree and B.Sc. Honors Degree respectively with a provision to re-enter and complete the degree or to stay throughout for five-year integrated M.Sc. Degree and earn both undergraduate and postgraduate degree.
- There is a provision to transfer the credits earned by the candidate during transfer from one institution to another.
- The program permits the consideration of credits earned from SWAYAM and other similar platforms recognized by the University.
- The Program has special provision s for independent learners to earn additional credits from inter / intra disciplinary subjects apart from mandatory credits.

Eligibility for Admission:

Candidates who have passed PUC from Karnataka State or any other States in India with equal qualifications are eligible for admission to the course, provided they have secured 50% marks (45% for SC / ST / Category-I Candidates) in the qualifying examination.

Semester System, Duration or the program, requirements and options:

- The Five-Year Integrated M.Sc. Program shall have ten semesters duration unless specified otherwise.
- Each academic year shall have two semesters; odd and even semesters.
- Each semester shall have 16 weeks (06 days per week system) with 90 working days (excluding Sundays and other holidays).
- The Program shall have multiple exit options at the end of 3rd and 4th academic years respectively with the award of B.Sc. Degree and B.Sc. Honours Degree.
- The candidate availing exit option shall re-enter to the program at the beginning of any academic year to complete the degree with the prevailing syllabus.
- All candidates shall be awarded Integrated M.Sc. (IMSc.) Degree on successful completion of Ten semesters (FIVE academic years), i.e., both undergraduate degree with research and postgraduate degree with research.

Year	Exit Options	Credits
Three Years	The Candidate will be awarded **"B.Sc. in Geography"** upon the successful completion of Third year or Six semesters of the five years Integrated M.Sc. (IMSc.) program.	140
Four Years	The Candidate will be awarded **"B.Sc. Honours in Geography"** upon the successful completion of Four year or Eight semesters of the five years Integrated M.Sc. (IMSc.) program.	180
Five Years	The Candidate will be awarded **"M.Sc. in Geography (with Specialization Geoinformatics or Natural Disaster Management)"** upon the successful completion of Fifth year or Tenth semesters of the five years Integrated M.Sc. (IMSc.) program.	220

Program Structure

Discipline Specific Core (DSC) Courses: The first, second, third and fourth semesters will have two DSC courses each. Every DSC course has 6 credits each (4 credits for theory and 2 credits for practical).

The fifth, sixth, seventh, eighth, ninth and tenth semesters have three Discipline Specific Core (DSC) courses each. The fifth and sixth semester DSC courses have 5 credits each (3 credits for theory and 2 credits for practical). The seventh semester has two DSC courses with 5 credits each (3 credits for theory and 2 credits for practical) and another DSC has 3 credits without practical components. In the seventh semester, the candidate willing to quit after fourth year needs to take research methodology course (for 3 credits).

The eighth semester has 3 DSC courses, one with 5 credits (3 credits for theory and 2 credits for practical) and another 2 with 3 credits each and with no practical component. If the candidate is willing to exit after eight semesters needs to take a research project (for 6 credits).

The ninth semester has 3 DSC courses, two with 5 credits (3 credits for theory and 2 credits for practical) each and one with 4 credits (3 credits for theory and 1 credit for practical).

In the end, the candidates need to submit the research results in the form of dissertation/reports for research projects, internships, field visits and study tour reports. The candidates need to appear for viva- voce in the concerned department.

Open Elective (OE) Courses: First, second, third and fourth semesters will have one OE course each. Every OE course has 3 credits and with no practical component. The OE courses are for other disciplines and the candidate has to choose one OE from the pool in each semester. The OE courses enhance the geographical knowledge and help students in preparation for the competitive examinations. There are 4 OE courses in the program.

Vocational Courses: Fifth and Sixth semester will have two vocational courses each for 3 credits. The candidate has to choose one vocational course from the pool.

There is a 2-credit internship course which has to be selected by the candidate compulsorily in the sixth semester. These courses can enable students to obtain the required technical knowledge along with artistic or practical skills.

Discipline Specific Elective (DSE) Courses: The Fifth, Sixth, Seventh, Eighth and Ninth semesters will have DSE courses. All the DSE courses have 3 credits each and with no practical component.

The seventh semester will have a research methodology course for 3 credits and the eighth semester will either be a research project or Internship for 6 credits. If candidate is not interested to opt for the Research Methodology in the seventh semester the candidate can opt one more DSE course from the given pool.

However, the candidates willing to pursue a PhD program in future can select a Research Project in the eighth semester. The candidate should have opted for the Research Methodology course in the seventh semester itself. If a candidate is not interested to opt for the Research project in the eighth semester, the candidate can opt two more DSE courses from the given pool. The DSE courses enhance the geographical knowledge and help students in preparation for the competitive examinations.

The ninth semester will have one DSE for 3 credits and the research methodology course for another 3 credits. If candidate is not interested to opt for the Research Methodology in the ninth semester the candidate can opt one more DSE course from the given pool.

Skill Enhancement Courses (SEC): The First, third, fifth and sixth semesters will have SEC courses. All the SEC courses have 2 credits each and with hands-on experience.

There shall be University examination at the end of each semester. The course pattern and the scheme of examinations are as follows:

Other Courses:

The tenth semester will have Research Project, Field Visit, Study Tour and Internship for six, four, four and six credits respectively.

The candidates have to select the theme/topic in the given pool and research has to be carried out. The candidate should participate in a field survey wherein the candidate needs to collect primary and secondary data from the relevant fields.

Study Tour is compulsory and needs to be conducted after the end of the ninth semester or prior to the commencement of the tenth semester. Further, for all the components staff-in-charge will be involved in guiding and supervising the candidates.

The candidate has to opt for internship (6 credits) compulsorily in the tenth semester. The candidate has to select the institutions/organizations/companies/establishments given in the list provided by the department. Further, the staff-in-charge will be involved in the guidance, continuous monitoring and evaluation of the candidates.

Course pattern

In the faculty of Science, the number of credits per semester may vary from 20 to 24, an average of 23 credits per semester and a total of around 220 credits for the program. The credits shall be based on the number of instructional hours per week, generally 1 credit per hour of instruction in theory and 1 credit for 2 hours of practical or project work or internship per week. The courses offered in a program have the Discipline Specific Core (DSC), Discipline Specific Elective (DSE), Open Elective (OE), Vocational courses (VoC) and Skill Enhancement Course (SEC).

Medium of instruction

The medium of instruction shall be Kannada / English.

Attendance

The course shall be treated as an independent unit for the purpose of attendance. A student shall attend a minimum of 75% of the total instruction hours in a course including assignments and seminars in each semester. There shall be no provision for condonation of shortage of attendance and a student who fails to secure 75% attendance in a course shall be required to repeat that semester.

Internal Assessment (IA)

Marks for internal assessment shall be awarded on the basis of internal assessment in the form of tests, case studies, field activities, assignments / seminars and other co-curricular activities. The internal assessment marks shall be notified on the department / college notice board for the information of the students and it shall be communicated to the Registrar (Evaluation) within 10 days before the commencement of the University examinations, and the Registrar (Evaluation) shall have access to the records of such internal assessment evaluations.

Particulars	IA Marks	Split-up Details and Marks	
Theory	40	Case study	10
		Earth related spatial activities	10
		Attendance	10
		Internal Test	10
Practical	25	Attendance	10
		Field based activity	10
		Internal Test	5
Project Work	75	Review Assessment	30
		Viva Voce	45
Internship 1	25	Viva voce	10
		Domain Knowledge	10
		Presentation	5
Internship 2	75	Review Assessment	30
		Viva voce	45
Field Visit	50	Review Assessment	30
		Viva voce	20
Study Tour	50	Review Assessment	30
		Viva voce	20

Research Project: 75 marks for IA, 30 Marks for Review Assessment; three review meetings will be conducted by staff-in-charge, each review assessment carries 10 marks. Review Assessment 1: at the beginning – Preparation made to start the work; Review Assessment 2: Middle - Progress done so far; Review Assessment 3: at the end – final outcome. 45 Marks for Viva Voce (language, communications, and expressions -15 marks, quality and skills of the research presentation -15 marks, question, and answers 15 marks. Remaining 75 marks for Project Report Submission (Review of Literature -10 marks; Statement of the Problems -10 marks, Research Methodology-flowchart -5 marks, use of Geospatial Technology -10 marks, Result & Discussion -10 marks, Conclusion & Recommendations -10 marks, Designing of the research framework -10 marks, References and citation -10 marks).

Internship 1: 25 marks for IA, 10 marks for Viva Voce (language, communications, and expressions -2 marks; quality and skills of the research presentation - 5 marks; question, and answers -3 marks), 10 marks for domain knowledge and 5 marks for presentation. 25 Marks for the successful completion of the Internship.

Internship 2: 75 marks for IA, 30 Marks for Review Assessment, three review meetings will be conducted by staff in-charge, each review assessment carries 10 marks. Review Assessment 1: at the beginning – Preparation made to start the work; Review Assessment 2: Middle - Progress done so far; Review Assessment 3: at the end – final outcome. 45 Marks for Viva Voce (language, communications, and expressions 15 marks), quality and skills of the research presentation (15 marks), question, and answers (15 marks). 75 Marks for the successful completion of the Internship.

Field Visit: 50 Marks for Internal Evaluation, 30 Marks for Review Assessment, three review meetings will be conducted by staff in-charge, each review assessment carries 10 marks. Review Assessment 1: at the beginning – Preparation made to start the work; Review Assessment 2: Middle - Progress done so far; Review Assessment 3: at the end – final outcome. 20 marks for Viva Voce. 50 Marks for field visit report (Candidate must present report pertaining to number of field visit made -10 marks; The methodology for collection data -10 marks; sample questionnaire prepared -10 marks, field visit evidence -10 marks and field observation -10 marks).

Study Tour: 30 Marks for Review Assessment, three review meetings will be conducted by staff in-charge, each review assessment carries 10 marks. Review Assessment 1: at the beginning – Preparation made to start the work; Review Assessment 2: Middle - Progress done so far; Review Assessment 3: at the end – final outcome. 20 marks for Viva Voce. 50 Marks for Study Tour report (Candidate must present report pertaining to number of field visit made -10 marks; The methodology for collection data -10 marks; sample questionnaire prepared -10 marks, field visit evidence -10 marks and field observation -10 marks).

Note: The departments must identify and adopt some geographic areas falling within the jurisdiction. Such geographic areas can be, forest, dryland areas, agriculture area, watershed region, village or city area, hinterland etc. Such adopted areas can continuously be used for research project work, primary data collection, field visit, study tours etc. for such activity's documents need to be maintained in the form of the report. Besides, co- curriculum activities like awareness programs, plantation, cleaning and greening, rallies, and camping etc. can also be conducted within such adopted areas.

Dissertation / Research Project / PhD Research / Faculty Research Projects and cleaning – greening, awareness and rally programmes have to be in the following regions identified:

1. City with hinterland: **Bengaluru with its BMRDA Region**,
2. Watershed: **Arkavathi River**,
3. Village Adopted: _____,
4. Forest: **Western Ghats**,
5. Arid Regions with Rural Areas: **Tumkur District**,
6. Coastal Region: **Karnataka Cost**.

Board of Examiners (BOE):

The Board of examiners constituted by the University shall consist of a Chairman, internal and external members out of whom at least one shall be from the Department / College offering the course and at least two external members from other universities. The board shall scrutinize the question papers and shall forward for the approval of university.

Results:

A candidate should obtain a minimum of 40% marks in each of the papers in the University examination and 50% marks including internal assessment marks. A candidate should obtain a minimum of 50% marks overall (in all semesters). The candidates who have passed in all the semester examinations are eligible for the award of the Five-Years Integrated M.Sc. Degree Program in Geography and Geoinformatics.

Carry Over:

A candidate who fails in a lower semester examination will be promoted to the next semester, however, the result of the candidates who have passed the VIII semester examination but not passed the lower semester examinations shall be declared as NCL (not completed lower semester examinations). Such candidates shall be eligible for the degree only after completion of all the lower semester examinations.

Question Paper Pattern:

The theory exam will be conducted for 60 Marks and it consists of 3 Parts namely Short, Medium and Long answer questions.

Part – A Each question carries 3 marks and the student has to answer 4 questions.

Part – B Each question carries 6 marks and the student has to answer 3 questions.

Part – C Each question carries 10 marks and student has to answer 3 questions.

Workload for Teachers:

- Each theory session may have up to a maximum of 20 students, extendable to 30 students for Integrated M.Sc. program along with other program irrespective of DSCC, DSE, SEC, OEC, Vocational and AECC in the class rooms.
- For a practical batch, each 14 students shall have one teacher.
- To determine a teacher's workload one-hour theory/ practical class shall be considered equal to one-hour workload.

Model Curriculum

Name of the Degree Program: Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of:

1. Geoinformatics and
2. Natural Disaster Management

Discipline Core: Geography, Geoinformatics & Natural Disaster Management

Total Credits for the Program: 220

Starting year of implementation: 2022-2023

Program Outcomes:

By the end of the program the students will be able to:

(Refer to literature on outcome-based education (OBE) for details on Program Outcomes)

PO1: Relating to Knowledge

By the end of the program the students will be able to:

1.1 Explain relevant terms and concepts of geography including definitions.

1.2 Give better explanation about relevant principles, theories and models in geography.

1.3 Show clear knowledge relating to man and environmental processes and factors.

1.4 Get better clarification about geospatial technology.

1.5 Show clear knowledge about natural disasters occurring in four various ways.

PO2: Understanding and application

By the end of the program the students will be able to:

2.1 Identify the importance of spatial scale and time scale.

2.2 Know the complex and interactive nature of physical and human environments.

2.3 Identify the importance of the resemblances and variance between places, environments and people.

2.4 Comprehend how processes bring changes in systems, distributions and environments.

2.5 Identify the importance of application of GIS for geography

2.6 Understand natural disasters through GIS in a better way.

PO3: Students Skills

By the end of the program the students will be able to:

3.1 Interpret a variety of types of geographical data and sources and recognize their limitations.

3.2 Communicate geographical evidence, ideas and arguments.

3.3 Use geographical data to identify trends and patterns.

3.4 Use diagrams and sketch maps to demonstrate geographical aspects.

3.5 Demonstrate skill of analysis and synthesis of geographical information.

3.6 Use GIS and Remote sensing technologies for planning and monitoring Natural Disaster.

PO4: Students Evaluation

By the end of the program the students will be able to:

4.2 Critically evaluate geographical principles, theories and models.

4.3 Assess the effects of geographical processes and change on physical and human environments.

4.4 Assess how the viewpoints of different groups of people, potential conflicts of interest and other factors interact in the management of physical and human environments.

4.5 Evaluate the relative success of failure of initiatives.

4.6 Critically evaluate Geospatial Technology & Natural Disaster and their essence.

Syllabus Aims:

These aims outline the educational context in which syllabus content should be viewed. Many of these aims may be delivered by the use of suitable case-studies, through application of geographical skills and through practical field visits.

The Integrated M.Sc. Geography and Geoinformatics and Integrated M.Sc. Geography and Natural Disaster Management syllabus aim to enable students to:

- Know the significance of scale in studying geography, Natural Disaster Management and Geoinformatics.
- Know the processes functioning at various scales within physical and human environments
- Improve a sense of space, place and location.
- Develop consciousness of the relevance of geography to understanding and solving contemporary environmental problems and issues through geospatial technology.
- To understand sustainable cities and communities in India and Karnataka.
- Explain the causes and effects of change over space and time on physical and human environments using Geospatial Technology.
- Develop a gratefulness of the nature, value, limitations and importance of different approaches to analyze and explain in geography.
- Increase the knowledge and ability to use and apply, appropriate skills and techniques including fieldwork.
- Improve a logical approach in order to present a structured, coherent and evidence-based argument.
- Develop a concern for accuracy and objectivity in extracting, recording, processing, presenting, analyzing and interpreting geographical data.

Curriculum Structure for Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of Geoinformatics and Natural Disaster Management

Name of the Post Graduate Program: Integrated M.Sc. (IMSc.)	Total Credits for the Program: 220
Discipline/Subject: Geography, Geoinformatics & Natural Disaster Management	Starting year of implementation: 2022-2023

Program Articulation Matrix for Core Courses:

Semester	Title /Name of the course	Program outcomes that the course addresses	Pre-requisite course(s)	Pedagogy	Assessment
I	Principles of Geomorphology	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Interactive Lectures, Case Studies	In-course & End Course Assessment
	Basics of Cartography	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Interactive Lectures, Case Studies	In-course & End Course Assessment
II	Introduction to Climatology	PO-1, PO-3, PO-4	No Pre-requisite course(s)	Interactive Lectures, Case Studies, Seminar	In-course & End Course Assessment
	Physical Geography	PO-2, PO-3	No Pre-requisite course(s)	Interactive Lectures, Case Studies, Quiz	In-course & End Course Assessment
III	Introduction to Oceanography	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Inquiry-based learning, Interactive Lectures	In-course & End Course Assessment
	Fundamentals of Human Geography	PO-1, PO-3	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
IV	Regional Geography of India	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Investigative Case-Based Learning, Seminar	In-course & End Course Assessment
	Urban Geography	PO-1, PO-3	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
V	Fundamentals of Remote Sensing	PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Population Resources & Dynamics	PO-2, PO-4	Fundamentals of Human Geography	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Development of Geographical Thought	PO-2, PO-3, PO-4	No Pre-requisite course(s)	Interactive Lectures, Group Activity	In-course & End Course Assessment
VI	Environmental Geography	PO-1, PO-2, PO-4	Physical Geography	Inquiry-based learning, Interactive Lectures	In-course & End Course Assessment
	Fundamentals of Geographic Information Systems	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Basics of Natural Disasters	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment

VII	Advanced Geomorphology	PO-2, PO-3, PO-4	Principles of Geomorphology	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment, Final report
	Advanced Climatology	PO-2, PO-4	Introduction to Climatology	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Geo-surveying	PO-2, PO-4	Basics of Cartography	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
VIII	Sustainable Soil Resource Management	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Agriculture & Food Security	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Climate Change: Vulnerability and Adaptation	PO-1, PO-2, PO-4	Basics of Natural Disasters	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
IX	Sustainable Water Resource Management	PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Sustainable Forest Resource Management	PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Regional Planning & Development	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Specialization: Geoinformatics				
	Remote Sensing for Water Resource Management	PO-1, PO-2, PO-4	Fundamentals of Remote Sensing	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Geographic Information Systems for Soil Resource Management	PO-1, PO-2, PO-4	Fundamentals of Geographic Information Systems	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	GIS Customization	PO-1, PO-2, PO-4	Python Programming	Blended learning, Interactive Lectures, MOOCs	In-course & End Course Assessment
	Specialization: Natural Disaster Management				
	Geospatial Applications for Disaster Management	PO-1, PO-2, PO-4	Fundamentals of Geographic Information Systems, Basics of Natural Disasters	Investigative Case-Based Learning, Seminar	In-course & End Course Assessment
	Geoinformatics for Biological Disasters and Public Health Management	PO-1, PO-2, PO-4	Basics of Natural Disasters	Inquiry-based learning, Interactive Lectures, Blended learning, MOOCs	In-course & End Course Assessment
	Disaster Risk Reduction & Response	PO-1, PO-2, PO-4	Disaster Forecasting and Planning	Investigative Case-Based Learning, Seminar	In-course & End Course Assessment

X	Research Project	PO-1, PO-2, PO-4	Research Methodology	Process-Oriented Guided Inquiry Learning (POGIL), Problem or Project Based	In-course & End Course Assessment, Final report
	Field Visit	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Process-Oriented Guided Inquiry Learning (POGIL), Problem or Project Based	In-course & End Course Assessment, Final report
	Study Tour	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Process-Oriented Guided Inquiry Learning (POGIL), Problem or Project Based	In-course & End Course Assessment, Final report

Program Articulation Matrix for Open Elective (OE)

Semester	Title of the course	PO that the course addresses	Pre-requisite course(s)	Pedagogy	Assessment
I	Mathematics for Geography	PO-1, PO-2	No Pre-requisite course(s)	Interactive lectures, Blended learning	In-course & End Course Assessment
	Fundamentals of Remote Sensing	PO-1, PO-2, PO-3	No Pre-requisite course(s)	Interactive lectures, Blended learning	In-course & End Course Assessment
II	Spatial Statistics	PO-1, PO-2	No Pre-requisite course(s)	Inquiry-based learning, Interactive Lectures	In-course & End Course Assessment
	Introduction to Geographic Information Systems (GIS)	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Case-Based Learning	In-course & End Course Assessment
III	Programming Fundamentals	PO-1, PO-2	No Pre-requisite course(s)	Interactive lectures, Blended learning	In-course & End Course Assessment
	Geography of India	PO-1, PO-2	No Pre-requisite course(s)	Interactive lectures, Blended learning	In-course & End Course Assessment
IV	Python Programming	PO-1, PO-2	Programming Fundamentals	Interactive lectures, Blended learning	In-course & End Course Assessment
	Geography of Karnataka	PO-1, PO-2	No Pre-requisite course(s)	Interactive lectures, Blended learning	In-course & End Course Assessment

Program Articulation Matrix for Vocational Courses:

Semester	Title of the course	PO that the course addresses	Pre-requisite course(s)	Pedagogy	Assessment
V	Mobile Asset Mapping	PO-1, PO-3	No Pre-requisite course(s)	Interactive lectures, Blended learning	In-course & End Courses assessment
VI	Open-Source GIS	PO-1, PO-3	No Pre-requisite course(s)	Interactive lectures, Blended learning	In-course & End Courses assessment

Program Articulation Matrix for Discipline Specific Elective (DSE):

Semester	Title Of the course	PO that the course addresses	Pre-requisite course(s)	Pedagogy	Assessment
VII	Settlement Geography	PO-1, PO-2,	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Spatial Database Managements	PO-1, PO-2,	Geographic Information System	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Disaster Forecasting and Planning	PO-2, PO-3	No Pre-requisite course(s)	Blended learning, Investigative Case-Based Learning, Seminar	In-course & End Courses assessment
	Cultural Geography	PO-1, PO-2	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Geoinformatics for Watershed Analysis	PO-1, PO-2, PO-4	Geographic Information System, Remote Sensing	Blended learning, Investigative Case-Based Learning, Seminar	In-course & End Courses assessment
	Hydro-Meteorological Hazards	PO-1, PO-2, PO-4	Advanced Climatology	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Research Methodology / Geo-Statistics	PO-1, PO-2, PO-3	Spatial Statistics	Inquiry-based learning, Interactive Lectures, case studies	In-course & End Courses assessment
VIII	Political Geography	PO-1, PO-2	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Landscape Ecology and Landuse Planning	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Coastal Hazards Management	PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Karnataka Geography	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive	In-course & End

				Lectures, MOOCs	Courses assessment
	Geoinformatics for Coastal Zone Management	PO-1, PO-2, PO-4	Geographic Information System, Remote Sensing	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Land Degradation & Desertification	PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Economic Geography	PO-1, PO-2	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Spatial Analysis and Modeling	PO-1, PO-2, PO-4	Geographic Information System, Remote Sensing	Interactive Lectures, Blended learning, MOOCs	In-course & End Courses assessment
	Anthropogenic Hazards and Management	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Research Project	PO-2, PO-3, PO-4	Research Methodology	Process-Oriented Guided Inquiry Learning (POGIL), Project Based Learning	End Courses assessment
IX	Trade & Transport Geography	PO-1, PO-2	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Tourism Geography	PO-1, PO-2	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Biogeography	PO-1, PO-2	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Specialization: Geoinformatics				
	Geoinformatics for Forest & Wild-Life Management	PO-1, PO-2, PO-4	Geographic Information System, Remote Sensing	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Web-GIS	PO-1, PO-2, PO-3	Geographic Information System, Remote Sensing	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Specialization: Natural Disaster Management				
	Policy, Institution, Governance for Disaster Management	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Geoinformatics for Drought Monitoring in India	PO-1, PO-2, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment
	Research Methodology *(Mandatory for All Students)*	PO-2, PO-3, PO-4	No Pre-requisite course(s)	Blended learning, Interactive Lectures, MOOCs	In-course & End Courses assessment

Program Articulation Matrix for Skill Enhancement Courses (SEC)

Semester	Title of the course	PO that the course addresses	Pre-requisite course(s)	Pedagogy	Assessment
I	Cartographic Technique	PO-1, PO-2	No Pre-requisite course (s)	Interactive lectures, Blended learning	In-course & End Course Assessment
III	Utility Mapping	PO-1, PO-2	Basics of Cartography	Inquiry-based learning, Interactive Lectures	In-course & End Course Assessment
V	Drone Mapping	PO-1, PO-2	Basics of Cartography	Interactive lectures, Blended learning	In-course & End Course Assessment
VI	Basics of R Programming	PO-1, PO-2	Programming Fundamentals	Interactive lectures, Blended learning	In-course & End Course Assessment

Program Articulation Matrix for Research Project, Field Visit, Study Tour, and Internship:

Semester	Title Of the course	PO that the course addresses	Pre-requisite course(s)	Pedagogy	Assessment
X	Research Project	PO-1	Research Methodology	Process-Oriented Guided Inquiry Learning (POGIL)	End Courses assessment
	Field Visit	PO-2, PO-3, PO-4	No Pre-requisite course(s)	Process-Oriented Guided Inquiry Learning (POGIL)	End Courses assessment
	Study Tour	PO-2, PO-3, PO-4	No Pre-requisite course(s)	Process-Oriented Guided Inquiry Learning (POGIL)	End Courses assessment
	Internship	PO-2, PO-3, PO-4	No Pre-requisite course(s)	Process-Oriented Guided Inquiry Learning (POGIL)	End Courses assessment

Program Structure for the Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) Degree

Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of **Geoinformatics** and **Natural Disaster Management** **Program Structure**								
Semester	Discipline Specific Core (DSC) (Credits) (L+T+P)	Discipline Specific Elective (DSE) / Open Elective (OE) (Credits) (L+T+P)	Ability Enhancement Compulsory Courses (AECC), Languages (L+T+P)		Skill Enhancement Course (SEC)			Total Credits
					Skill-based (Credits) (L+T+P)	Value-based (Credits) (L+T+P)		
I	DSC-A1 Principles of Geomorphology (4+2) DSC-A2 Basics of Cartography (4+2)	OE-1.1 Mathematics for Geography/ OE-1.2 Fundamentals of Remote Sensing (3)	L1-1 (3), L2-1 (3) (3+1+0 each)	Nil	SEC-1: Cartographic Techniques (2) (1+0+2)	Yoga (1) (0+0+2)	Health & Wellness (1) (0+0+2)	24
II	DSC-A3 Introduction to Climatology (4+2) DSC-A4 Physical Geography (4+2)	OE-2.1 Spatial Statistics / OE-2.2 Introduction to Geographic Information Systems (3)	L2-1 (3), L2-1 (3) (3+1+0 each)	Environmental Studies (2)	Nil	Physical Education - Yoga(1) (0+0+2)	NCC/ NSS/ R&R (S&G)/ Cultural (1) (0+0+2)	24
Note: First Semester students will have to undergo five days induction program								
III	DSC-A5 Introduction to Oceanography (4+2) DSC-A6 Fundamentals of Human Geography (4+2)	OE-3.1 Programming Fundamentals / OE-3.2 Geography of India /	L1-3 (3), L2-3 (3) (3+1+0 each)	Nil	SEC-2: Utility Mapping (2) (1+0+2)	Physical Education - Sports Skills (1) (0+0+2)	NCC/ NSS/ R&R (S&G)/ Cultural (1) (0+0+2)	24
IV	DSC-A7 Regional Geography of India (4+2) DSC-A8 Urban Geography (4+2)	OE-4.1 Python Programming / OE-4.2 Geography of Karnataka (3)	L1-4 (3), L2-4 (3) (3+1+0 each)	Constitution of India (2)	Nil	Physical Education – Games (1) (0+0+2)	NCC/ NSS/ R&R (S&G)/ Cultural (1) (0+0+2)	24
V	DSC-A9 Fundamentals of Remote Sensing (3+2) DSC-A10 Population Resources & Dynamics (3+2) DSC-A11 Development of Geographic Thought (3+1)	DSE-1.1 Geo-surveying / DSE-1.2 Rural Development (3) Vocational – 1 (3) Voc 1 Mobile Asset Mapping	Nil	Nil	SEC-3: Drone Mapping (2) (1+0+2)	Physical Education – Games (1) (0+0+2)	NCC/ NSS/ R&R (S&G)/ Cultural (1) (0+0+2)	22
VI	DSC-A12 Environmental Geography (3+2) DSC-A13 Fundamentals of Geographic Information Systems (3+2) DSC-A14 Basics of Natural Disasters (3+1)	Vocational – 2 (3) Voc 2 Open-Source GIS Internship (2)	Nil	Nil	SEC-4: Basics of R-Programming (2)	Physical Education – Games (1) (0+0+2)	NCC/ NSS/ R&R (S&G)/ Cultural (1) (0+0+2)	24
Exit option with Bachelor of Science Degree in Geography (140 Credits)								
VII	DSC-A15 Advanced Geomorphology (3+2) DSC-A16 Advanced Climatology (3+2) DSC-A17 Geo-Statistics (3)	DSE-A2.1 Settlement Geography/ DSE-A2.2 Spatial Database Managements / DSE-A2.3 Disaster Forecasting and Planning (3) (Student should select one from above and another from below pools for 3 credits each) DSE-A3.1 Biogeography / DSE-A3.2 Geoinformatics for Watershed Analysis DSE-A3.3 Hydro-Meteorological Hazards (3) Research Methodology (3)	Nil	Nil	Nil	Nil	Nil	22

VIII	DSC-A18 Sustainable Soil Resource Management (3+2) DSC-A19 Agriculture & Food Security (3+2) DSC-A20 Climate Change: Vulnerability and Adaptation (3)	DSE-A4.1 Political Geography / DSE-A4.2 Landscape Ecology and Landuse Planning / DSE-A4.3 Coastal Hazards Management (3) Research Project / Internship (6) / *If student is not willing to carry out Research Project or Internship he /she may have to elect two DSE, one from DSE-5 pool and another from DSE-6 pool for 3 credits each.* DSE-A5.1 Karnataka Geography/ DSE-A5.2 Geoinformatics for Coastal Zone Management/ DSE-A5.3 Land Degradation & Desertification (3) DSE-A6.1 Economic Geography / DSE-A6.2 Spatial Analysis and Modeling / DSE-A6.3 Anthropogenic Hazards and Management (3)	Nil	Nil	Nil	Nil	Nil	22
Exit option with Award of Bachelor of Science Honours Degree in Geography (180 Credits)								
IX	DSC-A21 Sustainable Water Resource Management (4+2) DSC-A22 Sustainable Forest Resource Management (4+2) DSC-A23 Regional Planning & Development (4+2)	DSE-A7.1 Trade & Transport Geography / DSE-A7.2 Tourism Geography/ DSE-A7.3 Biogeography (3) OE-5 Climate Action (3)	Nil	Nil	Nil	Nil	Nil	24
X	DSC-A24 Research Project (6) DSC-A25 Field Visit (4) DSC-A26 Study Tour (4)	Internship (6)	Nil	Nil	Nil	Nil	Nil	20
Award of Integrated M.Sc.(IMSc) Degree in Geography (220 Credits)								
Note: Students can earn credits by selecting open source like MOOCS, SWYAM, e-patasala, outreach program and other open e-learning platforms (20% of the total credit in the program)								

Semester	Integrated M.Sc (IMSc.) in Geography **Specialization: Geoinformatics**							
IX	DSC-A21 Remote Sensing for Water Resource Management (4+2)) DSC-A22 Geographic Information Systems for Soil Resource Management (4+2) DSC-A23 GIS Customization (4+2)	DSE-A7.1 Geoinformatics for Forest Resource Management / DSE-A7.2 Web-GIS (3) OE-5 Climate Action (3)	Nil	Nil	Nil	Nil	Nil	24
X	DSC-A24 Research Project (6) DSC-A25 Field Visit (4) DSC-A26 Study Tour (4)	Internship (6)	Nil	Nil	Nil	Nil	Nil	20
	Award of Integrated M.Sc.(IMSc) Degree in Geography with Geoinformatics specialization (220 Credits)							
	Note: Students can earn credits by selecting open source like MOOCS, SWYAM, e-patasala, outreach program and other open e-learning platforms (20% of the total credit in the program)							

Semester	Integrated M.Sc (IMSc.) in Geography **Specialization: Natural Disaster Management**							
IX	DSC-A21 Geospatial Applications for Disaster Management (4+2) DSC-A22 Geoinformatics for Biological Disasters and Public Health Management (4+2) DSC-A23 Disaster Risk Reduction & Response (4+2)	DSE-A7.1 Policy, Institution, Governance for Disaster Management / DSE-A7.2 Geoinformatics for Drought Monitoring in India (3) OE-5 Climate Action (3)	Nil	Nil	Nil	Nil	Nil	20
X	DSC-A24 Research Project (6) DSC-A25 Field Visit (4) DSC-A26 Study Tour (4)	Internship (6)	Nil	Nil	Nil	Nil	Nil	20
Award of Integrated M.Sc.(IMSc) Degree in Geography with Natural Disaster Management specialization (220 Credits)								
Note: Students can earn credits by selecting open source like MOOCS, SWYAM, e-patasala, outreach program and other open e-learning platforms (20% of the total credit in the program)								

COURSE PATTERN AND SCHEME OF EXAMINATION for Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of Geoinformatics and Natural Disaster Management

Semester - I

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-1	Principles of Geomorphology	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-2	Basics of Cartography	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
OE-1	1.1 Mathematics for Geography 1.2 Fundamentals of Remote Sensing	Theory	3	42	2	40	60	100	3
SEC-1	Cartographic Techniques	Practical	4	52	2	25	25	50	2

Semester - II

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-3	Introduction toClimatology	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-4	Physical Geography	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
OE-2	2.1 Spatial Statistics / 2.2 Introduction to Geographic Information Systems	Theory	3	42	2	40	60	100	3

Semester - III

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-5	Introduction to Oceanography	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-6	Fundamentals ofHuman Geography	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
OE-3	3.1 Programming Fundamentals / 3.2 Geography of India	Theory	3	42	2	40	60	100	3
SEC-2	Utility Mapping	Practical	4	52	2	25	25	50	2

Semester - IV

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-7	Regional Geography of India	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-8	Urban Geography	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
OE-4	4.1 Python Programming / 4.2 Geography of Karnataka	Theory	3	42	2	40	60	100	3

Semester - V

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-9	Fundamentals ofRemote Sensing	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	2
DSC-10	Population Resource &Dynamics	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	2
DSC-11	Development of Geographic Thought	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	1
DSE-1	1.1 Geo-surveying /	Theory			2				

	1. 2 Rural Development		3	42		40	60	100	3
VOC-1	Mobile Asset Mapping	Theory	3	42	2	40	60	100	3
SEC-3	Drone Mapping	Practical	4	52	2	25	25	50	2

Semester - VI

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-12	EnvironmentalGeography	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	2
DSC-13	Fundamentals ofGeographic Information Systems	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	2
DSC-14	Basics of Natural Disasters	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	1
VOC-2	Open-Source GIS	Theory	3	42	2	40	60	100	3
INP	Internship	-	4	52	2	25	25	50	2
SEC-4	Basics of R-Programming	Practical	4	52	2	25	25	50	2

Semester - VII

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-15	Advanced Geomorphology	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	2
DSC-16	Advanced Climatology	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	2
DSC-17	Geo-Statistics	Theory	3	42	2	40	60	100	3
DSE-2	2.1 Settlement Geography / 2.2 Spatial Database Managements / 2.3 Disaster Forecasting and Planning	Theory	3	42	2	40	60	100	3
DSE-3	3.1 Biogeography / 3.2 Geoinformatics for Watershed Analysis 3.3 Hydro-Meteorological Hazards	Theory	3	42	2	40	60	100	3
RM-1	Research Methodology		3	42	2	40	60	100	3

Semester - VIII

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-18	Sustainable Soil and Water Resource Management	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	2
DSC-19	Agriculture & Food Security	Theory	3	42	2	40	60	100	3
		Practical	4	52	2	25	25	50	1
DSC-20	Climate Change: Vulnerability and Adaptation	Theory	3	42	2	40	60	100	3
DSE-4	4.1 Political Geography / 4.2 Landscape Ecology and Landuse Planning / 4.3 Coastal Hazards Management	Theory	3	42	2	40	60	100	3
RP-1	Research Project / Internship		6	78	2	75	75	150	6
DSE-5	5.1 Karnataka Geography / 5.2 Geoinformatics for Coastal Zone Management / 5.3 Land Degradation & Desertification	Theory	3	42	2	40	60	100	3
DSE-6	6.1 Economic Geography / 6.2 Spatial Analysis and Modeling / 6.3 Anthropogenic Hazards and Management	Theory	3	42	2	40	60	100	3

***Note**: If student is not willing to carry out Research Project or Internship he /she may have to elect two DSE, one from DSE-5 pool and another from DSE-6 pool for 3 credits each*

Semester – IX (Geography)

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-21	Sustainable Water Resource Management	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-22	Sustainable Forest Resource Management	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-23	Regional Planning & Development	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSE-7	7.1 Trade & Transport Geography / 7.2 Tourism Geography/ 7.3 Biogeography	Theory	3	42	2	40	60	100	3

Semester – IX (Specialization: Geoinformatics)

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-21	Remote Sensing for Water Resource Management	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-22	Geographic Information Systems for Soil Resource Management	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-23	GIS Customization	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSE-7	7.1 Geoinformatics for Forest Resource Management / 7.2 Web-GIS	Theory	3	42	2	40	60	100	3

Semester – IX (Specialization: Natural Disaster Management)

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-21	Geospatial Applications for Disaster Management	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-22	Geoinformatics for Biological Disasters and Public Health Management	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSC-23	Disaster Risk Reduction & Response	Theory	4	52	2	40	60	100	4
		Practical	4	52	2	25	25	50	2
DSE-7	7.1 Policy, Institution, Governance for Disaster Management / 7.2 Geoinformatics for Drought Monitoring in India	Theory	3	42	2	40	60	100	3

Semester – X (Geography, GIS, and NDM)

Paper Code	Title of the Course / Paper	Type	Instruction Hour per Week	Total No. of Hours	Duration of Exam	IA Marks	Exam Marks	Total Marks	Total Credits
DSC-24	Research Project		6	78	2	75	75	150	6
DSC-25	Field Visit		4	52	2	75	75	150	4
DSC-26	Study Tour		4	52	2	75	75	150	4
INS-2	Internship		6	78	2	75	75	150	6

Five-Year Integrated B.Sc. and M.Sc. Degree Program (IMSc.) in Geography with specialization of Geoinformatics and Natural Disaster Management

Technical Skills and possible jobs after each exit level

Year	Exit Level	Objective	Credits	Technical Skills	Possible Jobs
III	B.Sc. Degree in Applied Geography	Understanding and exploration Focus and immersion	140	• Map Interpretation • Geomorphic Analysis • Climate Data Analysis & Interpretation • Cartography • Statistics Analysis • Cartography • GIS and Image Analysis • Tourism Management	▪ Field Surveyor ▪ Weather Data Analyst ▪ Field Surveyor ▪ Cartographer ▪ GIS Field Surveyor ▪ GIS Trainee ▪ Nature Conservation Officer ▪ School Teacher
IV	B.Sc. Honors in (Geography and Geoinformatics) (Geography and Natural Disaster Management)	Real Time Learning	180	• GIS & Image Analysis • Resource Management • Town Planning • Tourism Management	▪ Sustainability Consultant ▪ Tourism officer ▪ Transport planner ▪ Cartographer ▪ GIS Engineer ▪ Disaster Manager ▪ Environmental consultant ▪ Natural Disaster Scientist ▪ Geography Teacher ▪ Geography Researcher
V	Integrated M.Sc. in Geography and Geoinformatics Integrated M.Sc. Geography and Natural Disaster Management	Deeper Concentration / Research	220 Credits	• Geospatial Analysis. • Photogrammetry • Web GIS Development	▪ Program Manager for Response and Recovery ▪ Security Analyst ▪ Sustainability engineer ▪ Urban planner ▪ Landscape architect ▪ Disaster Recovery Specialist ▪ Disaster Recovery Coordinator ▪ Emergency Management Policy Advisor ▪ GIS Developer/ Manager ▪ Scientists

Integrated M.Sc (IMSc) Geography Semester 1

Title of the Course: DSC-A1 Principles of Geomorphology

Number of Theory Credits	Number of lecture hours/ semester	Number of practical Credits	Number of practical hours/ semesters
4	52 or 56	2	52 or 56

Course Outcomes:

1. After the completion of this course, students should be able to:
2. Define the field of Geomorphology and to explain the essential principles of it.
3. To outline the mechanism of dynamic nature of the Earth's surface and interior of the Earth.
4. To illustrate and explain the forces affecting the crust of the earth and its effect on it.
5. to understand the conceptual and dynamic aspects of landform development

Course Objectives:

This course aims to:

1. To define the concepts in Geomorphology and Physical Geography
2. To introduce various concept to understand cycles of the solid Earth surface
3. To understand the dynamic nature of the Earth's surface, various processes, and landforms.
4. To study the impact human on geomorphic system.

Content of Theory Course	52/56Hrs
Unit – 1 Geomorphology	13/14
Introduction to Geography: physical and human geography Introduction to Geomorphology: meaning, nature, development, and scope Principles of Geomorphology, Applied Geomorphology, Geological Time Scale Distribution of continents and oceans	
Unit – 2 Systems and Cycles of the Solid Earth	13/14
Internal structure of the earth, Alfred Wegener's, continental drift theory Theory of Isostacy: Views of Pratt and Airy, Convectional current theory and concept of sea floor spreading Theory of Plate Tectonics: plate boundaries, subduction, Case Studies: Volcano, Earthquake: reporting of latest incidents	
Unit – 3 The Dynamics of Earth	13/14
Earth's Movements: Endogenetic and Exogenetic forces, Sudden and Diastrophic movements-Epeirogenetic and Orogenetic Movements-Process of folding and faulting Vulcanicity and earthquake Rocks: Characteristics, types, importance, and rock cycle Weathering: meaning, types and controlling factors Mass Movement: meaning, controlling factors, types-landslides, rock-falls	
Unit – 4 Evolution of Landforms	13/14
Landforms: Meaning Types and factors controlling landforms development Slope Development: Concept and types Concept of Cycle of Erosion – W.M. Davis and W. Penck Agents of Denudation: River, Drainage patterns, Groundwater, Sea waves, Wind, Glaciers and resultant landforms **Application of Geomorphology in India and Karnataka:** Regional planning, Urban Planning and Transportation. Mining, Hazard Management, Agriculture and environmental Management **Case Study:** Students must be taken to observe local land formation and degradation and write a report on their effectiveness.	

Geomorphology Practical

Content of Practical Course 1: List of Experiments to be conducted

Exercise-1: Identification of Rocks and Minerals. Mineral samples: Iron ore, Bauxite ore and Manganese. Rock Samples: Granite, Basalt, Lime Stones, Sandstone, quartzite, and marble.

Exercise-2: Extraction and interpretation of Geomorphic information from Topographical maps

Exercise-3: Tracing of contours from topographical sheets, transect-longitudinal relief, relief ratio

Exercise-4: Slope Analysis - Slope Maps (Wentworth method) Slope (isotan and isosin) and aspect maps & Hypsometric curve and integral

Exercise-5: Drainage Morphometry: delineation of watershed, stream ordering and Morphometric analysis: mean stream length, drainage density, drainage frequency and sinuosity index

Field based Activity: Measurement of channel cross-sections in the field, Geomorphic map of channel bed, Study of erosional and depositional features in the field.

Textbooks

1. Ahmed E. (1985) Geomorphology, Kalyani Publishers, New Delhi.
2. P Mallappa, Physical Geography (Kannada Version)
3. Ranganath Principles of Physical Geography (Kannada Version)
4. Nanjannavar S S: Physical Geography (Kannada Version)
5. Hugar M R Physical Geography part 1(Kannada Version)
6. Goudar M B, Physical Geography (Kannada Version)
7. Kolhapure and S S Nanjan, Physical Geography (Kannada Version)

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1. Bloom A.L. (1978) Geomorphology: A Systematic Analysis of Late Cenozoic Landforms Prentice – Hall of India, New Delhi.
2. Brunsden D. (1985) Geomorphology in the Service of Man: The Future of Geography, Methnen, U.K.
3. Chorley, R.J., Schumm, S. A. and Sugden, D.E. 1984: Geomorphology, Methuen, London
4. Cooke, R.U. and Warren, 1973: Geomorphology in Deserts, Batsford, London
5. Dayal, P. 1996: Textbook of Geomorphology, Shukla Book Depot, Patna.
6. Goudie Anrew et.al. (1981) Geomorphological Techniques, George Allen &Unwin, London.
7. Homes A. (1965) Principles of Physical Geology, 3rd Edition, ELBSS Edn.
8. Strahler A.N. (1968) The Earth Sciences, Harper & Row Intl. Edn, New York
9. Thornberry W.D. (1969) Principles of Geomorphology 2nd Edition, Wiley Intl. Edn. & Wiley, 1984.
10. Verstappen H. (1983) Applied Geomorphology, Geomorphological Surveys for Environmental Development, Elsevier, Amsterdam

Reference Websites

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2. http://www.moorlandschool.co.uk/earth/tectonic.htm
3. https://www.usgs.gov/
4. https://www.ksndmc.org/

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Date 16/09/2021	Course Co-ordinator	Subject Committee Chairperson

Integrated M.Sc (IMSc) Geography Semester 1

Title of the Course: DSC-A2 Basics of Cartography

Number of Theory Credits	Number of lecture hours/ semester	Number of practical Credits	Number of practical hours/ semesters
4	52 or 56	2	52 or 56

Course Outcomes:

1. Understating a map and map making process
2. Formulate the techniques involved in representing the 3d feature on 2d surface
3. Manage the methods involved in preparing visually appealing maps
4. Organisations involved in map making

Course Objectives:

This course aims to:

1. Develop foundational knowledge and demonstrate applied skills in cartographic principles and geo-spatial data visualization, design, and communication.
2. Analyze, interpret, and make measurements from topographic and thematic maps, aerial photographs, and satellite imagery.

Content of Theory Course 1	52/56Hrs
Unit – 1 Concept, scope & significance of Cartography	13/14
Growth & Development of cartography: Impact of Technology on Cartography. Map as tool in Geographical Studies Cartography as a science of human communication. Web cartography. Elements of generalization. Measurement of Geographical variables: Nominal, Ordinal, Interval and Ratio. Map- making process: Map symbolization. Perception and Designing, Color theory, Color and Pattern Creation, Typography and Lettering the map, Qualitative and Quantitative symbols Map compilation and map layout, Future Cartography. Mapping organization and services in India: SOI, NATMO and NRSC.	
Unit – 2 Shape of the Earth	13/14
Spheroid, Ellipsoid and Geoid. Geographic Coordinates: Latitude and Longitude. Datum, Map projections: Properties, Distance, Direction and Angle, Selection of appropriate map projection and types.	
Unit – 3 Scope and objectives of map design	13/14
Controls of map design and constrains in map design. Map Scale: Statement, Representative Fraction and Geographical Scales, Determining and scale. Ground Survey and Positioning: Measuring distance, and direction, Traditional Survey methods, GPS.	
Unit – 4 Types of Maps	13/14
Types of maps: Thematic and composite mapping. Techniques of map making: Choropleth, Isarthmic, Dasymetric, Chorochromatic, Choroschematic and Flow maps. Data representation on maps: Pie diagrams, bar diagrams and line graphs. Case Study: Students will have to draw few layers of maps of a village nearby and prepare layout and fringe information and submit.	

Cartography Practical

Content of Practical Course 1: List of Experiments to be conducted

Exercise 1: Representation of Data

Dot Density, Graduated Symbol, Graduated Color, Gray Scale, Choropleth Method, Isopleth Method, Block Pile Diagrams, Pie Diagrams, Stacked Bar Charts, Flowdiagrams

Exercise 2: Map Scale

Large Scale vs Small Scale, Construction of the Map Scales, Map Scale Conversion, RF Scale

Exercise 3: Introduction to Topographical Maps

Interpretation of toposheet, Maps of Survey of India, marginal information of topographical maps -all Signsand Symbols.

Exercise 4: Interpretation of SOI Topographical Maps

Relief, Drainage, Vegetation, means of communication and settlements

Exercise 5: Use of GPS

Collection of Locational Data using handheld GPS or Mobile GPS Apps

References

1. Monkhouse F.J. & H.R. Wilkinson (1952) Maps and Diagrams, their compilation and concentration, Methuen & Co, London
2. Harwell J.D & M.S. Newson (1973) Techniques in Physical Geography, Macmillan Edn. Ltd, London.
3. Mishra R.P. & Ramesh A (1968) Fundamentals of Cartography, Prasaranga, University of Mysore.
4. Menno-Jan Kraak & FerjanOrmeling (2003) Cartography Visualization of Geospatial Data, Pearson Edn Pvt. Ltd. (Singapore) New Delhi.
5. Nag P (1992) Thematic Cartography and Remote Sensing, concept Publishing Co. New Delhi.
6. Tyner J., (1992). Introduction to Thematic Cartography, Prentice-Hall, Englewood Cliff, New Jersey.
7. Robinson, A.H., Morrison J.L., Muehrcke P.C., Kimerling A.J., and Guptill S.C., (2009). Elements of Cartography, New York, John Wiley and Sons. USA.
8. Kraack M.J., and Omeling F.J., (2015), Cartography: Visualization of Spatial Data (Third Edition), Pearson Education Limited, England

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Integrated M.Sc (IMSc) Geography Semester I

Title of the Course: OE-1.1 Mathematics for Geography

Number of Theory Credits	Number of lecture hours/ semester
3	39 or 42

Course Outcomes:

At the end of the course the students will:

1. Understand the foundations of mathematics.
2. Develop and maintain problem-solving skills.
3. Be able to write and understand basic proofs.

Course Objectives:

This course aims to

1. Develop mathematical curiosity and use inductive and deductive reasoning when solving problems.
2. Become confident in using mathematics to analyse and solve problems spatial in nature.
3. Students will feel a sense of accomplishment in their increasing ability to use mathematics to solve problems of interest to them or useful in their chosen fields. Students will attain more positive attitudes based on increasing confidence in their abilities to learn mathematics.
4. Students will learn to understand material using standard mathematical terminology and notation when presented either verbally or in writing.

Content of Theory Course	39/42Hrs
Unit – 1 Elementary Mathematics	10
Matrices, Types of Matrices, Algebra of Matrices, Determinants, Linear Equations, Roots of variables, Permutation vs. Combination, Partial Fractions, Proper and Improper Fractions, Ratio and Proportions, Variables and Constants, Algebra of Limits, Concepts of Differentiation, Indefinite Integrals. Units and Units Conversion-Volume, Length, Area.	
Unit – 2 Geometry and Spatial Mathematics	10
Geometrical shapes, Line, line segment, traverse, closed and open traverse, interior and exterior angles, sides of geometry, Centre, radius, diameter, arc, sector, chord, segment, semicircle, circumference, Types of angles, Measure of angles, Intersecting and perpendicular lines. Rhumb lines, greatest circle distance, earth radius, latitudes, longitudes, angular units, spatial measurements, Heron's method of area, land parcel division, direction and bearing measurements.	
Unit – 3 Spatial Complexity, Connectivity and Applications	10
Geography of Networks, Diffusion and Coalescence of Space, Connectivity, Nodes, Links, Shortest Route, Dijkstra's algorithm, Urban Structure Matrix, Concepts of Monte Carlo Simulation, Shannon Entropy, Euclidean Distance, Spatial Interpolation	
Unit – 4 Geographical Uncertainties and Mathematical Modelling	12
In-Situ, transfer, epistemic and transmissivity uncertainty, semivariograms, bias detection, uncertainty modelling, Total operating characteristics (TOC), Relative Operating Characteristics(ROC), Confusion Matrix, Bias Correction, Cumulative Distributive Function, Kappa Coefficient and Kling-Gupta Efficiency modelling, PBIAS, RMS, RMSE, R-Square modelleling.	

References

1. Higher Engineering Mathematics by Grewal, B.S., Khanna Publishers, 1993.
2. Engineering Mathematics by Sastry, S.S., Vol. I and II, Prentice Hall of India, 2nd edition, 1994.
3. Elementary differential equations by Rainville, E.D. and Bedient, P.E., 6th edition.
4. Higher Engineering Mathematics by Grewel, B.S., 33rd edition.
5. Differential Calculus by Shanthi Narayan, 13th edition.

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Integrated M.Sc (IMSc) Geography Semester I

Title of the Course: OE 1.4 Fundamentals of Remote Sensing

Number of Theory Credits	Number of lecture hours/ semester
3	39 or 42

Course Outcomes:

1. This course is to make understand the basic concepts of Remote Sensing and to impart necessary skills of remote sensing analysis, and image interpretation to the students. So that, students acquire employable skills in remote sensing.
2. Students will learn how to handle and process the satellite images for understanding of biophysical phenomena of the earth system.

Course Objectives:

1. To congregate the basic concepts and fundamentals of physical principles of remote sensing
2. To create a firm basis for successful integration of remote sensing in any field of application.
3. To study basics of digital image processing and image interpretation techniques.
4. To study the applications of the remote sensing to solve the real-world problems.

Content of Theory Course	39/42Hrs
Unit – 1 Introduction	9/10
Definition of Remote Sensing, developmental stages, Laws of Physics, electromagnetic waves, spectrum, regions, wavelength, frequencies, and applications. Types-Satellites, Sensors, Payloads, Orbits, telemetry of satellites.	
Process and types of Remote Sensing	10
Process of remote sensing, interaction of radiation with atmosphere and targets, atmospheric noises, attenuation in radiance, resolutions of remote sensing, optical remote sensing, visible region of the spectrum, thermal remote sensing, microwave remote sensing, Hyperspectral remote sensing, LiDAR, and other remote sensing platforms.	
Unit – 3 Image Classification and Interpretation	10
Satellite products and its spectral characteristics, composite images, band ratios; Land use land cover classification schemes-Anderson and NRSC; Visual image interpretation, elements, stages of interpretation and interpretation keys. Image classification-supervised, unsupervised, and principal component analysis (PCA) and accuracy assessment.	
Unit – 4 Applications of Remote Sensing	10/12
Disaster Management, Meteorological Studies, Agricultural and Irrigation Studies, Forestry Studies, Hydrological Studies, Natural Resource, Oceanic and Coastal mapping, Soil resource mapping, Urban and Rural Mapping and Management. **Case Study:** Students must be taken to observe nearby remote sensing department and allow them to observe how remotely sensed data is gathered and processed. .	

REFERENCES

1. Remote Sensing of the Environment: An Earth Resource Perspective (Prentice Hall Series in Geographic Information Science) - Second Edition (2006), John Jensen
2. Remote Sensing and GIS, Second Edition (2011), Bhatta, B.
3. Introduction to Remote Sensing and Image Interpretation (2003); Lillesand T.M.

WEB RESOURCES

1. Projections: https://map-projections.net/imglist.php
2. Textbook of Canadian Remote Sensing https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf
3. ITC Netherlands, Principles of Remote Sensing https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesremotesensing. pdf

REFERENCES: MOOC

1. Remote Sensing - https://nptel.ac.in/courses/105/108/105108077/
2. Introduction to Remote Sensing https://nptel.ac.in/courses/121/107/121107009/
3. Digital Image Processing of Remote Sensing Data https://nptel.ac.in/courses/105/107/105107160/
4. Remote Sensing and GIS - https://nptel.ac.in/courses/105/103/105103193/
5. Remote Sensing Essentials - https://nptel.ac.in/courses/105/107/105107201/
6. Remote Sensing: Principles and Applications - https://nptel.ac.in/courses/105/101/105101206/
7. Basics of Remote sensing, GIS & GNSS technology and their applications
8. https://onlinecourses.swayam2.ac.in/aic20_ge05/preview
9. Remote Sensing and GIS
10. Remote sensing and image interpretation (2015); Chipman, Jonathan W., Kiefer, Ralph W., Lillesand
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12. Practical handbook of remote sensing, First Edition (2016) - Lavender, Andrew, Lavender, Samantha
13. Introductory Digital Image Processing: A Remote Sensing Perspective, Fourth Edition (2015) - John R. Jensen
14. Image processing and GIS for remote sensing: techniques and applications; Second Edition (2016) - Liu, Jian-Guo, Mason, Philippa J https://onlinecourses.nptel.ac.in/noc19_ce41/preview

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Integrated M.Sc (IMSc) Geography Semester 1

Title of the Course: SEC 1- Cartographic Techniques

Number of Theory Credits	Number of lectures hours/ semester
2	42

Course Outcomes:

After the completion of this course, students should be able to:

6. Define the field of cartography and to explain the essential principles of it.
7. To outline the mechanism of map making

Course Objectives:

This course aims to:

5. To define the concepts in cartography
6. To introduce various concepts of scale and mapping skills
7. To understand the techniques map layouts

Content of Theory Course	42 Hrs
Unit – 1 Cartographic Basic	11
Cartography – Nature and Scope; Scales – Concept and application; Graphical Construction of Comparative and Diagonal Scales; Elements of the map, types of maps; Cartographic Appreciation.	
Unit – 2 Map Projections	11
Map Projections – Classification, Properties and Uses; Graphical Construction of Polar Zenithal Stereographic, Bonne's and Mercator's Projections, and reference to Universal Transverse Mercator.	
Unit – 3 Physical Feature Extraction and Interpretation	10
Interpretation of Topographical maps with the help of Cross and Longitudinal Profiles; Slope Analysis – Wentworth's method.	
Unit – 4 Mapping Techniques	10
Choropleth maps, Dot Maps; Isopleth Maps, Chorochromatic Maps; Choroschematic Maps; Proportional Symbols.	

References

1. Anson R. and Ormelling F. J., 1994: International Cartographic Association: Basic Cartographic, Pregmen Press.

2. Gupta K.K. and Tyagi, V. C., 1992: Working with Map, Survey of India, DST, New Delhi.

3. Mishra R.P. and Ramesh, A., 1989: Fundamentals of Cartography, Concept, New Delhi.

4. Monkhouse F. J. and Wilkinson H. R., 1973: Maps and Diagrams, Methuen, London.

5. Rhind D. W. and Taylor D. R. F., (eds.), 1989: Cartography: Past, Present and Future, Elsevier, International Cartographic Association.

6. Robinson A. H., 2009: Elements of Cartography, John Wiley and Sons, New York.

7. Sarkar, A. (2015) Practical geography: A systematic approach. Orient Black Swan Private Ltd., New Delhi.

8. Sharma J. P., 2010: Prayogic Bhugol, Rastogi Publishers, Meerut.

9. Sharma, J P (2010) Prayogtmak Bhugolki Rooprekha, Rastogi Publications, Meerut.

10. Singh R L & Rana P B Singh (1991) Prayogtmak Bhugol ke MoolTatva, Kalyani Publishers, New Delhi.

11. Singh R. L. and Singh R. P. B., 1999: Elements of Practical Geography, Kalyani Publishers.

12. Singh, R L & Dutta, P K (2012) Prayogatmak Bhugol, Central Book Depot, Allahabad

13. Mishra, R.P (2014) Fundamentals of Cartography (Second Revised and Enlarged Edition), Concept publication.

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Integrated M.Sc (IMSc) Geography Semester II

Title of the Course: DSC-A3 Climatology

Number of Theory Credits	Number of lecture hours/ semester	Number of practical Credits	Number of practical hours/ semesters
4	52 or 56	2	52 or 56

Course Outcomes:

After the completion of this course, students should be able to

1. Define the field of climatology and to understand the atmospheric composition and structure.
2. To outline the mechanism and process of solar radiation transfer to earth surface and to explain the temperature distribution and variation according to time and space.
3. To illustrate and explain the air pressure system, wind regulating forces and the formation of the Atmospheric Disturbance.
4. To understand and compute the air humidity as well as to explain the process of Condensation and formation of precipitation and its types.

Course Objectives:

This course aims to:

1. To define the field of climatology and components of the climate system
2. To introduce various dimensions of climatology like structure and composition.
3. To understand the global atmospheric pressure, temperature, and wind system.
4. To study the concept of atmospheric moisture and its types

Content of Theory Course	52/56Hrs
Unit – 1 Composition and Structure of the Atmosphere	13/14
Nature and Scope of Climatology, Atmospheric Sciences; Climatology and Meteorology, Origin and structure of the Atmosphere: Troposphere, Stratosphere, Mesosphere, Ionosphere, Exosphere and their characteristics. Composition of the atmosphere Weather and Climate	
Unit – 2 Atmospheric Temperature	13/14
Insolation: Definition, Mechanism, Solar Constant. Factors affecting the Insolation: Angle of incidence, length of the day, Sunspots, Distance between the earth and the sun, effect of the atmosphere. Heating and cooling process of the atmosphere-Radiation, Conduction, convection, and advection. Temperature: meaning and Influencing Factors on the Distribution of Temperature-Distribution of the temperature: Vertical, Horizontal, and Inversion of temperature. Global Energy Budget: Incoming shortwave solar radiation, Outgoing Long wave Terrestrial radiation, Albedo. Net Radiation and Latitudinal Heat Balances.	
Unit – 3 Atmospheric Pressure and Winds	13/14
Atmospheric Pressure: Influencing factors on atmospheric pressure. Vertical and Horizontal Distribution of the atmospheric pressure and Pressure Belts, Pressure Gradient. Tri-cellular-Hadley, Ferrel's and Polar Cells.	

Winds: influencing factors, Types - planetary, seasonal, local wind Variable winds- Cyclones and anti-cyclones. Air-Masses and Fronts: Definition, Nature, Source Regions, Classification.	
Unit – 4 Atmospheric Moisture	13/14
Humidity: Sources, influencing factors and types-Absolute, Relative and Specific. Hydrological cycle: process of evaporation, condensation. Clouds and its types precipitation and its forms. Climate Change: Causes and consequences, recent issues-floods, drought. **Case Study**: Students must be taken to observe local place weather conditions to write a report on weather changes and differentiate with the climate.	

Climatology Practical

Content of Practical Course 1: List of Experiments to be conducted

Conduct all exercises with Goal, Procedure, devices, and findings.

Exercise 1: Acquisition of Climate Variables

Exercise 2: Plotting of variables (Manual and Automated)

Exercise 3: Generating Descriptive Statistics of Climate Variables

Exercise 4: Derivation of Water-Balance Chart

Exercise 5: Derivation of Actual and Potential Evapotranspiration

Exercise 6: Derivation of Drought Indices (Standard Precipitation Index, Aridity Index)

Exercise 7: Calculation of Bio-Climatic Variables (refer worldclim.org)

Exercise 8: Parametric and Non-Parametric Trend Detection

Exercise 9: Periodicity and Return Period Calculation

Exercise 10: Charting and Graphing of Climate variables (Scatterplot, Bar, Wind rose, Spider, Isohyets, Non-Linear Splines)

Field based Activity: Measurement of Water-Balance in the field, Study of erosional and run-off in the field.

Textbooks

1. Lal, D. S. (1998). Climatology. Allahabad: Chaitanya Publishing House.
2. P Mallappa, Physical Geography (Kannada Version)
3. Ranganath Principles of Physical Geography (Kannada Version)
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8. Lutgens, Frederic K. & Tarbuck, Edward J. (2010). The Atmosphere: An Introduction to Meteorology. New Jersey: Pearson Prentice Hall.
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2. https://mausam.imd.gov.in/
3. https://www.weatheronline.in/
4. https://earthexplorer.usgs.gov/
5. https://www.nhc.noaa.gov/satellite.php

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Integrated M.Sc (IMSc) Geography Semester II

Title of the Course: DSC-A4 Introduction to Remote Sensing

Number of Theory Credits	Number of lecture hours/ semester	Number of practical Credits	Number of practical hours/ semesters
4	52 or 56	2	52 or 56

Course Outcomes:

1. This course is to make understand the basic concepts of Remote Sensing and to impart necessary skills of remote sensing analysis, and image interpretation to the students. So that, students acquire employable skills in remote sensing.
2. Students will learn how to handle and process the satellite images for understanding of biophysical phenomena of the earth system.

Course Objectives:

1. To congregate the basic concepts and fundamentals of physical principles of remote sensing
2. To create a firm basis for successful integration of remote sensing in any field of application.
3. To study basics of digital image processing and image interpretation techniques.
4. To study the applications of the remote sensing to solve the real-world problems.

Content of Theory Course 1	52/56Hrs
Unit – 1 Introduction to Remote Sensing	13/14
Definition and components, History of Remote Sensing, Electromagnetic Magnetic Spectrum, Basics of wave theory, Particle theory, Stefan Boltzman law - Wiens-Displacement Law, Interaction of EMR with the atmosphere and with the surface feature, Atmospheric window, spectral reflectance of land covers (minerals, rocks, water, vegetation, and urban area).	
Sensors and platforms	13/14
Types of orbits- sun synchronous and geo synchronous, Sources of energy, Classification of remote sensors- Active, Passive, Electro-mechanical and optical sensors. Resolution concept - Spectral, Radiometric, and temporal resolution. Platform types and characteristics, Launch of space vehicles. Angular characteristics-FOV and IFOV, pushbroom and whiskbroom cameras, Panchromatic, multi spectral, hyperspectral scanners, geometric characteristics of the imageries. Advanced Remote Sensing: Microwave, Radar (Scatterometer, Radiometer, and Altimeter), Lidar and Thermal.	
Unit – 3 Aerial Photography	13/14
Elements, Types and interpretation of Aerial photography, Principles, Classification of Aerial photographs on the basis of Height and Tilt, Scales, Components of camera, film, Aerial platforms. Elements of Aerial photo interpretation, Digital and Analog data, Image formats, Stereo pairs, Applications of Aerial Photography	
Unit – 4 Applications of Remote Sensing	13/14
International remote sensing centers, Indian remote sensing centers and their activities, new satellite programs of India. Land observation satellites, Meteorological satellites, Marine observation satellites. Remote Sensing Applications in various Fields.	

Remote Sensing Practical

Exercise 1: Satellite Products and Band Characteristics

Exercise 2: Layers Stacking and Band Composition

Exercise 3: Pre-Processing: Geometric and Radiometric Correction

Exercise 4: Mosaic of Multipath and Multi Row Imageries

Exercise 5: Extraction of Area of Interest

Exercise 6: Image Enhancement and Principal Component Analysis

Exercise 7: Image Classification: Supervised and Unsupervised

Exercise 8: Spectral Signatures and Feature Space Analysis

Exercise 9: Change Detection

Exercise 10: Spectral Indices and Thematic Mapping.

WEB RESOURCES

1. Projections: https://map-projections.net/imglist.php
2. Textbook of Canadian Remote Sensing https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf
3. ITC Netherlands, Principles of Remote Sensing https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesremotesensing. Pdf
4. http://earthobsevatory.nasa.gov/Library/RemoteSensing

REFERENCES: MOOC

1. Remote Sensing - https://nptel.ac.in/courses/105/108/105108077/
2. Introduction to Remote Sensing https://nptel.ac.in/courses/121/107/121107009/
3. Digital Image Processing of Remote Sensing Data - https://nptel.ac.in/courses/105/107/105107160/
4. Remote Sensing and GIS - https://nptel.ac.in/courses/105/103/105103193/
5. Remote Sensing Essentials - https://nptel.ac.in/courses/105/107/105107201/
6. Remote Sensing: Principles and Applications - https://nptel.ac.in/courses/105/101/105101206/
7. Basics of Remote sensing, GIS & GNSS technology and their applications
8. https://onlinecourses.swayam2.ac.in/aic20_ge05/preview
9. Remote Sensing and GIS

References

1. Lillesand T.M and Kiefer R.W, Remote Sensing and Image interpretation, 7th Edition, John Wiley & Sons, Canada.
2. Jensen J.R, (2012), Remote Sensing of Environment: An Earth Resources Perspective, 2nd Edition, Pearson Education, Upper Saddle River, Prentice Hall, New Jersey.
3. Elachi C and van Zyl J.J, (2006). Introduction to the Physics and Techniques of Remote Sensing, John Wiley & Sons, Canada.
4. Joseph G, (2005), Fundamentals of Remote Sensing, 2nd Edition, Universities Press (India) Pvt Ltd, Hyderabad.

5. Narayan L R A, (1999), Remote sensing and its Applications, Universities Press (India) Pvt Ltd, Hyderabad.
6. Rampal K.K, (1999), Hand book of Aerial Photography and Interpretation, Concept Publishing Co, New Delhi.
7. Avery T.E and Berlin G.L, (1992), Fundamentals of Remote Sensing and Air Photo Interpretation, 5th Edition, Prentice Hall, New Jersey.
8. Sabins, F.F.Jr, (1987), Remote Sensing; Principles and Interpretation, 2nd Edition, W.H. Freeman and Co, New York.
9. John R. Jensen: Remote sensing of the Environment. Pearson education publication
10. Jensen, John R., 2005, Introductory Digital Image Processing, 3rd Ed., Upper Saddle River, NJ: Prentice Hall, 526 pages.
19. Principles of Remote Sensing – An Introductory Textbook by W. H. Bakker et al
20. Frontiers of Remote Sensing Information Processing. by: C. H. Chen http://rst.gsfc.nasa.gov/Front/tofc.html.

	Dr. K Prasanna kumar	**Prof. Ashok Hanjagi**
Date 16/09/2021	Course Co-ordinator	Subject Committee Chairperson

Integrated M.Sc. Semester II

Title of the Course: OE 2.1 Spatial Statistics

Number of Theory Credits	Number of lecture hours/ semester
3	39 or 42

Course Outcomes:

At the end of the course the students will be:

1. Describe and discuss the key terminology, concepts tools and techniques used in
2. statistical analysis
3. Understand and critically discuss the issues surrounding sampling and significance
4. Solve a range of problems using the techniques covered
5. Conduct basic statistical analysis of data.

Course Objectives:

This course aimsto

1. To develop the student's ability to deal with numerical and quantitative issues in Geography.
2. To enable the use of statistical, graphical, and algebraic techniques wherever relevant.
3. To have a proper understanding of Statistical applications in Geography.

Content of Theory Course	39/42Hrs
Unit – 1 Introduction	9/10
Statistical Methods for Geography - Scientific method and mathematical notation - Descriptive Statistics - Measures of central tendency: Mean, Median, and Mode - Measures of Dispersion: Range, Variance, Standard Deviation, z-score, Skewness, Kurtosis and Histograms.	
Unit – 2 Probability	10
Probability Concepts - Discrete Probability Distributions: Uniform, Binomial and Poisson Distributions - Continuous Probability Distributions - Probability Models - Central Limit Theorem and Confidence Intervals, box, log, log-linear transformation	
Unit – 3 Hypothesis Testing and Sampling	10
Sources of Data - Spatial Sampling (Stratified, Random, Clusters) -Hypothesis Testing: Null Hypothesis, Alternative Hypothesis, p-value, Chi-square, degree of freedom, wald coefficient, z-test and t-test - Analysis of Variance (ANOVA)., One Way and Two-Way ANOVA, outliners detection and inferances	
Unit – 4 Correlation and Regression	10/12
Covariance - Pearson's Correlation Coefficient - Spearman's Rank Correlation Coefficient – Correlation and Geographic Problems -Regression Analysis., Measuring Geographical Distribution, Mean Center, Median Center, Standard Deviation, Geographical Weighted Regression, Moran-I Index, Exploratory Spatial Data Analysis.	

References

1. Rogerson, P. A. (2001) Statistical Methods for Geography, Sage Publications, New Delhi.
2. Pal, S. K. (1998) Statistics for Geoscientists, Tata McGraw Hill, New Delhi.
3. Hammond, P. and McCullagh, P. S., (1978) Quantitative Techniques in Geography: An Introduction, Oxford University Press, New York.
4. S.C. Gupta (2018) Fundamentals of Statistics, 7th edition, Himalaya Publishing House.Pedagogy

Dr. K Prasanna kumar **Prof. Ashok Hanjagi**

Date 16/09/2021 Course Co-ordinator Subject Committee Chairperson

Integrated M.Sc (IMSc) Geography Semester II

Title of the Course: DE 2.4: Introduction to Geographic Information Systems (GIS)

Number of Theory Credits	Number of lecture hours/ semester
3	39 or 42

Course Outcomes:

1. Students are trained to adapt the theoretical concepts in a practical way through the mathematical models of geography.
2. Students will have the hands-on training on various modes of spatial and non-spatial data collection, data storage, data analytics, data interpretation and data display through the thematic maps.
3. Students are exposed on spatial thinking to solve the geographical problems with range of proven mathematical and statistical models.
4. Students can employ in various corporate and government organisation where they deal to solve geographical problems.

Course Objectives:

This course aims to:

1. Understand the concept and techniques of the Geographic Information Systems.
2. Define the GIS data types and structures.
3. Study geo processing and visualization concepts and techniques in GIS.

Content of Theory Course	39/56Hrs
Unit – 1 Introduction	10
Emergence of GI Science, Milestone and Developmental stages in GIS, Definition, scope, role of GIS in digital world; Components, functionalities, merits and demerits, global market, interdisciplinary domains, and its integration with GIS.	
Unit – 2 Geodesy and Spatial Mathematics	10
Cartesian coordinates, latitude, longitudes, formats of angular units, geographical coordinates, Datum: WGS84, vs NAD32. UTM, Aerial Distance measurement using Geographic and projected coordinates, Area, Perimeter, length by coordinates and various international measures.	
Unit – 3 GIS Data and Scale	10
Spatial Data and its structures; sources and types of data collection; data errors, topology of data and relationship. Large Scale vs Small Scale, generalization; precision and accuracy of data-logical consistency and non-spatial data integration	
Unit – 4 Geoprocessing and Visualization	12
Spatial and Non-Spatial Queries, proximity analysis, Preparation of Terrain and Surface models. Hotspot and density mapping. Types of maps, thematic maps and its types, relief maps, flow maps and cartograms. Tabulations: Graphs and Pivot tables.	

References

1. An Introduction to Geographical Information Systems - Ian Heywood (2011)
2. Geographic Information Systems: A Management Perspective - Aronoff, S. (1989)
3. GIS - Fundamentals, Applications, and Implementations - Elangovan, K. (2006)
4. Introduction to Geographical Information Systems - Chang, Kang-Tsung (2015)
5. Remote Sensing and GIS - Bhatta, B. (2011)
6. Mathematical Modelling in Geographical Information System, Global Positioning System and Digital Cartography - Sharma, H.S. (2006)
7. Spatial analysis and Location-Allocation Models - Ghosh, A. and G. Rushton (1987)
8. Geographic Information Systems and Cartographic Modelling - Tomlin, C.D. (1990)
9. Geographic Information Systems and Science - Paul A. Longley, et. al. (2015)
10. Geographic Information Systems and Environmental Modelling - Clarke, C., K. (2002)

Reference Websites

1. IIRS MOOC programme: https://isat.iirs.gov.in/mooc.php
2. ITC Netherlands, Principles of GIS https://webapps.itc.utwente.nl/librarywww/papers_2009/general/principlesgis.pdf
3. Geographical Information Systems: Principles, Techniques, Management and Applications https://www.geos.ed.ac.uk/~gisteac/gis_book_abridged/

	Dr. K Prasanna kumar	**Prof. Ashok Hanjagi**
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