



**SCHOOL OF ENVIRONMENTAL SCIENCES**

**Mahatma Gandhi University**

**STRATEGIC PLAN**

**FOR THE COMING TWENTY YEARS**

**Plan I: Development of New Departments under the School**

**Plan II: Development of the present courses and introduction of New  
postgraduate programmes**

**Plan III: Certificate programmes**

**Plan IV: Transdisciplinary Centre for Environment and Disaster Research**

**Plan V: Expansion of “Centre for Environment Audit & Consultancy (CEAC)**

**Plan VI: Expansion of Remote Sensing and GIS Centre**

## **INTRODUCTION**

The School of Environmental Sciences, Mahatma Gandhi University is one of the premier centres in India offering academic and research programs in Environmental sciences and Disaster management. The school is an ideal venue for interdisciplinary research along with human resource development envisaging expertise in the field of environmental science, disaster management and sustainable development. Presently the school runs three Masters programmes- M.Sc. Environmental Sciences and Management, M.Sc. Environmental Sciences and Disaster Management and MSc. Applied Geology (Under the Department of Geology of the School) and Ph.D programmes. The courses for the programmes are carefully designed with the objective of developing research and building human resources in all the fields of geosciences, environmental sciences and disaster management.

The school already has six divisions of academia pertaining to various fields of environmental sciences viz. Environmental Chemistry, Environmental Microbiology and Toxicology, Ecology and Resource Conservation, Environmental Biotechnology and Waste Management, Remote sensing and GIS, Geoscience and Disaster Management. As the School is pacing forward in academics and research, our development pathway we envision the development of these divisions into six independent departments within the school. The department of Geology has already been sanctioned by the University and we have started a new MSc programme- MSc in Applied Geology under this department. However, we propose the following departments as very near future endeavours.

## **PLAN - I**

### **Development of New Departments under the School**

#### **Details of the Departments**

The school proposes the following departments

1. Department of Environmental Chemistry
2. Department of Ecology and Sustainability Studies
3. Department of Environmental Biotechnology
4. Department of Disaster management
5. Department of Geoscience and Geospatial technology
6. Department of Ecotoxicology and Microbiology

## **1. Department of Environmental Chemistry**

The Environmental Chemistry Department is a division of the School of Environmental Sciences, focuses on the chemistry of the environmental systems such as air, water and soil. The group monitors and assesses the chemical speciation of contaminants in the environmental matrices.

We are experts of assessment of emerging pollutants and conducting research on control and advanced treatment techniques for contaminants.

### **Objectives**

- To monitor air, water and soil pollution
- To assessment of emerging contaminants
- To develop treatment technologies for POPs and emerging contaminants

### **Vision**

- To facilitate the assessment of contaminants in the environment and develop treatment techniques for pollutants including emerging pollutants

### **Mission**

- To develop manpower for environmental monitoring and assessment
- To facilitate human resources for developing and implementing efficient treatment techniques/facilities for contaminants
- To extend facilities for the safeguarding of the environment

### **Research areas**

- Monitoring of PPCPs and other emerging contaminants in aquatic ecosystems
- AOPs / ARPs for the treatment of contaminants
- Photochemical degradation
- Air quality monitoring
- Indoor air pollution
- Green Technologies
- Environmental monitoring in the polar region

## **2. Department of Ecology and Sustainability studies**

Ecological knowledge is very crucial for the management of natural resources as well as developmental activities. The proposed Department of Ecology and Sustainability studies aims to study the distribution and abundance of species in time and space, and the interactions among organisms with their environment in different tropical ecosystems. The DESS focuses on humanity's harmonious co-existence with its environment and aims at putting this information to practical use for achieving sustainability.

### **Objectives**

- To study the ecological interactions and complexities of various ecosystems
- To develop skilled human resources for effective and sustainable management of natural resources

### **Vision**

- To contribute on sustainable societal development and good living conditions for future generations

### **Mission**

- To create and disseminate knowledge through research on the interaction between humans, animals and ecosystems for the sustainable use of natural resources.
- To enable human resources to specialize in the sustainability of ecosystems, communities, landscapes and heritage, and to focus on the interactions between them
- To carry out research with the goal of understanding, advancing and guiding processes of societal change toward sustainable development.

### **Research areas**

- Ecology and ecosystem studies
- Biodiversity and Conservation biology
- Climate change and ecosystems
- Invasive species
- Sustainability studies
- Western Ghats

### **3. Department of Environmental Biotechnology**

The department has the focus on developing trained manpower for environmental sustenance and management. Use of Biological Resources in remediating the contaminated sites, and development of green technologies to manage environmental issues pertaining to Climate Change, Waste Management, Energy crisis, and Environmental Pollution.

The Department aims to utilise biological organisms, their products and their services in finding solutions to major Environmental issues being faced globally such as waste management, energy crisis and climate change. Waste management is an issue almost in every nation, viewing waste as a resource will be the approach of the department and finding means of utilising the waste to recover materials and energy so that this approach can become sustainable. Aerobic and Anaerobic microbial techniques will be used along with plants and organisms in remediation techniques in order to meet the recoveries mentioned above. Bioenergy would be another focus area aiming to assess the potential of recovery of Hydrogen from anaerobic reactors treating of waste material along with methane. Generation of bioelectricity directly while treating wastewater using Microbial Fuel Cells (MFCs) is another approach. Finding a sustainable solution to the issue of plastics and microplastics through finding alternatives to plastics – Biocomposites; Biodegradable plastics – Bioplastics and microbial biodegradation of plastics are on the anvil.

On long run, the research focus of the department would be on developing advanced technologies to reduce and utilise waste to benefit industries and the environment – concepts like industrial ecology would be focused.

#### **Objectives**

- To develop green technologies for solid and liquid waste management
- To promote bioremediation techniques to abate environmental pollution
- To promote research on Vegetation Carbon sequestration – soil carbon dynamics
- To understand the degradation process of plastics and their additives.
- To develop potential microbial fuel cells

#### **Vision**

- To extend research and development facilities for the advancement of biological techniques for the betterment of the environment and mankind.

## **Mission**

- To develop human resources with expertise in Green Technologies for Environment Management.
- To promote bioremediation technologies and biomaterials development as alternatives to plastics.
- To extend consultancy services in waste auditing ; waste management and green technologies

## **Research Areas**

- Waste management
- Plastics and Bioplastics
- Polar Research on Microplastics and associated contaminants
- Bioremediation and Phytoremediation
- Bioenergy: Hydrogen, Methane recoveries through biomethanation; Microbial Fuel cells
- Environmental Nanotechnology

## **4. Department of Disaster Management**

Managing disasters is a need of the hour as there is a considerable hike in natural and manmade disasters due to the global change in the climate and human interventions in nature. To study the various aspects of disasters and their management, the School of Environmental Science has a Master's programme in Environmental Science and Disaster management and various ongoing Ph.D. projects. The Department of Disaster Management is a major initiative of the school to enhance the disaster management studies in response to the Disaster Risk Reduction (DRR) strategy of the country. The Department has developed cutting-edge teaching and research methods to provide theoretical and practical perspectives on disaster mitigation, response and recovery.

## **Objectives**

- To give training on the basics and applied aspects of natural and anthropogenic disasters and their management.
- To nurture high creativity and innovative idea on translational research and training in Disaster Management

## **Vision**

- The department envisions create knowledge for understanding of the disaster and help to develop human resources for disaster management.

## **Mission**

- To develop human resources with skills and knowledge to critically analyse and apply key concepts in disaster management such as vulnerability, resilience, governance, disaster risk reduction and sustainable development.
- To support developing new policies on disaster management
- To create awareness of the disasters and help local government bodies to create a disaster management plan.

## **Research areas**

- Natural disasters and their mitigation
- Climate change and disasters
- Anthropogenic disaster mitigation and management.

## **5. Department of Geoscience and Geoinformatics**

Geoscience is a multidisciplinary subject, which includes the study of minerals (mineralogy), rocks (petrology), the structure of the Earth (structural geology), landforms and the processes that produce them (geomorphology), fossils (paleontology), the development of sedimentary strata (stratigraphy) and the evolution of planetary bodies and their satellites (astrogeology) etc. This is a critical time to understand how Earth works as a system and how humans interact with Earth. Understanding the causes and potential societal consequences of natural Earth processes (e.g., earthquakes, floods, landslides, tsunamis, volcanic eruptions, weather, and global climate change) and the production, availability, and potential depletion of natural resources (e.g., water, soil, mineral, and energy) are of particular importance because they impact our economy, our security, and the safety and sustainability of our environment. Geoinformatics put forth skills ranging from evaluation, innovation, analysis for solving various geoscientific problems using techniques involving IT and non-IT methods.



The Department envisages the understanding of earth's processes and deciphering the records of Earth's past. Investigating these records, as well as human interaction with modern Earth processes and resources, is therefore critical to the well-being of humanity and the planet.

The Mahatma Gandhi University syndicate has already sanctioned the Department of Geology under the School of Environmental Sciences and is proposed to be renamed as the **Department of Geoscience and Geoinformatics**

### **Objectives**

- To carry out research in the theoretical and applied aspects of geology, pertaining to specific areas such as Mineralogy, Petrology, Sedimentology, Hydrogeology, Geophysics etc.
- To develop the field of geosciences with applications of geoinformatics
- To develop human resources with skills and practical knowledge in the field of applied geology and geoinformatics for the sustainable development

### **Vision**

- The department envisages understanding the interaction between human activities, the Earth system and our living environment.

### **Mission**

- Empowering students with scientific knowledge, skills, and dispositions to make informed decisions as citizens of our common home is a vital undertaking and a key responsibility for science educators and geoscientists.

### **Research areas**

- Mineralogy
- Petrology
- Hydrogeology
- Geomorphology
- Sedimentology
- Remote sensing

## **6. Department of Ecotoxicology and Microbiology**

Department of Ecotoxicology and Microbiology executes research on the presence and impact of contaminants on humans and other biotas as well as on various ecosystems. The group utilises an integrated approach for studying the impacts of pollutants including substances of emerging concern, climate change, habitat degradation etc. We also conduct studies on the fate and transport of highly toxic pollutants in various ecosystems including polar ecosystems. We investigate complex microbial communities and their importance for the reliability of microbial ecosystem services. The group assesses the microbial interaction with pollutants, the role of microbes in the elemental cycles, microbial contamination etc.

### **Objectives**

- To understand the pollutant fate and transport in various environmental matrices
- To study the impacts of contaminants on human and ecological health
- To understand the microbial degradation and transformation of chemicals, and in particular anthropogenic pollutants.
- To study the occurrence, and impact of microbes in drinking water resources.
- To understand the role of microbes in the biogeochemical cycles of elements in the changing climate scenario.
- To find out the application of microbes in the field of soil remediation and water treatment
- To assess the environmental impact of various development activities
- To develop environment management strategies for various development activities and ecosystems

### **Vision**

- To provide scientific basis to understand the interaction between the environmental processes, stress factors, and ecological and human health and develop skilled human resources for risk assessment and address pollution-related ecological and human health problems.

### **Mission**

- To facilitate human resource development for the risk assessment of pollutants

- To impart training in state-of-the-art approaches for evaluating specific cases of environmental contamination, and for making management decisions using quantitative tools and approaches.
- To carry out consultancy services for assessing ecosystem degradation, pollutant transport etc.

## **Research**

- Transformation of Mercury and other metals in aquatic ecosystems
- Fate and transport of mercury in the Arctic environment
- Fate and transport of emerging contaminants like Dioxins/Furans, Perfluorinated compounds etc.
- Perchlorate contamination
- Particulate matter and associated metals in the atmosphere
- Ethnobiology and Phytochemistry
- Role of microbes in litter degradation
- Metal-microbe interactions
- Eco restoration

## **PLAN - II**

### **Development of the present courses and introduction of new postgraduate programmes**

#### **Future prospects of the ongoing programs**

##### ***1) MSc Environment Science and Management***

The MSc Environment Science and Management program will be developed into specialised programs as listed below

- MSc Environment Science and Management (Geoinformatics)
- MSc Environment Science and Management (Waste Management)
- MSc Environment Science and Management (Ecoinformatics)
- MSc Environment Science and Management (Environmental Chemistry)
- MSc Environment Science and Management (Ecotoxicology)

- MSc Environment Science and Management (Polar Science)

The first two semesters cover basic environmental science and management courses, and the specialised courses will be taught in the last two semesters.

## ***2) MSc: Environment Science and Disaster Management***

The MSc Environment Science and Disaster Management program will be developed into a specialised program solely for Disaster Studies and its Management – MSc Disaster Management.

### **Scheme of a few suggested courses**

#### ***MSc Environmental Science and Management (Ecotoxicology)***

**Scope :** The primary objective of this post-graduate program is to produce highly qualified scientists and technicians committed to protecting the environment. Students will have the scientific background needed to discuss the objectives of the new policies through the programme. It takes on the major technological and scientific problems as being of the utmost importance. It combines an entirely new scientific method with the immediate application of the findings to safeguard the environment and human health. This master's degree focuses primarily on training in areas related to the analysis of the origin, distribution, and behavior of environmental chemical pollutants, including toxicological analysis at the cellular and molecular level, the development and use of biomarkers of exposure and effects, the identification of mechanisms of resistance to environmental pollution, and the application of environmental bioremediation techniques in degraded environments.

**Outcome:** The course will train students as professionals in the biological evaluation of the health of terrestrial, freshwater, and marine ecosystems as a result of earning a master's degree in environmental contamination and toxicology. Employability is high due to new policies and environmental laws. They can be employed as ecotoxicologist, toxicologist, industrial toxicologist etc. The students will get an excellent postgraduate program on Environmental Contamination and Toxicology. They will be able to design, implement and report on independent research projects. The students will get an opportunity to enter into higher studies at qualified and recognized professional institutions.

## **Scheme**

### ***Core courses***

Ecosystems

Environmental contamination

Biogeochemistry of Environmental Pollutants

Environmental Analytical chemistry

Advanced instrumental analysis

Introduction to ecotoxicology

Toxicokinetics and biotransformation

Toxicity testing

Biomarkers

Environmental risk assessment

Lab experiments /practicals

### ***Electives***

Food security and contamination

Introduction to scientific research

Research methodology and biostatistics

Soil remediation

Sanitation and health

Restoration of polluted ecosystems

Thesis

## **M.Sc. Environmental Science and Management (Polar science)**

Polar science is a multidisciplinary field of study that is constantly increasing its popularity in many universities and research institutes worldwide. There is a need for a master's program in polar sciences to offer education and training in India, given the relevance of climate change's effects on the environment, society, and the physical world. Supporting the educational infrastructure in this region is necessary to preserve the Polar region and to ensure the visibility of the scientific research conducted there. The main goal is to create the knowledge India needs

to contribute to polar sciences and increase India's added value by mentioning polar studies on a global platform.

The proposed course is a collaborative program with the International Centre for Polar Studies of the University

## **Scheme**

### ***Core courses***

Polar meteorology and climate  
Glaciology Sea Ice and ice sheet science  
Ecology of polar ecosystem  
Polar biogeochemistry  
Human impact on polar regions  
Environmental chemistry and pollution  
Environmental Geosciences  
Analytical Instrumentation  
Remote Sensing and GIS  
Ecotoxicology

### ***Electives***

Quaternary climate change  
Polar magmatism  
Bioprospecting in polar regions  
Remote sensing in polar regions  
Ice core biology  
Climate change and polar regions  
Laws and treaties related to polar regions  
Polar Atmosphere  
Paleoclimate  
Permafrost and hydrogeology  
Research Methodology and ethics

## **M. Tech Geoinformatics**

M. Tech. in Geoinformatics and Earth Observation is a program that can be offered through the centre. The evolution of smart community-based research has increased the demand for spatial assessment and earth system observations. The needs are further enhanced due to climate change impacts. Domain knowledge about the monitoring phenomenon plays a key role in designing systems that minimize the impact of natural hazards and reduce disaster risk. To achieve this we developed a multidisciplinary curriculum that introduces a wide spectrum of geospatial data analysis for multi-hazard risk assessment and disaster risk reduction. This program aims to provide the students with an opportunity to acquire detailed systematic knowledge and a critical understanding of spatial environment-related processes. Through this programme state-of-the-art technologies for data collection and analysis, as well as the ability to independently develop innovative solutions to complex problems in the area of the environment is envisaged. The students will learn to become a valuable part of the national and global efforts of climate change mitigation and adaptation, disaster risk reduction, Smart City planning etc.

### **Infrastructure- needs**

- UAV, DGPS, Total Station, LiDAR System
- Two smart computer labs with high-end systems are needed (UAV data lab and Programming lab).

### **Human resources- needs**

Professor : 1

Assistant Professors : 6

## **PLAN - III**

### **Certificate programmes**

#### **1. Certificate Programme in EIA & EMP**

In this course, students will develop a basic understanding of the history, need, structure, process, involved methods, and challenges. Students will also learn criteria for selecting methods for impact assessment, an overview of methods, parameters for public participation and techniques for writing reports.

Environmental Impact Assessment (EIA) is a process of evaluating the impacts of a proposed developmental activity. It encompasses both the beneficial and adverse impacts on socio-economic, cultural, environmental and human-health. There are numerous projects/developmental activities coming up worldwide. Environmental Clearances became mandatory for all developmental projects as per the Environmental Impact Assessment (EIA) notification 2006 of MoEF and CC in India. There is a dearth of knowledge among people in industries/academics on the conduct of an effective EIA. The workshop is intended to strengthen the knowledge of EIA among students and stakeholders and familiarise the trainees with the protocols of different environmental clearance procedures and the preparation of EIA reports.

In this course students will develop basic understanding of the history, need, structure, process, involved methods and challenges. Students will also learn criteria for selecting methods for impact assessment, an overview of methods, parameters for public participation and technique for writing reports.

### **Scheme**

Introduction to EIA

Environmental impacts

Baseline Data Collection

Terms of reference

Environmental Impact Assessment methods

Environment management plan

EIA for different environmental programmes

## **2. Certificate programme in Unmanned Aerial Vehicle (UAV) mapping and Digital Survey**

India is greatly progressing in the world of aerial mapping and surveying with multi-dimensional applications, especially in Facility and Infrastructure planning and Management, Agricultural and Industrial System etc. A huge lack of UAV-licensed pilots is anticipated by Govt. of India for the coming decade. There are no such courses are offered through any of the Government institutions so far. Only one university is approved by DGCA for conducting UAV-based courses, hence there is a huge potential for conducting such a course.



The course will cover all major aspects of the procedure, from selecting the right UAV for your needs, learning the basic aspects of aerial software, and then executing your flights according to the spatial products you need to obtain from the field. The aspirants will be able to plan their own projects and produce excellent maps, DEMs, and 3d models, as well as demonstrate some serious skills that are a must in the UAV industry nowadays.

Along with UAV-based mapping modules on sophisticated types of equipment like DGPS, Total Station LiDAR will also be included in the course.

### **3. Certificate programme in Web GIS and Software Engineering for Data Science**

This course is designed as an introduction to Web GIS, to the programming concepts underlying the construction and implementation of high-quality web mapping applications. Instruction will be provided in commonly used open-source GIS and related programming tools for customizing web-based mapping applications, and the development of distributed web services for GIS. In addition, an overview of common proprietary web mapping software like ERSI's ArcServer is provided, as well as an introduction to mobile GIS technologies. In this course, aspirants will gain an understanding of the basic concepts of programming web GIS applications, including integrating different types of spatial information into web-enabled GIS maps.

## **PLAN -IV:**

### **TRANSDISCIPLINARY CENTRE FOR ENVIRONMENT AND DISASTER RESEARCH**

The centre will conduct research on various environmental aspects of the State of Kerala. The problems related to agroecosystems, wetlands, water bodies, urban environments, and waste management will be studied and research for alternatives and remedial measures for the environmental problems will be taken up. The centre will consider the lowlands, midlands and high ranges. The high ranges of Kerala, a part of the Western Ghats, are facing various environmental issues due to developmental activities and increased human inhabitancy. The significance of Western ghats in controlling the climate and water resources of Kerala is very high. Hence the protection and conservation of high ranges of Kerala are highly significant. More studies have to be carried out on the geological aspects, disaster potential, climate, hydrology and ecology. The major aims of the Centre is to conduct studies on landforms and various environmental aspects of the high ranges and to translate this research for the betterment of the high ranges. Apart from this, studies related to agricultural pollution are also important. The ecological conservation of our wetlands and surface water bodies is highly significant to improve our environmental health. Studies will be conducted in the major wetlands like Ramsar sites, and surface water bodies on ecological and pollution aspects. The center aims to develop proper measures for the restoration of degraded ecosystems.

#### **Disaster Research**

A natural disaster is the consequence of the combination of a natural hazard (a physical event e.g., volcanic eruption, earthquake, landslide) and human activities. Human vulnerability, caused by the lack of appropriate emergency management, leads to financial, structural, and human losses. The degree of potential loss can also depend on the nature of the hazard itself, ranging from wildfires, which threaten individual buildings, to impact events, which have the potential to end civilization. This understanding is concentrated in the formulation of in-depth disaster research in the School of Environmental Sciences, M.G. University.

Kerala has been affected by natural disasters such as floods, landslides, coastal erosion etc. So the present research is aimed to investigate the Geology, Geomorphology, Geochemistry,

Meteorological aspects, and Soil characteristics of various parts of Kerala. The research will be augmented with remote sensing data compiled and analysed with GIS.

The major aims of the study include

1. Understanding the geology and structures of the disaster-prone terrain
2. Understanding the geomorphologic features
3. To investigate the geochemistry of the sediments
4. To understand the soil characteristics
5. To understand the Spatio-temporal changes of the terrain
6. To understand the human interventions and land use pattern changes during past decades
7. To develop suitable mitigation measures for the natural disasters affecting Kerala.

**Besides the local problems, the Centre will also carry out studies on the Polar environment** in collaboration with the International Centre for Polar Studies (ICPS) of the University. Presently, the School is engaged in Arctic expedition, however, in the future, the school is planning to extend the research into the Antarctic, Himalayas and Southern ocean.

## **INFRASTRUCTURE**

### **Labs**

- Need more labs (6 nos)
- High-Performance Equipments

### **Equipment**

- LA -ICP-MS
- MC-ICP-MS for Stable Isotope Mass Spectrometry
- XRD
- XRF
- AAS
- Resistivity Meter
- Ground-penetrating radar (GPR)

## Man Power

SI No	Name of the Position	Number of Posts
1.	Research Scientist	2
2	Project Scientist	2
3	Technical Assistant	2

## PLAN - V

### **Expansion of 'Centre for Environment Audit & Consultancy (CEAC)'**

The school has recently started a Centre for Environment Audit & Consultancy (CEAC). The centre's mission is to audit the environment of institutions, industries and other developmental projects and conduct environmental consultancy services.

#### ***Scope of the expansion of the center***

The environment is a complex of physical, chemical and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival. The unsustainable way of development, industrialization and increasing urbanization has led to the degradation of the environment. Depletion of natural resources such as water, energy resources and air has accelerated the Environmental degradation process, which in turn started affecting human civilization. Environment management is an option intended to protect the environment through preventive measures with an agenda of proper management of natural resources. Environment auditing is a vital step essential in framing the strategies of environmental management of a given area/region. It is essential to consider the environmental concerns and disaster risks before and after implementing any developmental activity. The usage of energy, water, air and other ecosystem partners have to be considered and given more attention to reduce impacts and develop green technologies for sustenance. Hence it is proposed to expand the newly formed Centre.

The main objectives of the proposal are

- To become a centre with full-fledged capacity for the audit of the environment and disaster risk assessment

- To promote environmental awareness among policymakers, government and non-government agencies and general public
- To be a spearhead on the information on the environment, sustainable development and eco-auditing

## **PLAN - VI**

### **Expansion of Remote Sensing and GIS Centre**

Dr. R. Satheesh Centre for Remote Sensing and GIS (formerly known as the Centralized Remote Sensing and GIS Facility, renamed after the first Co-ordinator of the Facility and Reader of the School, late Dr. R. Satheesh), the first of its kind in a university in Kerala is established by the University as a 'Centre of Excellence' in the field of Remote Sensing and GIS applications with technical and financial support from the Indian Space Research Organization (ISRO), Dept. of Space, Govt. of India under the National Natural Resources Management System, Sub Committee on Technology and Training (NNRMS-SC-T) Programme as a joint venture of the University and ISRO. The facility was inaugurated by Dr. G. Madhavan Nair, former Chairman, ISRO on March 15, 2003.

The centre now functions as a self-sustained centre by conducting generating revenue by conducting various academic/ Research/ Consultancy programmes/ projects.

### **Future plan**

The centre is now envisaged to be developed as a "Centre of Excellence" and Nodal centre for all Geoinformatics-based solutions of the state. The future need of the country for the technically skilled Geospatial analyst can be satisfied through the centre in support of the Digital India/ Skill India Programmes. Also, the present decade is declared as "Geospatial Decade" for the country, which again emphasizes the need for such a "Centre of Excellence" in a public University.

Machine Learning/ Artificial Intelligence based analyses are now greatly used in the Geospatial sector. With the present infrastructure/ human resource further development of the centre won't be possible hence a state-of-the-art infrastructure facility also additional human resource is inevitable for the centre.

## **ACADEMIC PROGRAMMES- ONGOING**

### **a. Short-term course in Geoinformation Science and Technology**

The module of the course was developed in collaboration with National Remote Sensing Centre (NRSC), ISRO under the NNRMS programme during the year 2003 and was periodically updated by the faculty council of the school. Presently 33<sup>rd</sup> batch of the course is ongoing with a strength of 60 students. More than 500 professionals were developed through the centre with 90% placement at various government as well as non-governmental organisations.

### **b. Internship Programmes**

Every year during the month of August we are offering an online internships programme for Academicians, Professionals, Scholars and Students. The duration of the programme will be 30 days and an internship certificate also will be provided at the end of the course based on attendance in the online sessions.

Interested persons can do an offline internship for any duration during any month at the centre also.

### **c. Customised training Programmes for Government/ Corporate Institutions**

On-demand need-based training programmes are conducted through the centre on demand. Various training programmes are conducted for college/ university teachers, officers of Dept. of soil survey and soil conservation, Dept. of Town Planning, Dept. of Local Self Government (Mahatma Gandhi NREGS) etc.

### **d. Students Project**

Guidance and support are given to students of B. Sc, B. Tec, M. Sc and M. Tec programmes of various streams who wish to incorporate Geoinformatics tools in their research work.

### **e. Free Online courses**

The centre is a recognized network institution of Indian Institute of Remote Sensing (IIRS), Dehradun and organizing online courses IIRS-ISRO E-CLASS Platform. Also we are a recognized network institution of NPTEL (National Programme on Technology Enhanced Learning) and jointly organizing courses under SWAYAM portal.

## **ACADEMIC PROGRAMMES- PROPOSED**

### **a. M. Tec Geoinformatics**

M. Tech. in Geoinformatics and Earth Observation is a program that can be offered through the center. The evolution of smart community-based research has increased the demand for spatial assessment and earth system observations. The needs are further enhanced due to

climate change impacts. Domain knowledge about the monitoring phenomenon plays a key role in designing systems that minimize the impact of natural hazards and reduce disaster risk. To achieve this, we developed a multidisciplinary curriculum that introduces to a wide spectrum of geospatial data analysis for multi-hazard risk assessment and disaster risk reduction. This program aims to provide the students with an opportunity to acquire detailed systematic knowledge and a critical understanding of spatial environment-related processes. Through this programme state-of-the-art technologies for data collection and analysis, as well as the ability to independently develop innovative solutions to complex problems in the area of the environment are envisaged. The students will learn to become a valuable part of the national and global efforts of climate change mitigation and adaptation, disaster risk reduction, Smart City planning etc.

**b. Certificate programme in Unmanned Aerial Vehicle (UAV) mapping and Digital Survey**

India is greatly progressing in the world of aerial mapping and surveying with multi-dimensional applications especially in Facility and Infrastructure planning and Management, Agricultural and Industrial System etc. Huge lack of UAV licensed pilots are anticipated by Govt. of India for the coming decade. There are no such courses are offered through any of the Government institutions so far. Only one university is approved by DGCA for conducting UAV based course, hence there is a huge potential for conducting such a course.

The course will covers all major aspects of the procedure, from selecting the right UAV for your needs, to learning the basic aspects of aerial software, and then executing your flights according to the spatial products you need to obtain from the field. The aspirants will be able to plan their own projects and produce excellent maps, DEMs and 3d models, as well as demonstrate some serious skills that are a must in the UAV industry nowadays. Along with UAV based mapping modules on sophisticated equipment's like DGPS, Total Station LiDAR will also include in the course.

**c. Certificate programme in Web GIS and Software Engineering for Data Science**

This course is designed as an introduction to Web GIS, to the programming concepts underlying the construction and implementation of high-quality web mapping applications. Instruction will be provided in commonly used open-source GIS and related programming tools for customizing web-based mapping applications, and the development of distributed web services for GIS. In addition, an overview of common proprietary web mapping software like ERSI's ArcServer is provided, as well as an introduction to mobile GIS technologies. In this course, aspirants will gain an understanding of the basic concepts of programming web

GIS applications, including integrating different types of spatial information into web-enabled GIS maps.

## **INFRASTRUCTURE- EXISTING**

### **Labs**

GIS and Remote Sensing lab (25 ft x 18 ft = 450 ft<sup>2</sup>)

AutoCAD lab (12 ft x 18 ft = 216 ft<sup>2</sup>)

Survey and Drafting lab (12 ft x 18 ft = 216 ft<sup>2</sup>)

Photogrammetry and Visual lab (12 ft x 18 ft = 216 ft<sup>2</sup>)

### **Softwares Available**

ArcGIS 10.5.1

Surfer V23

Erdas Imagine 2015

AutoCAD 2D

### **Equipment's**

Total Station Equipment

Spectroradiometer (Visible- IR range)

GPS- Garmin

Distometre

Planimetre

TruArc™ 15 Compass

Brunton- Omni Sight Sighting Compass

Brunton- Omni Slope Sighting Inclinometer

Brunton- Standard Transit

## **INFRASTRUCTURE- ADDITIONAL REQUIREMENTS**

### **Labs**

- Need more lab/ smart classroom (4 nos) spacing (4000 ft<sup>2</sup> area requirement is there)
- High-Performance Computing facility for UAV/ LiDAR data processing. Also, for environmental/ Disaster based modeling.

### **Equipment**

- UAV, DGPS, Total Station, LiDAR System
- Spectroradiometer
- Ground-penetrating radar (GPR)



**Man Power- Existing**

SI No	Name of the Position	Number of Posts
1.	Co- Ordinator	1
2.	Technical Officer	1
3	Technical Assistant	2

**Man Power- Proposed**

SI No	Name of the Position	Number of Posts
3.	Research Assistant	2
4	Technical/ Research Assistant	2

## TIMELINE

Item	1 <sup>st</sup> phase					2 <sup>nd</sup> phase					3 <sup>rd</sup> Phase					4 <sup>th</sup> Phase				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	█	█	█	█	█	█	█	█	█	█										
2	█	█	█	█	█															
3		█	█	█	█	█	█	█												
4	█	█	█	█	█															
5	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
6	█	█	█	█	█	█	█	█	█	█										
7	█	█	█	█	█	█	█	█	█	█										
8	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█

1. Development of New Departments under the School
2. Development of the present courses
3. Introduction of New postgraduate programmes
4. Certificate programmes
5. Transdisciplinary Centre for Environment and Disaster Research
6. Expansion of “Centre for Environment Audit & Consultancy (CEAC)
7. New building for Remote Sensing and GIS Centre
8. Procurement of equipment

**EXPECTED BUDGET (Cr)**

<b>Item</b>	<b>1<sup>st</sup> phase</b>	<b>2<sup>nd</sup> Phase</b>	<b>3<sup>rd</sup> Phase</b>	<b>4<sup>th</sup> Phase</b>	<b>Total</b>
<b>Manpower</b>					
<b>Professor (2 no.)</b>	2.4	2.4	2.4	2.4	<b>9.6</b>
<b>Associate Professor (3 no.)</b>	3.06	3.06	3.06	3.06	<b>12.24</b>
<b>Assistant Professor (8 no.)</b>	3.84	3.84	3.84	3.84	<b>15.36</b>
<b>Research Scientist (2 no.)</b>	0.72	0.72	0.72	0.72	<b>2.88</b>
<b>Project Scientist (2 no.)</b>	0.42	0.42	0.42	0.42	<b>1.68</b>
<b>Technical Assistant (4no)</b>	0.72	0.72	0.72	0.72	<b>2.88</b>
<b>Equipment</b>	5	10	10	5	<b>30</b>
<b>Building</b>	5	5			<b>10</b>
<b>Chemicals and glasswares</b>	0.4	0.5	0.5	0.7	<b>2.1</b>
<b>High performance Computing facility and software</b>	3	2	2	2	<b>9</b>
<b>Furniture and fixtures</b>	0.5	1.5	0.2	0.2	<b>2.4</b>
<b>Travel and Fieldwork</b>	0.5	0.7	0.9	1.2	<b>3.3</b>
<b>Contingency</b>	1	1	1	1	<b>4</b>
<b>Extension activities</b>	0.1	0.15	0.15	0.2	<b>0.6</b>
<b>Maintenance</b>	0.6	0.8	0.8	1	<b>3.2</b>
<b>Total</b>	<b>27.26</b>	<b>32.81</b>	<b>26.71</b>	<b>22.46</b>	<b>109.24</b>

**Estimated total budget for twenty years – Rs. 109.24 Cr. (Rupees One Hundred and Nine Crores, Twenty-four Lakhs)**

\*\*\*\*\*