Department of Natural Resources
TERI School of Advanced Studies, New Delhi

Quality Indicator Framework (QIF)

An introduction to Department of Natural Resources (DNR)

About the Department

The Department aspires to advance and impart knowledge about the environment and natural resources, including their characteristics and dynamics, their economic and societal values and their management in an ecologically, socially, technically, and economically sound and sustainable manner. The Department offers masters in Geoinformatics and doctoral programme. The programme prepare students to meet the changing needs of society for effective and integrated environmental management. The courses equip them with cutting edge tools and techniques through teaching and research. The Department's areas of research include remote sensing, GIS, GPS, forestry, applied ecology, landscape ecology, biodiversity assessment, conservation and characterization and related fields.

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Vision:

Department of Natural Resources (TERI SAS) envisions capacity building in the broad areas of sustainable utilisation and development of Natural resources, rehabilitation and restoration of terrestrial and aquatic ecosystems, disaster resilience and ecosystem integrity, forging new partnerships and collaborations using sustainability solutions. DNR shall also endeavour to act as a think tank for natural resources management and ecological restoration.

Mission

The Department aspires to advance and impart knowledge about the environment and natural resources, including their characteristics and dynamics, their economic and societal values and their management in an ecologically, socially, technically, and economically sound and sustainable manner.

Department of Natural Resources is one of the oldest Department at TERI SAS and is its present structure with a Master's Programme in Geoinformatics, PhD programme and Research Projects on Natural Resource Management since July 2018. Earlier the Department was known as Environmental Management and Natural Resources as Departments like Plant Biotechnology, Energy and Environment were created from the Department.

Presently, DNR is represented by five Faculty members and a Programme Assistant. At the time of submission of this report for the period 2015-20 for Departmental Audit following are the members who have contributed to the Quality Indicator Framework.

1. Dr Vinay Sinha, Associate Professor and Head of Department
2. Dr. Sudipto Chatterjee, Associate Professor
3. Dr Anu Rani Sharma, Assistant Professor
4. Dr Nithiyanandam Yogeswaran, Assistant Professor
5. Dr Neeti, Assistant Professor
6. Ms. Vidhya Sharma, Programme Assistant.

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Criterion I – Curricular Aspects

Key Indicator – 1.1 Curriculum Design and Development

Metric Number: 1.1.1

Curricula developed /adopted have relevance to the local/ national / regional/global developmental needs with learning objectives including Programme outcomes, Programme specific outcomes and course outcomes of all the Programme offered by the University

Response:

MSc Geoinformatics programme offered by Department of Natural Resources (DNR) attempts to develop expertise in and applying geospatial technologies to solve earth's most pressing challenges in environmental, social and economic domains. Keeping in view of the fast development in the sector the programme has been revised and the curriculum is under implementation since the academic year 2018.

File description:

Annexure 1.1.1: Programme mission, vision and outcomes / (http://www.terisas.ac.in/msc-geoinformatics)

Metric Number: 1.1.2

Percentage of Programmes where syllabus revision was carried out during the last five years

1.1.2.1: How many Programmes were revised out of total number of Programmes offered during the last five years

Programme offered by DNR: (2)

1. MSc (Geoinformatics)

Programme revised: 1 (MSc Geoinformatics)

Changes in MSc Geoinformatics have been made with respect to independent studies/application based Geoinformatics (Land, Water and Air).

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2. PhD Natural Resource Management.

Changes in PhD programme in DNR is in consonance with changes in the PhD rules at TSAS. A DPEC has been set up and the programme has a representation in the committee.

1.1.2.2: Number of all Programmes offered by the institution during the last five years

Year 2015-2017
1. MSc (Environmental Studies and Resource Management*
2. MSc (Climate Science and Policy)*
3. MSc (Geoinformatics)
4. Doctoral Programme; Natural Resource Management

Year 2017-2020
1. MSc (Geoinformatics)
2. Doctoral Programme; Natural Resource Management.

* 1. MSc (Environmental Studies and Resource Management & 2. MSc (Climate Science and Policy) shifted to Department of Energy and Environment in 2017.

File description:
Annexure 1.1.2.A: Notification of Reconstruction of Department and Programmes
Annexure 1.1.2.B: Minutes of Academic Council/BOS meeting

Details of Programme syllabus revision in last 5 years:

MSc Geoinformatics programme was revised since the Academic Session 2019 -20 with due diligence followed 43rd Academic council approved on 12th June 2018.

Annexure 1.1.2.C: Academic council minutes & syllabus of the courses / https://www.terisas.ac.in/msc-geoinformatics.php

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Metric Number: 1.1.3

Average percentage of courses having focus on employability/ entrepreneurship/ skill development during the last five years

1.1.3.1: Number of courses having focus on employability/ entrepreneurship/ skill development year wise during the last five years

Response: MSc Geoinformatics being technical and a skill-oriented programme, total 22 Courses have potential of employability through the skills gained through the courses.

File description:

Annexure 1.1.3.1.A: Technical and a Skill-oriented programme 22 courses
Annexure 1.1.2.C: Academic council minutes & syllabus of the courses

Entire Programme outline is available at the undermentioned website. Minutes of the Academic Council and BOS meetings with approval for these courses.

Link: http://www.terisas.ac.in/index.php?option=com_program&task=tab&id=148698

MoUs with relevant organizations for these courses, if any:

File description:
Annexure 1.1.3.1.B: Collaboration with Kalindi College, New Delhi and University of Sri Jayewardenapura, Srilanka

Average percentage of courses having focus on employability/entrepreneurship.

All the courses have focus on employability

File description:
Annexure 1.1.3.1.A: Technical and a Skill-oriented programme 22 courses

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Key Indicator – 1.2 Academic Flexibility

Metric Number: 1.2.1

Percentage of new courses introduced of the total number of courses across all Programmes offered during the last five years

1.2.1.1: How many new courses were introduced within the last five years

Response: 6 New courses were added during last 5 year *viz.*,

1. Application of Geoinformatics for Land resources,
2. Application of Geoinformatics for Water resources
3. Application of Geoinformatics for Atmosphere
4. Geocomputation
5. Programming in Geoinformatics and
6. Fundamentals of Physics

Above courses newly introduced in MSc Geoinformatics in the last five years.

File description:

Annexure 1.1.2.C: Academic council minutes & syllabus of the courses

1.2.1.2: Number of courses offered by the institution across all Programmes during the last five years

Approx. 250 courses offer across the programme in TERI SAS all are available on TERI SAS website.

Relevant Documents:

List of the courses available under different programme. For detail kindly visit https://www.terisas.ac.in/

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Key Indicator – 1.3 Curriculum Enrichment

Metric Number: 1.3.1

Institution integrates cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

Response:

This metric is addressed by TERI SAS. The programme is designed to aid as a tool to environmental sustainability. The courses that enhances professional ethics amongst the students are placed in undermentioned Excel Sheet. However, the few courses are unique in this programme under this metric.

File description:
Annexure 1.3.1: Environment and Sustainability, Human Values and Professional Ethics

Metric Number: 1.3.2

Number of value-added courses imparting transferable and life skills offered during the last five years

1.3.2.1: How many new value-added courses are added within the last 5 years

Response: N/A in MSc Geoinformatics.

Metric Number: 1.3.3

Average Percentage of students enrolled in the courses under 1.3.2 above

1.3.3.1: Number of students enrolled in value-added courses imparting transferable and life skills offered year wise during the last five years

Response: N/A for MSc Geoinformatics, Department promote students to join any other programme / Institutions for value-added courses.

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Metric Number: 1.3.4

Percentage of students undertaking field projects / internships (current year data)

Response: 100%of students in MSc Geoinformatics programme participate in Field projects/ Internships

File description:
Annexure 1.3.4: List of courses associated with field projects / internships

Key Indicator – 1.4 Feedback System

Metric Number: 1.4.1:

Structured feedback received from 1) Students, 2) Teachers, 3) Employers, 4) Alumni 5) Parents, for design and review of syllabus - Semester wise /year wise

Options:

A. Any 4 of the above
B. Any 3 of the above
C. Any 2 of the above
D. Any 1 of the above
E. None of the above

} **Opt one**

Response: Option opted: A. Any 4 of the above

URL for Stake holder feedback report: URL uploaded, The Stakeholder feedback report focus on application-based courses which were duly incorporated in the revised programme. Fundamentals of Physics and skills in GIS programming therefore were emphasized upon.

File description:
Annexure 1.4.1.A: Feedback taken from the batch till 2018

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Action taken report of the university on feedback report as stated in the minutes of the Governing Council, Syndicate and Board of Management

Feedback and the action taken have been communicated to BOS and AC during presentations on programme revision.

File description:
Annexure 1.4.1.B: Action taken on feedback report

Metric Number: 1.4.2:
Feedback processes of the institution may be classified as follows:

A. Feedback collected, analysed and action taken and feedback available on website
B. Feedback collected, analysed and action has been taken
C. Feedback collected and analysed **Opt one**
D. Feedback collected
E. Feedback not collected

Response:

Option B. Feedback collected. analyzed and action has been taken

URL for feedback report:

FEEDBACK FORM FOR EMPLOYERS: https://forms.office.com/Pages/ResponsePage.aspx?id=N7QUVKPdEECJlaMtB8V7l2Qd9KlfAfBAqueVSPmomDZUMk9VWTg0UVpVNzFYVUhSQ0JMS0dPOEgzRi4u
FEEDBACK FORM FOR FACULTY: https://forms.office.com/Pages/ResponsePage.aspx?id=N7QUVKPdEECJlaMtB8V7l2Qd9KlfAfBAqueVSPmomDZUMFM3VlYwWUU3QUNRUU9GNks3QjdTQ1VYQy4u
FEEDBACK FORM FOR ALUMNI: https://forms.office.com/Pages/ResponsePage.aspx?id=N7QUVKPdEECJlaMtB8V7l2Qd9KlfAfBAqueVSPmomDZURVIxMVJYM0w1UUJKRDFUTTZJTkFCUThIUi4u

File description:
Annexure 1.4.1.C: Feedback collected, analysed and action
Annexure 1.1.2.C: Academic council minutes & syllabus of the courses

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Criterion II – Teaching-Learning and Evaluation

Key Indicator - 2.1 Student Enrollment and Profile

Metric Number: 2.1.1

Demand ratio (Average of last five years)

Presently most of the seats filled.

File description:
Annexure 2.3.3.1: The list of Mentor & Mentee

Metric Number: 2.1.1

Average percentage of seats filled against reserved category (SC, ST, OBC, Divyangjan, etc.) as per the applicable reservation policy during the last five years.

Response: The programme is professional and open selection criteria offer at university level.

Key Indicator - 2.2 Catering to Student Diversity

Metric Number: 2.2.1:
The institution assesses the learning levels of the students, after admission and organises special Programmes for advanced learners and slow learners

Response: After admission, learning levels are assessed by continuous evaluation process through quizzes, assignments, presentations, laboratory experiments and tests (1, 2 & 3). Further for both slow and advanced learners many expert lectures are organized. Additionally, each programme has MPEC which meets at least two times in a semester. First MPEC is conducted immediately after Test-1 in which the performance of the students are monitored

Appropriate actions are taken by course coordinators. Slow learners are monitored, mentored and guided by the faculty. Informal discussions are held with students at beginning of the semester. Programme Coordinator conducts monthly meetings with the students.

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Key Indicator - 2.3 Teaching - Learning Process

Metric Number: 2.3.1

Student centric methods, such as experiential learning, participative learning and problem-solving methodologies are used for enhancing learning experiences

Response: In MSc Geoinformatics programme, the entire curriculum focuses on student centric approach with active learning that maintains a 1:1 ratio of theory and hands-on exercise. In this way, students internalize the theory they have learnt by doing hands-on exercise. For example: In our remote sensing courses, the students use satellite data of their hometown and thus are familiar with the area to understand the spectral pattern of different land cover classes. This kind of activity increases their curiosity and they are keen to learn how their town/city appear in an image from space. In this way they are emotionally invested in a very technical course.

Most of our courses also use participative learning approach where students have to seek for answer for a problem. For example, in a course on programming in Geoinformatics, students are given problem such as finding all the schools in flood prone area in a state that may need immediate attention given relevant input. Students are asked to identify the steps that may be required to solve the problem and then automate the process that can be used for other regions as well. This kind of exercise helps them to have feel of real world problem for which they can use technology efficiently. Another example is from a course on law and policy for maps and remote sensing, in which debate and moot-court (mock court) trial method is used which is very much inclusive of all students.

Metric Number: 2.3.3

Ratio of students to mentor for academic and stress related issues (current year data)

2.3.3.1: Number of mentors

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The Mentor Mentee arrangement has been worked in DNR since 2019.

File description:
Annexure 2.3.3.1: The list of Mentor & Mentee

Key Indicator - 2.4 Teacher Profile and Quality

Metric Number: 2.4.3

Teaching experience of full-time teachers in number of years (current year data)

2.4.3.1: Total experience of full -time teachers

As showcased through the table that follows, faculty in DNR have an overall experience ranging from 5 to 22 years. This encompasses both teaching, research and service.

File description:
Annexure 2.4.3.1.A: Teaching experience of full-time teachers and their Name

List of teachers including their PAN, designation, department and experience details

File description:
Annexure 2.4.3.1.B: List of teachers including their PAN, designation, department and experience details

Metric Number: 2.4.4

Percentage of full-time teachers receiving awards who received awards, recognition, fellowships at state, National, International level from Government, recognized bodies during the last five years

2.4.4.1: Number of full time teachers receiving awards from state/National/international level from Government, recognized bodies during the last five years

Year	2015 -16	2016 - 17	2017 - 18	2018 -19	2019 -20
Number	-	-	1	-	1

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Response: The details are placed as Annexures,

File description:
Annexure 2.4.4.1: List of awards

Key Indicator - 2.5 Evaluation Process and Reforms

Metric Number: 2.5.1:
Average number of days from the date of last semester-end/ year- end examination till the declaration of results during the last five years

2.5.1.1: Number of days from the date of last semester-end/ year- end examination till the declaration of results year wise during the last five years

Year	2015 -16	2016 -17	2017 -18	2018 - 19	2019 - 20
Programme	MSc (Geo)	MSc (Geo)	MSc (Geo)	MSc (Geo)	MSc (Geo)
No.	60	61	84	39	24

File description
Annexure 2.5.1.1: Number of days from the date of last semester-end/ year- end examination

Metric Number: 2.5.4: Positive impact of reforms on the examination procedures and processes including IT integration and continuous internal assessment on the examination management system

Response: Information provided by Controller of Examinations.

The Department observes that the overall examination procedure has led to a system of evaluation that is continuous in nature and helps the faculty to undertake mid-term interventions which helps addressing learning issues the students may so have. It is pertinent to mention here that in event

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of the pandemic in the country there has been change in examination procedure as per the instruction received through TERI SAS notifications.

File description

Annexure 2.5.4: Positive impact of reforms on the examination procedures and processes

Key Indicator - 2.6 Student Performance and Learning Outcomes

Metric Number: 2.6.1:

Programme outcomes, Programme specific outcomes and course outcomes for all Programmes offered by the institution are stated and displayed on website and communicated to teachers and students

Response:

Master of Science in Geoinformatics at TERI SAS is a two years interdisciplinary program for students who want to develop expertise in and applying geospatial technologies to solve world's most pressing real-world challenges in environmental, social and economic domains. Geoinformatics is a rapidly evolving field that brings meaningful insights to solve real world problems by bringing together technologies and tools required for acquisition, exploration, visualization, analysis and integration of various spatial data. There are several components of Geoinformatics that include cartographic Geovisualization, GIS, Remote sensing, photogrammetry, spatial statistics, Geostatistics, multivariate statistics and other advanced tools and techniques

Programme Specific Outcomes

1. Extensive hands-on expertise: The programme provides extensive hands-on through courses and research projects relevant to the Geoinformatics domain.
2. Exposure to state-of-the art tools and technologies: This programme provides exposure to cutting-edge tools and technologies such as latest remote sensing technology (e.g.,UAV), programming (e.g.,Python and R), database management like Oracle and MySQL, and other standard COTS and FOSS relevant to the field and other cross-cutting domains.
3. Conceptual clarity: The programme provides conceptual clarity of the fundamentals to face the continuous technological advancements in the field of Geoinformatics
4. Capacity building: Capacity building of the students to face the technological advancements in the field of Geoinformatics and demonstrate confidence in undertaking new (unfamiliar) analysis

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5. Leadership skills: This programme provides leadership skills in their respective field as well as in other cross-cutting domains.

Course outcomes:
The course outcomes are provided in the word document attached below.
File description:
Annexure 2.6.1: Programme/ Course Specific Outcomes

Metric Number: 2.6.2:
Attainment of Programme outcomes, Programme specific outcomes and course outcomes are evaluated by the institution

Response:
Each and every course in the geoinformatiics programme has a structured and dedicated practical hours. The latest in the field of geoinformatics *viz.*, Web mapping, UAVs, Geocomputation, Machine learning amongst others are now a part of the programme. Fundamental and application-based courses, complemented with major and minor projects ensure conceptual clarity. Study tours and a semester dedicated to a work opportunity with an external organization guided by a supervisor impart capacity building and leadership skills.

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Criterion III - Research, Innovations and Extension (250)

Key Indicator - 3.1 Promotion of Research and Facilities (20)

Metric Number: 3.1.3:

Number of teachers awarded international fellowship for advanced studies/ research during the last five years

3.1.3.1: The number of teachers awarded international fellowship for advanced studies / research year wise during the last five years

Year	2015 -16	2016 -17	2017 -18	2018 - 19	2019 -20
Number of teachers	-	-	1	-	-

Response: 1.

File description

Annexure 3.1.3: Teachers international fellowship /awarded

Metric Number: 3.1.4:

Number of JRFs, SRFs, Post-Doctoral Fellows, Research Associates and other research fellows in the university enrolled during the last five years

Response:

Year	2015 -16	2016 - 17	2017 -18	2018 -19	2019 -20
Number	2	4	7	3	4

File description:

Annexure 3.1.4: List of research fellows and their fellowship details

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Metric Number: 3.1.6:

Percentage of departments with UGC-SAP, CAS, DST-FIST, DBT, ICSSR and other similar recognitions by government agency (current year data)

Response: Nil

Key Indicator - 3.2 Resource Mobilizations for Research

Metric Number: 3.2.1:

Grants for research projects sponsored by the non-government sources such as industry, corporate houses, international bodies, endowments, Chairs in the institution during the last five years (INR in Lakhs)

3.2.1.1: Total Grants for research projects sponsored by the non-government sources such as industry, corporate houses, international bodies, endowments, Chairs in the institution year wise during the last five years (INR in Lakhs)
Institutional data in prescribed format

File description:
Annexure 3.2.1: Grant award letters for research projects sponsored by non-government

Metric Number: 3.2.2:
Grants for research projects sponsored by the government sources during the last five years (INR in Lakhs)

3.2.2.1: Total Grants for research projects sponsored by the government sources year wise during the last five years (INR in Lakhs)

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Response: Grants received in INR is placed in under mentioned table:

Year	2015-16	2016-17	2017-18	2018-19	2019-20
INR in Lakhs	128.05	100.88	175.20	57.21	87.54

File description:
Annexure 3.2.2: Grants for research projects sponsored by the government sources

Metric Number: 3.2.3:

Number of research projects per teacher funded by government and non-government agencies during the last five years

3.2.3.1: Number of research projects funded by government and non-government agencies during the last five years
Response same as Metric 3.2.2

3.2.3.2: Number of full-time teachers worked in the institution during the last 5 years

Information on this metric is provided by TERI SAS Administration

LIST OF FACULTY (2015-2017)

1. Prof Suresh Jain, Professor & HoD
2. Dr Sudipta Chatterjee , Associate Professor.
3. Dr Vinay Sinha, Associate Professor
4. Dr Kamna Sachdeva, Assistant Professor
5. Dr Chubanmela Jamir, Assistant Professor
6. Dr Chander Kumar, Assistant Professor
7. Dr. Anu Rani Sharma, Assistant Professor
8. Dr Neeti, Assistant Professor
9. Dr Nithiyanandam Yogeswaran, Assistant Professor

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LIST OF FACULTY (2017-2020)

1. Dr Vinay Sinha, Associate Professor and HOD
2. Dr Sudipta Chatterjee, Associate Professor
3. Dr Anu Rani Sharma, Assistant Professor
4. Dr Nithiyanandam Yogeswaran, Assistant Professor
5. Dr Neeti, Assistant Professor

Key Indicator - 3.3 Innovation Ecosystem

Metric Number: 3.3.2:
Number of workshops/seminars conducted on Intellectual Property Rights (IPR) and Industry-Academia Innovative practices during the last five years

Response: Nil

Metric Number: 3.3.3:
Number of awards for innovation won by institution/teachers/research scholars/students during the last five years

3.3.3.1: Total number of awards for innovation won by institution/teachers/research scholars/students year wise during the last five years

Response: Nil

Metric Number: 3.3.4 :
Number of start-ups incubated on campus during the last five years

3.3.4.1: Total number of start-ups incubated on campus year wise during the last five years

Response: Nil

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Key Indicators - 3.4 Research Publications and Awards

Metric Number: 3.4.1:

The institution has a stated Code of Ethics to check malpractices and plagiarism in Research

Response: The TERI School of Advanced Studies (TERI SAS) expects all students to conduct themselves within and outside precincts of the campus in an honorable and ethical manner, befitting the students of a research institution. TERI SAS students must maintain discipline, bear a good moral character and display responsible behavior towards it and the society. A student discipline system exists to handle infractions against TERI SAS rules and regulations. Students will be penalized for breach of prescribed rules and regulations and the nature of penalty will be decided following a disciplinary procedure and guidelines.

File description:
Annexure 3.4.1: Student discipline code

Metric Number: 3.4.4:

Number of Ph.D awarded per teacher during the last five years

3.4.4.1: How many Ph.D are awarded within last 5 years.

Year	2015-16	2016-17	2017-18*	2018-19	2019-20
Awards	9	3	4	2	4
Faculty	10	10	10	5	5
Awards /Faculty	0.9	0.3	0.4	0.4	0.2

*In 2017, Reconstruction of the Department and two programme moved to Department of Energy and Environment.

File description:
URL to the research page on HEI web site http://www.terisas.ac.in/doctoral-publications

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List of PhD scholars and their details like name of the guide, title of thesis, year of award

File description:
Annexure 3.4.4.: List of PhD scholars and their details like name of the guide, title of thesis, year of award

Metric No 3.4.4.1 List of publications from the Department

Year	2015	2016	2017	2018	2019	2020
Number	34*	26	31	10	05	18

*In 2017, Reconstruction of the Department and two programme moved to Department of Energy and Environment.

File description:
Annexure 3.4.4.1: List of research articles published from the Department

3.4.4.2: Number of teachers recognized as guides during the last five years

Response: All faculty of DNR are recognized as guides.

Metric Number: 3.4.6

Number of books and chapters in edited volumes / books published, and papers in national/international conference-proceedings per teacher during the last five years

3.4.6.1: Total number of books and chapters in edited volumes / books published, and papers in national/international conference-proceedings year wise during the last five years

Year	2015 - 16	2016 -17	2017 -18	2018 -19	2019 -20
Number	-	-	2	1	2

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Response: List books and chapters in edited volumes/books published
File description:
Annexure 3.4.6: List of books and chapters in edited volumes / books published from the Department

Key Indicators - 3.6 Extension Activities

Metric Number: 3.6.1:

Extension activities in the neighbourhood community in terms of impact and sensitising students to social issues and holistic development during the last five years

DNR provides an excellent platform and opportunity for students to undertake extension activities and share their learnings with the society at large. This not only provides an opportunity to them to interact with the society but also sensitise communities to different aspects of natural resources management. Our students have had the opportunities to work very closely with govt. and communities to address issues related to water distribution in NE states, address the issue of forest resource sharing at the fringes of our national parks and sanctuaries an d work very closely with school children to address urban biodiversity conservation issues. The attachment placed under exemplify aforementioned. In close coordination with DEE, DNR has undertaken activities related to awareness about climate change with the school children. The faculty in DNR are invited by schools in Delhi in their award ceremonies to deliver guest lectures. PhD scholars have participated in eco-restoration initiatives with Ministry of Coal, Govt. of India.

File description:
Annexure 3.6.1: Extension activities in the neighbourhood community

Metric Number: 3.6.2:

Number of awards and recognition received for extension activities from Government /recognised bodies during the last five year

3.6.2.1: Total number of awards and recognition received for extension activities from Government /recognised bodies' year wise during the last five years

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Response: Letter received from Ministry of Coal Government of India is placed

File description
Annexure 3.6.2: Awards and recognition received for extension activities from Government /recognized bodies

Metric Number: 3.6.3:

Number of extension and outreach Programmes conducted in collaboration with industry, community and Non- Government Organisations through NSS/NCC/Red cross/YRC etc., during the last five years

3.6.3.1: Number of extension and outreach Programmes conducted in collaboration with industry, community and Non-Government Organisations through NSS/NCC/Red cross/YRC etc., year wise during the last five years

Year	2015-16	2016-17	2017-18	2018-19	2019-20
Number	-	2	5	1	4

Response: Dept of Natural Resources continuously organizes many outreach events in collaboration with industry/community. The detailing about these events are provided below.

File description
Annexure 3.6.3.A: Reports of the event of outreach programmes

Number of extension and outreach programmes conducted with industry, community etc for the last five years

File description
Annexure 3.6.3.B: List of participants in extension and outreach programmes

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Metric Number: 3.6.4:

Average percentage of students participating in extension activities with Government Organisations, Non-Government Organisations and Programmes such as Swachh Bharat, Aids Awareness, Gender Issue, etc. during the last five years

3.6.4.1: Total number of students participating in extension activities with Government Organisations, Non-Government Organisations and Programmes such as Swachh Bharat, Aids Awareness, Gender Issue, etc. year wise during the last five years

Response: Department promote such activities, the ECO Club take care at Institute/ University level the Committee of ECO Club represents by students and faculty of DNR.

Key Indicator - 3.7 Collaboration

Metric Number: 3.7.1:

Number of Collaborative activities for research, faculty exchange, student exchange per year

3.7.1.1: Total number of Collaborative activities for research, faculty exchange, student exchange year wise during the last five years

Year	2015	2016	2017	2018	2019	2020
Number				1		

File description
Annexure 3.7.1: Collaborat on with Turkish Higher Education Council

Metric Number: 3.7.2

Number of linkages with institutions/industries for internship, on the-job training, project work, sharing of research facilities etc. during last five years

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3.7.2.1: Number of linkages for faculty exchange, student exchange, internship, field trip, on-the-job training, research, etc year-wise during the last five years.

Year	2015-16	2016-17	2017-18	2018-19	2019-20
Number	12	16	7	17	19

File description
Annexure 3.7.2: Details of linkages with institutions/industries for internship

Metric Number: 3.7.3:

Number of functional MoUs with institutions of national, international importance, other universities, industries, corporate houses etc. during the last five years (only functional MoUs with ongoing activities to be considered) (10)

3.7.3.1: Number of functional MoUs with institutions of national, international importance, other universities, industries, corporate houses etc. year wise during the last five years

Year	2015	2016	2017	2018	2019
Number	-	-	2	2	-

Response: MoU's with Kalindi College DU, University of Sri Jayewardenapura Srilanka, Ananth Technologies Ltd. Hyderabad and Gurugram Municipal Development Authority are placed

Details of functional MoUs with institutions of national, international importance, other universities etc during the last five years

File description
Annexure 3.7.3: MoUs with institutions of national & international importance

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Criterion IV – Infrastructure and Learning Resources

Key Indicator - 4.2 Library as a Learning Resource

Metric Number: 4.2.7:

E-content is developed by teachers:
1. For e-PG-Pathshala
2. For CEC (Under Graduate)
3. For SWAYAM
4. For other MOOCs platform
5. For NPTEL/NMEICT/any other Government initiative
6. For institutional LMS

Options:
A. Any 4 of the above
B. Any 3 of the above
C. Any 2 of the above
D. Any 1 of the above
E. None of the above

} **Opt one**

Response: E. None of the above, it is very specialized skilled based programme. The 60% of courses of the programme are based on hands-on training, practical field and intensive lab exercise. This requires continues monitoring and support to the students. University have high-end dedicated systems in Geoinformatics laboratory for Image processing, Photogrammetry, spatial modelling, Geographical Information System, MIKE, SWAT and many more open sources software.

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Criterion V - Student Support and Progression

Key Indicator - 5.1 Student Support

Metric Number: 5.1.3:

Number of capability enhancement and development schemes

1. Guidance for competitive examinations
2. Career Counselling,
3. Soft skill development,
4. Remedial coaching,
5. Language lab,
6. Bridge courses
7. Yoga and Meditation
8. Personal Counselling

Options:

A. 7 or more of the above
B. Any 6 of the above
C. Any 5 of the above
D. Any 4 of the above
E. ≤ 3 of the above

} **Opt one**

Response: E

Soft skill development

NRE 106 Communication skills and technical writing
NRG 103 Project management

Bridge courses

NRG 102 Fundamentals of physics
NRE 113 Applied mathematics

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Key Indicator - 5.2 Student Progression

Metric Number: 5.2.2:

Percentage of student progression to higher education (previous graduating batch) (current year data)

5.2.2.1: Number of outgoing students progressing to higher education

MSc (Geoinformatics) is skill and employment based programme most of the students move to career opportunities in Industry or Research organization. Most of the cases they opt the higher education at later stage.

Metric Number: 5.2.3

Average percentage of students qualifying in state/ national/ international level examinations during the last five years (e.g.: NET/SLET/GATE/GMAT/CAT/GRE/TOEFL/Civil Services/State government examinations)

5.2.3.1: Number of students qualifying in state/ national/ international level examinations (eg: NET/SLET/GATE/GMAT/CAT/GRE/TOEFL/ Civil services/State government examinations) year wise during the last five years

5.2.3.2: Number of students appearing in state/ national/ international level examinations (eg: NET/SLET/GATE/GMAT/CAT/GRE/TOEFL/ Civil Services/State government examinations) year wise during the last five years

Response: Information not collected at Department level, it is centralized system at University level.

Key Indicator - 5.3 Student Participation and Activities

Metric Number: 5.3.1

Number of awards/medals for outstanding performance in sports/cultural activities at national/international level (award for a team event should be counted as one) during the last five years (10)

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5.3.1.1: Number of awards/medals for outstanding performance in sports/cultural activities at national/international level (award for a team event should be counted as one) year wise during the last five years

Response: No Students during 5years

Metric Number: 5.3.2

Presence of an active Student Council & representation of students on academic & administrative bodies/committees of the institution

Response: Students are members of certain committees of TERI SAS. Example: ECO Club: Covid Task Force and other cultural committee is well established at Institutional level. These Committees are reconstituted by time to time by competent authority.

File description

Annexure 5.3.2: List of the Committee and Notification from 2015-20

Metric Number: 5.3.3

Average number of sports and cultural activities / competitions organised at the institution level per year

5.3.3.1: Number of sports and cultural activities / competitions organised at the institution level year wise during the last five years

Response: TERI SAS has a common Sports and Cultural set of activities. An annexure detailing DNR participation in such activity is placed as under.

File description

Annexure 5.3.3: DNR participation in sports activity

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Annexure 1.1.1 Programme mission, vision and outcomes

Programme Overview

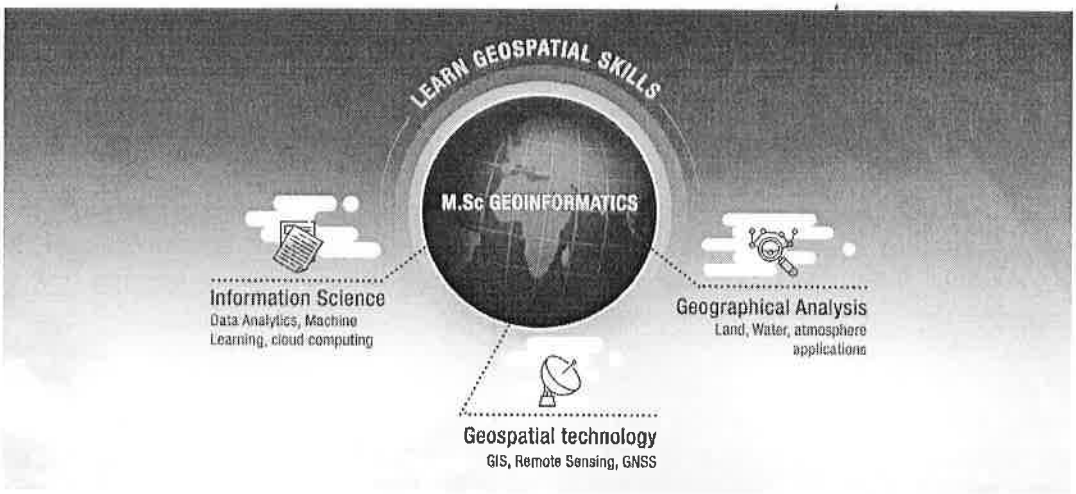
Master of Science in Geoinformatics at TERI SAS is a two years interdisciplinary program for students who want to develop expertise in and applying geospatial technologies to solve world's most pressing real-world challenges in environmental, social and economic domains. Geoinformatics is a rapidly evolving field that brings meaningful insights to solve real world problems by bringing together technologies and tools required for acquisition, exploration, visualization, analysis and integration of various spatial data. There are several components of Geoinformatics that include cartographic geovisualization, GIS, Remote sensing, photogrammetry, spatial statistics, geostatistics, multivariate statistics and other advanced tools and techniques.

The core strength of the programme lies in its innovative curriculum that imbues present and future professionals on development and the use of cutting-edge geospatial technologies to emulate real-life problems. Over the period of two years, students gain sound knowledge in the scientific principles behind computational and analytical foundation of Geoinformatics as well as its applications in domains such as conservation biology, urban planning, meteorology and natural resource management through hands-on exercises, training programmes, 8 weeks summer internship, independent study and a semester long major project. Programme has flexible options for choosing elective courses across different departments that support students to build career in the domain of their interest.

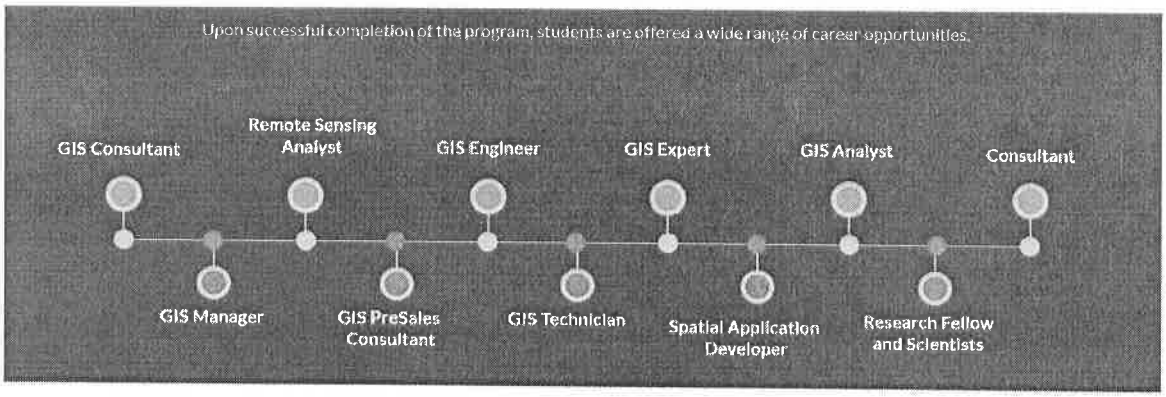
Programme specific outcome

- **Extensive hands-on expertise:** The programme provides extensive hands-on through courses and research projects relevant to the Geoinformatics domain.
- **Exposure to state-of-the art tools and technologies:** This programme provides exposure to cutting-edge tools and technologies such as latest remote sensing technology (e.g.,UAV), programming (e.g.,Python and R), database management like Oracle and MySQL, and other standard COTS and FOSS relevant to the field and other cross-cutting domains.
- **Conceptual clarity:** The programme provides conceptual clarity of the fundamentals to face the continuous technological advancements in the field of Geoinformatics.
- **Capacity building:** Capacity building of the students to face the technological advancements in the field of Geoinformatics and demonstrate confidence in undertaking new (unfamiliar) analysis.
- **Leadership skills:** This programme provides leadership skills in their respective field as well as in other cross-cutting domains.





Career Prospects

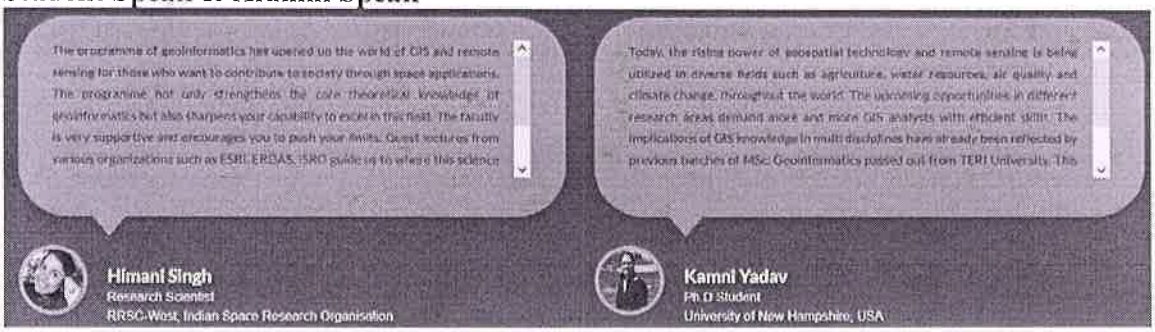


- The students who complete MSc Geoinformatics programme possess the requisite skills to work in corporate sector in both public and private organizations in India and overseas
- Our students have secured placements at corporates such as ESRI, RMSI, Pitney Bowes among others and esteemed research institutes/organizations such as ISRO centers, other Government organizations and academic institutions. Several students have also initiated their own startups.

Skillset Gained Through Programme



Student Speak & Alumni Speak



Annexure 1.1.2.A Notification of Reconstruction of Department and Programmes

Archive: {In Archive} Organisational changes
Leena Srivastava to: ml-faculty, ML-TU-ADS 09-01-2017 14:15
This message is being viewed in an archive.

Dear All

To better improve the mapping of programmes under the relevant departments, we are relocating the following two programmes under the Energy and Environment Department:

1. M.Sc. Environmental Studies and Resource Management
2. M.Sc. Climate Science and Policy

Dr Suresh Jain would be the Head of the Department of Energy and Environment. All faculty members other than those with Geoinformatics as a specialisation would also move to DEE. Programme Coordinators would remain as earlier. We would like to thank Prof B Prasad for the leadership he has provided in the last few years

The Department of Natural Resources would be headed by Dr Sudipta Chatterjee and would continue to run the M.Sc. Geoinformatics Programme, with Dr Sinha as the Programme Coordinator. Dr Chatterjee has been requested to develop Masters programme relevant to Department of Natural Resources in the coming few months. He has some thoughts on this which he will be discussing with concerned colleagues as we move forward.

Leena

****
Leena Srivastava
Vice Chancellor, TERI University

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****

Annexure 1.1.2.B Minutes of Academic Council/BOS meeting

Minutes of the meeting of BOS Meeting for MSc Geoinformatics program review

The first meeting of Board of Studies for MSc Geoinformatics programme review was conducted on March 16, 2018 to review the programme structure of revised Geoinformatics and the course content of first semester.
The meeting was attended by

(1) Dr. Prateek Sharma
(2) Dr. Sudipta Chatterjee
(3) Dr. Vinay Sinha
(4) Dr. Neeti
(5) Dr. Anu Rani Sharma
(6) Dr. Nithiyanandam
(7) Dr. C. K. Singh
Two external experts
(8) Dr. J. K. Garg (Professor, Indraprastha University)
(9) Dr. P L N Raju (Director, NESAC) (Over the Skype)

Dr. Sudipta initiated the board of meeting by welcoming all the experts.
Dr. Neeti provided the details of all the steps carried out until now for reviewing the MSc Geoinformatics programme along with revised curriculum structure.
Dr. Raju could participate over skype and he suggested sending the comments through email.

The following points were discussed in the meeting:

1. Programme structure
2. Course Content for the first semester

1.**Programme Structure:** Following points were discussed.

a. **Division of courses into theory and lab:** The courses: Principles of Remote Sensing, Principles of GIS and GNSS, Principles of Cartography, Spatial Modeling and its applications, Photogrammetry, Advances in Remote Sensing, Advances in GIS will be divided into theory and lab based course.
b. **Requirement of additional courses**: Similar to Applied Mathematics, there is requirement of a course called Physics of Remote Sensing (2 credit: Audit course) to ensure proper understanding of remote sensing.
c. **Three new core courses** in third semester(each of the course will be of 3 credits) : Geoinformatics Applications for Land resources, Geoinformatics Applications for water resources, and Geoinformatics Applications for atmosphere need to be there in the third semester. Each of these courses will have a final project component. Instead of students doing an independent project of 4 credits in third semester, students will



be doing three small projects related to land, water, and air. These projects could be group projects.

i. Geoinformatics applications for Land resources must cover concept of landscape ecology
ii. Geoinformatics applications for water resources must have both ocean and inland water resources.
iii. Geoinformatics applications for atmosphere must cover satellite meteorology concept and studies related to air pollution.

d. With the introduction of these three courses as core courses, there will not be any separate independent study (4 credit). The project will be included as part of these three courses.
e. With the inclusion of new course on Geoinformatics applications for atmosphere, the elective course "Satellite Meteorology" will not be offered to MSc Geoinformatics as an elective.
f. IOT part of the Advances in GIS may be removed and the total credit for the course may be reduced to 3 credits.

2. **Course Content for first semester of MSc Geoinformatics Programme:**

a) Principles of Cartography:
   i. The course need to be restructured as two courses: One will have only theory and the other course will be only lab. Two separate syllabus with list of all the topics and lab sessions need to be made.
   ii. Concept of map accuracy need to be included in the syllabus

b) Principles of GIS and GNSS
   i. This course may be divided into two courses with three credits on theory of GIS and GNSS and one credit for GIS and GPS practical. Two separate syllabus with list of all the topics (lab sessions) need to be made.
   ii. Topics on GIS data standard, and Indian GPS System NAVIK need to be included.

c) Principles of Remote sensing
   i. Details of geostationary satellites (INSAT, weather and communication satellites) need to be included
   ii. Since application will be covered in the three new application based courses in third semester, this course will be restructured to 3 credits and module on applications will be removed.
   iii. The course will be divided into two courses, with 2 credits for theory course and 1 credit for lab course.
   iv. The new book on Fundamentals of Remote Sensing (2018) by George Josef and C. Jeganathan need to be included in the references

d) Fundamentals of Programming:

i. This course needs to have a 2-hour session on fundamentals of programming. This may include history and concept of flowchart.

e) Technical Writing:
   i. The course may cover library usage.

f) Environmental Statistics: No suggestion

g) Applied Mathematics: No suggestion

Specific comments received from Dr. P. L. N. Raju

1. The course is well structured.
2. The course covers all the latest technologies like MW, HSRS, LiDAR, UAV etc.
3. Course details are vague and abstract form. Suggested to give detailed course contents, hourly wise etc.
4. I do not see the number of hours for theory lectures and practical etc. I suggest to give sufficient no of hours for practical as well, may be 50% of hours .

Decision:
The modifications suggested by BOS will be made and the First Semester Courses will be placed to the Academic Council scheduled in June 2018 for approval.



MINUTES OF THE FORTY-THIRD MEETING OF THE ACADEMIC COUNCIL HELD ON 12 JUNE 2018 AT 10.30 A.M.

PRESENT

The following members of the Academic Council attended the meeting:

Members
Dr Leena Srivastava, Chairperson
Dr Rajiv Seth
Dr Prateek Sharma
Dr J K Garg
Mr Rakesh Mehrotra
Dr Vivek Suneja
Dr Suresh Jain
Dr Sapna A Narula
Dr Nandan Nawn
Dr Chaithanya Madhurantakam
Dr Vishnu Konoorayar
Dr Manipadma Datta
Dr Atul Kumar
Dr Kamna Sachdeva
Dr Naqui Anwer
Dr Anandita Singh
Dr Anu Rani Sharma
Capt. Pradeep Kumar Padhy (Retd.), Secretary

Invitees
Dr. Soumendu Sarkar;
Mr Sapan Thapar
Dr Neeti
Dr Chubamenla Jamir
Dr Akash Sondhi
Dt Montu Bose
Dr Abhijit Datey
Dr C K Singh
Dr VSP Sinha
Dr Nithiyanandam Yogeswaran

Prof TC Kandpal, Dr Malathi Lakshmikumaran, Dr Anubha Kaushik, Dr Arun Kansal, Dr Shaleen Singhal, Dr Ramakrishnan Sitaraman and Ms Fawzia Tarannum could not attend the meeting.

The Vice Chancellor welcomed all the new members of the Academic Council and Invitees. The Council placed on record its deep sense of appreciation of the services rendered by outgoing members Dr Rakesh Kosha and Dr Kanchan Chopra during their tenure as member of the Academic council.

ITEM NO.1 To confirm the minutes of the forty second meeting of the Academic Council held on 02 Apr 2018. The minutes of the forty second meeting of the Academic Council held on 02 Apr 2018, were circulated to the members and no comments have been received.

TS/AC 41.1.1 The Council resolved that the minutes of the meeting of the Academic Council held on 02 April 2018 be confirmed.

ITEM NO. 2 To consider and approve Course Participation Certificate for Distance Education Programmes. Mr Sapan Thapar Coordinator, Open and Distance Learning, intimated that a large number of students undergoing programmes conducted under the open and distance learning format were not able to complete their programmes because of various extraneous reasons. He proposed that a Certificate of Participation be issued to these students to help them join back the programmes at a time of their choosing within the permissible limits. He stated that this certificate would be issued to students who could score a minimum of 50% in all the assignments submitted. He presented the draft certificate to the Council. After deliberating the issue, the members recommended that instead of a certificate a letter of participation be issued to such students.

TS/AC 43.2.1 The Council resolved that the participation letter as amended be accepted and approved (Annexure 1).

ITEM NO.3. To consider and approve the outline of a few courses proposed by Department of Policy Studies. The recommendations of the meeting of the Board of Studies of Department of Policy Studies held on 25 April 18 were placed before the Council. The following suggestions were provided:

(a) **Growth Economics**

(i) To add a module and associated references on Kaldorian and Kaleckian growth models.

(ii) Format of references to be made as per a citation style.

(iii) Description and indicators of evaluation to be added.

(b) **Development Economics**

(i) Assessment title to be changed "preparation of policy brief" to "policy brief" in the Evaluation section.

(ii) Description regarding practical in Module 1 to be added.

(iii) Description and indicators of evaluation to be added.

(iv) References are to be formatted as per a given citation style.

(c) **Introduction to Mathematical Methods in Economics**

(i) Additional textbooks to be mentioned.

(ii) The word 'Introduction to' be dropped from the title.

(iii) Last module title to be changed to Ápplication'.

(d) **Microeconomics**

(i) Transaction costs to be introduced. In Module VIII "Markets as Institutions" to be introduced. Three papers were included in the list of readings as essential for this module.

(ii) Details of tutorials to be added in the section on "Pedagogical Approach".

(e) **Probability and Statistics**

(i) Goal of practical is to be reflected in the course objectives.

(ii) References are to be formatted as per a given citation style.

(f) **Application of Quantitative Data Analysis in Development Practice**

(i) The word 'advanced level' in the 2nd bullet point of course objectives must be removed.

(ii) Details of 'Tutorials' (T) and Practical (P) (i.e. what is to be taught in Tutorials and Practical) are to be mentioned in the specific modules.

(iii) In the large-scale survey, 'Census Surveys/Data' may be included along with other surveys.

(The course already included three large scale nationally reported surveys (NFHS, IHDS & NSSO). These three surveys are conducted by Govt. of India in a timely and systematic manner and are useful to the students of

development practice. Further, SDP students get detailed exposure to Census Data during the course on Population and Health: Techniques of Analysis and Policy Perspectives (MPD 124)offered in the 2nd semester. Considering the credit limit and no. of hours, feasibility of additional surveys is also difficult.)

(iv) The proposed evaluation criteria follow continuous evaluation system with terms paper presentation and submission. It was decided that students would be asked to present and submit first term paper by middle of the semester and another one by the end of the semester.

(v) The evaluation criteria be mapped as per the course outline. Two separate evaluation tasks provided to the students to match the two different modules. One module covers application of statistical analysis for small scale survey, while another covers use of large scale surveys for development practice.

(g) **Art and Sustainability**

(i) Course Matching with the university USP and a continuous evaluation system. The course description indicates that - This course is geared towards sensitizing students on different dimensions of sustainability by creating varying art forms through the core philosophical principles of introspection, reflection, action and liberation. While applying the four core principles of introspection, reflection, action and liberation, this course will delve into a liberating journey from the bonded sense of materialism by integrating notions of sustainability, efficiency and sufficiency while connecting with notions of human welfare and quality of life. This indicates that the basic premise of the course is based on the USP of the university. In the evaluation system the following tests are put in place -

- Test 1: A Book Review, Critical Analysis: 40% weightage
- Test 2: A sustainability product formation (short story, poetry, any type of literary output, painting, short documentary, dance video, music composition, any other art form according to the interest of the student): 40% weightage
- Test 3: Class Room Participation: 20% weightage. Class room participation will be captured by discussing issues of artefacts, tribal arts and how in the context of an issue of equity and justice these arts have a valuable contribution.
- These tests will ensure that all sustainability products are opened for an online voting and display on the campus for voting by faculties and management to ensure transparent, fair assessment of students. No marking system will be done on the sustainability product. Based on the votes gathered by each sustainability product the performance of the students will be continuously assessed. For the book review and class room participation, the student with more original, out of the box thinking and perspectives will be graded higher. This will ensure that constant evaluation takes place.
- As a part of Test 3, within the class room 5 groups will be created and a question related to certain themes surrounding sustainability will be asked. Each group will be then asked to present their narration of the exploration done by the group collectively while addressing the question on a particular theme centering around sustainability by using any art form of their interest which they will present to all the other groups. If a group does well, then all group members in that group will be rewarded for

giving incentives of collective thinking while addressing sustainability questions.

- This is done to create a continuous evaluation system.

(ii) Course is mapped with learning outcomes: -

- The course will have three tests. The three tests will comprise of - a) Test 1: A Book Review, Critical Analysis: 40% weightage, b) Test 2: A sustainability product formation (short story, poetry, any type of literary output, painting, short documentary, dance video, music composition, any other art form according to the interest of the student): 40% weightage and c) Test 3: Class Room Participation: 20% weightage. Class room participation will be captured by discussing issues of artefacts, tribal arts and how in the context of an issue of equity and justice these arts have a valuable contribution.
- Each test has been linked to the learning outcomes in the following manner:
- Have the ability to create and sustain a self – reflective **(Test 1& 3),** empathetic **(Test 2),** experimental perspective **(Test 2)** about bridging philosophies between the theoretical, experimental and practical aspects of social, economic and environmental domains of sustainability.
- Will be able to create application of different art forms in their professional and public life with three main components viz. reflection, action and liberation **(Test 2).**
- Will be able to create a collective thinking around issues and principles of equity and justice surrounding sustainability by using different art forms **(Test 3).**

(iii) Course is fair, transparent and unbiased in the assessment of students: The tests will be opened up through online voting and peer review based collective performance system within the classroom to ensure a transparent, fair and unbiased assessment of students and their performance in the class.

TS/AC 43.3.1 The Council resolved that the outlines of the following Courses placed at Annexure 2 be accepted as amended and approved: -

Ser	Course	Type	Credits
M.Sc (Economics)			
1	Growth Economics*	Core	4
2	Development Economics*	Core	4
3	Mathematical Methods for Economics**	Core	4
4	Microeconomics	Core	4
5	Environment and Economic Development	Core	4
6	Probability and Statistics**	Core	4
7	Econometrics	Core	4
MA (SDP)			
1	Application of Quantitative Data Analysis in Development Practice (SDP)**	Elective	2
Common			
1	Art and Sustainability*	Elective	2

* *New Courses*

** *New Title*

ITEM NO. 4. To consider and approve the revision in the programme structure of MSc (Economics) Programme. The recommendations of the meeting of the Board of Studies of Department of Policy Studies held on 25 Apr 18 w.r.t. MSc (Economics) programmes were placed before the Council. The following suggestions were given:-

(a) Economics of Natural Resource title be changed to Natural Resource Economics.

(b) Economics of the Environment title be changed to Environmental Economics.

TU/AC 43.4.1 The Council resolved that revised structure of MSc (Economics) programme as under be accepted as amended and approved. The Council recommended that the structured feedback from various stakeholders be obtained in order to take inputs on the programme structure and analysis of the same be presented in the next Academic Council:-

Restructured **Outline** of **MSc Economics programme**		
Year/Semester	**Courses**	**Credits**
First year		**32**
1st Semester	**4 Core courses of 4 credits**	**16**
	Probability and Statistics	4
	Macroeconomics	4
	Microeconomics	4
	Introduction to Mathematical Methods for Economics	4
2nd Semester	**4 Core courses of 4 credits**	**16**
	Environment and Economic Development	4
	Growth Economics	4
	Development Economics	4
	Econometrics	4
Second year		**40**
3rd Semester	**3 Core courses of 4 credits + Elective courses of 8 credits**	**20**
	Core 1: Methods of Research in Economics	4
	Core 2: Environmental Economics	4
	Core 3: Natural Resource Economics	4
	Elective courses from those offered in the MSc Economics programme or open electives	8
4th Semester	**Master's Thesis**	**20**

ITEM NO.5. To consider and approve the revised structure of M.Sc (Geoinformatics) Programme. The recommendations of the meeting of the Board of Studies of Department of Natural Resources held on 16 Mar 18 w.r.t. M.Sc (Geoinformatics) were placed before the Council.

TU/AC 43.5.1 The Council resolved that the following revised structure of MSc (Geoinformatics) programme be accepted as amended and approved: -

Year/ Semester	**Courses**	**Type**	**Credits**
1st year			
1st Semester	Total credits (5+0/1/2 Core Courses + 1 Core Audit)		**15**
	Principles of Cartography	Core	3

	Principles of Remote Sensing	Core	3
	Principles of GIS and GNSS	Core	4
	Environmental Statistics	Core	3
	Fundamentals of Computers and Programming	Core	2
	Applied Mathematics	Core* (Audit)	-
	Fundamentals of Physics	Core** (Audit)	-
	Technical Writing	Core (Audit)	-
2nd Semester	Total credits		**19**
	Photogrammetry	Core	3
	Digital Image Processing and Information Extraction	Core	4
	Spatial Data Modelling and its Applications	Core	4
	Multivariate Data Analysis	Core	3
	Programming in Geoinformatics	Core	3
	Law and Policy for Maps and Remote Sensing	Core	2
	Project Management	Core (Audit)	-
	Research Methodology and Thesis Writing	Core (Audit)	-
2nd year			
3rd Semester	Total Credits		**21**
	Advances in Remote Sensing	Core	4
	Advances in GIS and current trend	Core	4
	Geoinformatics Applications for Land Resources	Core	3
	Geoinformatics Applications for Water Resources	Core	3
	Geoinformatics Applications for Atmosphere	Core	3
	Minor Project (during summer break)	Core	2
	Geocomputation	Elective	3
4th Semester	Total Credits		**15**
	Major Project		15

ITEM NO. 6 To consider and approve the outline of a few courses for MSc (Geoinformatics) Programme. The recommendations of the meeting of the Board of Studies of Department of Natural Resources held on 16 March 18 w.r.t. MSc (Geoinformatics) were placed before the Council. Dr Garg informed that a thorough review of the individual modules has been carried out by the BoS and the external faculty. A detailed discussion was held on the course outlines. As per the suggestion of Dean Academic, learning outcomes and evaluation criteria for all the five courses were revisited and revised.

TU/AC 43.6.1 The Council resolved that outlines of the following five courses of MSc (Geoinformatics) programme be accepted as amended (vide Annexure 3) and approved: -

Ser	Course	Type	Credit
1	Principles of Cartography	Core	3
2	Principles of GIS and GNSS	Core	4
3	Principles of Remote Sensing	Core	3

4	Fundamentals of Computers and Programming	Core	2
5	Fundamentals of Physics	Audit	2

ITEM NO. 7 To consider and approve revised structure of MBA (Business Sustainability) Programme.. The recommendations of the meeting of the Board of Studies of Department of Business & Sustainability held on 22 May 18 w.r.t. MBA (Business Sustainability) were placed before the Council. A detailed discussion was held on the programme structure.

TU/AC 43.7.1 The Council resolved that revised structure of MBA (Business Sustainability) programme as under be accepted as amended and approved. The Council recommended that the structured feedback from various stakeholders be obtained in order to take inputs on the programme structure and analysis of the same be presented in the next Academic Council: -

Year/Semester	**Course Title**	**Type**	**Credits**
1st Year			
1st Semester	Total Credits		23
	Principles and concepts of sustainability	Core	2
	Business ethics	Core	2
	Sustainability Reporting	Core	2
	Managerial economics	Core	3
	Marketing management	Core	3
	Fundamentals of Management	Core	2
	Business communication	Core	3
	Statistical methods for management	Core	3
	Corporate accounting and reporting	Core	3
2nd Semester	Total Credits		21
	Legal aspects of business	Core	2
	Qualitative research methods in management	Core	2
	Strategies for Sustainable Business	Core	3
	Macroeconomic Environment	Core	3
	Corporate Finance	Core	3
	Management Information System	Core	2
	Advanced statistical methods for management	Core	2
	Corporate Social Responsibility	Core	2
	Organizational behaviour and leadership	Core	2
2nd year			
3rd Semester	Total Credits		21 (15+6)
	Accounting and finance for sustainability	Core	3
	Minor Project	Core	6
	Entrepreneurship	Core	2
	Supply chain management	Core	2
	Business, Natural Ecosystems and Community	Core	2
	Health Finance	Elective	3
	Corporate governance	Elective	2
	Sustainable consumption and production	Elective	2
	Techniques of environmental valuation	Elective	4
	Financial intermediaries, institutions and	Elective	2

	regulations		
	Integrated impact assessment	Elective	4
	Derivatives and risk management	Elective	2
	International financial management	Elective	2
	Business to business marketing	Elective	2
	Urban Governance	Elective	4
	Environmental management system	Elective	4
	Brand management	Elective	2
	Security Analysis and portfolio management	Elective	2
	Production and Operations Management	Elective	3
	Consumer behavior	Elective	2
	Project design and management for sustainable development practice	Elective	4
	Social Entrepreneurship	Elective	2
	Design Thinking	Elective	2
4th Semester	Major project	Core	14

ITEM NO.8 To consider and approve the revised programme structure of MBA (Infrastructure). The recommendations of the meeting of the Board of Studies of Department of Business & Sustainability held on 22 May 18 w.r.t. MBA (Infrastructure) were placed before the Council. A detailed discussion was held on the programme structure.

TU/AC 43.8.1 The Council resolved that revised structure of MBA (Infrastructure) programme as under be accepted as amended and approved. The Council recommended that the structured feedback from various stakeholders be obtained in order to take inputs on the programme structure and analysis of the same be presented in the next Academic Council:-

Year/ Semester	Course Title	Type	Credits
1st year			
1st Semester	Total Credits		20
	Module 1 Basics of Infrastructure Business		
	Introduction to Infrastructure Business	Core	2
	Economics of Infrastructure and Pricing Strategies	Core	2
	Infrastructure project finance	Core	2
	Corporate Accounting and Reporting	Core	2
	Corporate Finance	Core	2
	Statistical methods for management	Core	3
	Module 2 Law & Policy Framework for Infrastructure Business		
	Legal & Regulatory aspects of infrastructure	Core	2
	Business Laws and Infrastructure projects	Core	2
	Contracts Laws	Core	2
	Environmental and Social Laws	Core	1
2nd Semester	Total Credits		20
	Module 1 Strategy and Risk		
	Business Ethics	Core	1
	Strategic planning	Core	2

	Risk analysis and Implementation Management	Core	3
	Project planning and management	Core	2
	Bidding System Management	Core	1
	Module 2 Operational aspects of Infrastructure		
	Quality Management	Core	2
	Management information systems	Core	2
	Infrastructure organization and HR	Core	3
	Logistics and supply chain management	Core	2
	Macroeconomic Environment	Core	3
2nd Year			
3rd Semester	Total Credits		23 (17+6)
	Minor Project	Core	6
	Integrated impact assessment	Core	3
	Public Private Partnership	Core	2
	Corporate governance	Core	2
	Innovation and change management for infrastructure projects	Core	2
	Strategic communication and stakeholder engagement	Core	2
	Advanced Logistics and Supply Chain Management	Elective	2
	Accounting and finance for sustainability	Elective	3
	Financial intermediaries, institutions and markets	Elective	2
	Sustainable Urban Transport	Elective	2
	Entrepreneurship	Elective	2
	Urban water supply and waste management	Elective	2
	Business to business marketing	Elective	2
	Total credits		
4th Semester	Major Project	Core	14

ITEM NO. 9 To consider and approve the outlines of new Courses for MBA (Business Sustainability/ Infrastructure). The recommendations of the meeting of the Board of Studies of Department of Business & Sustainability held on 22 May 18 w.r.t. MBA (Business Sustainability/ Infrastructure) were placed before the Council. A detailed discussion was held on the course outlines. The following suggestions were provided:

(a) **Health Finance**

(i) The title of the course may be revised for alignment with the content of the course.

(ii) Learning outcomes to be linked with evaluation.

(iii) Health care system should be discussed before we talk about the financing.

(iv) Different financing mechanism like – publicly funded, provided by the private sector and PP should be included.

(v) Other issues of health system like insurance coverage, availability of the healthcare services could be discussed.

(vi) If the course title includes the word "sustainable" then sustainability for whom should be clearly mention.

(vii) Pricing mechanism of insurance company, their profitability etc. should be taught in the course.

(b) **Fundamentals of Management**

(i) Management of family owned businesses, contemporary forms of organizations, platforms and networks including blockchains, and usage of AI/analytics to be included.

(ii) Title of module 6 to be rephrased.

(iii) Focus on inter-firm linkages and management of such linkages to be added.

(iv) Title of the course to be revisited for specificity/alignment with course content.

(v) Learning outcomes to be linked with evaluation components; details for evaluation to be added.

(vi) Presentations by students to be included over and above 28 hours of teaching.

(c) **Organisational Behaviour and leadership**

(i) The title of the course must be Organisational Behaviour and Leadership.

(ii) Topics on Trust in organizational context, corporate governance and leadership, and followership, sexual harassment may be added.

(iii) Learning outcomes to be linked with evaluation components; details for evaluation to be added.

(iv) Presentations by students to be included over and above 28 hours of teaching.

(d) **Sustainability Reporting**

(i) Learning outcomes to be linked with evaluation components.

(ii) Topic on Science based targets may be added.

(e) **Advanced Logistics and Supply Chain Management**

(i) Suggestion to incorporate (a) the usage of IT/AI/Analytics in Logistics and Supply Chain Management and (b) linking of regional value chains with global value chains.

(ii) Learning pack to be elaborated in terms of suggested books, weblinks, articles, research papers, case studies etc.

(iii) Learning outcomes to be defined and linked with evaluation.

(f) **Design Thinking**

(i) Suggestion to increase the number of credits from 1 to 2 to cover the course content intensively.

(ii) Learning outcomes to be linked with evaluation components.

(g) **Social Entrepreneurship**

(i) The course needs major revision as it lacks theoretical grounding in the present form. To incorporate the same, the number of credits may be increased from 1 to 2.

(ii) Learning outcomes to be linked with evaluation components.

(h) **Corporate Social Responsibility**

(i) Learning outcomes to be linked with evaluation components.

(ii) Suggestion to keep philanthropy out of the context of this course.

(i) **Business, Ecosystem and Community**

(i) Suggested title for the course- Business, Natural Ecosystems and Community.

(ii) The title of the first module of the course may be revised.

(iii) Aquatic systems/ wetlands ecosystems; abiotic structure to be added.

(iv) First module to be focused on imparting fundamental knowledge of ecosystem structure and functioning.

(v) Social cost benefit analysis, basic duties of corporate citizens, valuation of externalities may be added as some sub-topics.

(vi) Formatting may be revisited and learning outcomes to be linked with evaluation components.

(vii) The course content may be revisited in places for more clarity Linkage/collaboration with organizations like Tatas to be explored for practical exposure.

(j) **Additional Comments**

(i) Nomenclature of the individual courses in MBA (Business Sustainability) and MBA (Infrastructure) to be revisited.

(ii) A course on Business Analytics could be introduced as an elective in the MBA programmes.

TU/AC 43.9.1 The Council resolved that outlines of the following courses of MBA (Business Sustainability/Infrastructure) programme be accepted as amended (vide Annexure 4) and approved: -

Ser	Course	Type	Credit
Business Sustainability/Infrastructure			
1	Health Finance	Elective	3
2	Fundamentals of Management	Core	2
3	Organizational Behaviour and Leadership	Core	2
4	Sustainability Reporting	Core	2
5	Advanced Logistics & Supply Chain Management	Elective	2
6	Design Thinking	Elective	1
7	Social Entrepreneurship	Elective	1
8	Corporate Social Responsibility	Core	2
9	Business, Natural Ecosystems and Community	Core	2

ITEM NO. 10 : To consider and approve the outlines of new Courses for M.Tech (UDM). The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. M.Tech (UDM) were placed before the Council. A detailed discussion was held on the course outlines.

TU/AC 43.10.1: The Council resolved that outlines of the following courses of M.Tech (UDM) programme be accepted as amended (vide Annexure 5) and approved: -

Ser	Course	Type	Credit
1	Urban Governance	Core	3
2	Introduction to Geographic Information System (GIS)	Core	1

ITEM NO. 11 To consider and approve the outlines of new Courses for 3rd Semester of MSc (CSP). The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. 3rd Semester of MSc (CSP) were placed before the Council. A detailed discussion was held on the structure.

TU/AC 43.11.1 The Council resolved that the following revised structure for 3rd Semester of MSc (CSP) programme be accepted as amended and approved:-

Ser	Courses	Type	Cr
3rd Semester	1 Core course of 3 credits + Electives courses of 12 credits (can choose any four from this		15

	bouquet) The electives are grouped into two streams; (i) Climate Science and technology, and (ii) Climate Policy and Development. Students will be asked to choose any four from these electives		
	Seminar course on Global environmental change	Core	3
	Climate Science and Technology		
	Ecosystem and Climate Change	Elective	3
	Advanced Climate Modelling	Elective	3
	Aerosol Science	Elective	3
	Renewable Energy Technologies	Elective	3
	Geoinformatics for Natural resource management	Elective	3
	Glacier hydrology	Elective	3
	Satellite Meteorology	Elective	3
	Energy System Modeling	Elective	3
	Independent study	Elective	3
	Climate Policy and Development		
	Climate Change and Disaster Risk Reduction	Elective	3
	Economics of Climate Change	Elective	3
	Food Security and Agriculture	Elective	3
	Public Health and Development: Issues and Methods	Elective	3
	Accounting and Finance for Sustainability	Elective	3
	Governance of Climate Change	Elective	3
	Independent study	Elective	3

ITEM NO. 12(a) To consider and approve the outlines of new Courses for MSc (CSP). The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. MSc (CSP) were placed before the Council. A detailed discussion was held on the course outlines and following suggestions were provided:-

(a) **Ecosystem and Climate Change**:

(i) map outcomes of the course with given modules. Also, if practical component is involved then its list should be provided.

(ii) The topic on theory of Assembly Rules be incorporated in Model 2.

(iii) The Learning Outcomes to be mapped with the Course Objectives.

(iv) Details of the Evaluation Criteria to be provided.

(b) **Disaster Risk Reduction.** Headings to each module should be provided. Ecosystem approach (Eco DRR) of disaster reduction should be incorporated.

(c) **Advance Climate modeling.** map outcomes of the course with given modules. Also, if practical component is involved then its list should be provided.

(c) **Economics of Climate Change:**

(i) Discussion around nomenclature happened and it was suggested that Economics of Environment and Climate change cannot be used together: The nomenclature was therefore changed to "Economics of Climate Change".
(ii) Last module of the course needs major changes as currently it does not cover economics at all.
(iii) Outcomes of the course and evaluation should be mapped.
(iv) The last model considers the economic principles that have been applied in devising the institutional mechanisms for dealing with climate change. I
(v) Term Paper – mapped with points (2) & (3) of Course Objectives and point (2) of Learning Outcomes. End-Semester Major Exam – Mapped with points (1), (2) & (3) of Course Objectives and point (1) of Learning Outcomes. Assignments – Mapped with point (1) of Course Objectives and point (1) of Learning Outcomes.

(d) **Renewable Energy and Technologies**. Need to define how this course is different from other renewable energy courses offered in REEM program. Objective of the course should clearly define this aspect. Moreover, this needs to realign with respect to CSP program.

TU/AC 43.12(a).1 The Council resolved that outlines of the following six courses of MSc (CSP) programme be accepted as amended (vide Annexure 6) and approved: -

Ser.	Course	Type	Credit
1	Ecosystems and Climate Change*	Elective	3
2	Climate Change and Disaster Risk Reduction*	Elective	3
3	Advance Climate Modelling*	Elective	3
4	Economics of Climate Change	Elective	3
5	Renewable Energy Technologies*	Elective	3
6	Energy Systems Modeling*	Elective	3

ITEM NO. 12 (b): To consider and approve Change of teaching hours of Applied mathematics bridge Audit course for M.Sc (CSP) programme. Dr Kamana informed that during earlier program revision, 10 hours of bridge course was introduced in CSP program for new students who had not studied mathematics up to 10+2 standard. She stated that it was realized that students needed additional hours to grasp sufficient knowledge of mathematics. She therefore proposed that 3 credit course (NRE 113) which was initially part of the program be restored.

TU/AC 43.12(b) The Council resolved the changes of teaching hours of Applied mathematics bridge Audit course of MSc (CSP) programme be accepted as amended and approved.

ITEM NO.13 To consider and approve the outline of courses for MTech (REEM) Programme. The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. MTech (REEM) were placed before the Council. A detailed discussion was held on the course outlines. The followings were suggested and action has been taken accordingly: -

(a) **Energy audit and management**
(i) Best practices for ECM in industries to be added.
(ii) Programmes like EESL to be introduced.
(iii) Distribution of contact hours for each module to be revisited with emphasis on experiential learning.

(b) **Energy Simulation Laboratory**
(i) Best practices for ECM in industries to be added.

(ii) Programmes like EESL to be introduced.

(c) **Grid Integration of Renewable Energy**

(i) Best practices for ECM in industries to be added.

(ii) Programmes like EESL to be introduced.

(d) **Waste to Energy**

(i) Whether the course is technology centric or project centric?

(ii) Financial/economic analysis of waste to energy plant to be included.

(e) **Solar Photovoltaic Power Generation**

(i) In Module 6, the topics of case studies to be explicitly mentioned. One suggestions is to write "Case Studies based on module 1, 2, 3, 4 and 5", if deemed fit.

(ii) In Module 7 (Financial analysis and environmental benefits), the topics i.e. performance analysis and energy payback, financial analysis, and CO_2 mitigation needs further explanation like which financial tool is to be used.

(f) **Independent Study**

(i) The eligibility criteria of CGPA to be 7.5 or above to be revisited and rationale for it to be mentioned.

(ii) Since the course is not a project work, then why a report is required to be submitted at the end for final evaluation? In this way the evaluation criteria and procedure to be revisited.

(g) **Smart Grid.** The Module 6 to be modified, no need to mention the word Rural. It could be 'application of smart grids' or something like that.

TU/AC 43.13.1: The Council resolved that outlines of the following eight courses of MTech (REEM) programme be accepted as amended (vide Annexure 7) and approved: -

Ser	Course	Type	Credit
1	Energy Audit and Management	Elective	3
2	Energy Simulation Laboratory	Core	3
3	Grid Integration of Renewable Energy	Elective	3
4	Waste to Energy	Elective	2
5	Solar Thermal Power Generation	Elective	3
6	Solar Photovoltaic Power Generation	Elective	3
7	Independent Study	Elective	3
8	Smart Grid	Elective	2

ITEM NO. 14. Extension of maximum period for submission of thesis. The Registrar informed the council that a doctoral candidate was expected to submit his/her thesis within five years from the date of registration and the period might be extended by Academic Council as a special case. He stated that the following candidates who had registered for PhD programme require extension since they have completed the 5 years period as indicated below.

Ms Achla Khanna (1011RPA) - Extension of a year w.e.f 02 July 2017#

Mr Vipan Kumar (1031RPB) - Extension of a year w.e.f 12 July 2017#

Ms Tanu Sri (1124RBB) – Extension of a year w.e.f.07 July 2018

#: *Synopsis submitted in July, 2017. Thereafter thesis not submitted. New Synopsis being submitted*

The Registrar informed that on the recommendation of the supervisor, approval was sought for an extension of one year in respect of above candidates for the submission of their theses.

TU/AC 43.14.1 The Council resolved that one-year extension be accorded to:-

Ms Achla Khanna (1011RPA) - w.e.f 02 July 2017
Mr Vipan Kumar (1031RPB) - w.e.f 12 July 2017
Ms Tanu Sri (1124RBB) – w.e.f.07 July 2018

Sd/
Capt Pradeep Kumar Padhy (retd.)
Registrar

Enclosures:-

Annexure 1
Annexure 2
Annexure 3
Annexure 4
Annexure 5
Annexure 6
Annexure 7

Distribution:-

Electronic Copy
1. Vice-Chancellor, TERI School of Advanced Studies
2. All members of the Academic Council
3. Website

Printed Copy
4. Registrar, TERI School of Advanced Studies

Annexure 1

10, INSTITUTIONAL AREA, VASANT KUNJ, NEW DELHI – 110 070



LETTER OF PARTICIPATION

TO WHOMSOEVER IT MAY CONCERN

Mr **XXXX** has enrolled in the Certificate course in "XXYY" (through Open and Distance Learning mode) during the period XXYY to XXYY and has partially* completed the requirements for the award of the "Certificate in XXYY".

Sd/-
Centre Head

Dated: XXXX

Registration date: XX-XX-XXXX

Marksheet for "Certificate in XXYY"			
Module Name	Assignment	Semester End Exam	Grade
Introduction to Renewable Resources	XX/100	XX/100	B
Solar Technologies	XX/100	Pending	Pending
Wind Technologies	XX/100	XX/100	Pending
Energy Analysis	XX/100	Pending	Pending
<<Name of Module>>			

Annexure 3

Course syllabus for Semester I

Course title: Principles of Cartography			
Course code: NRG 171	**No. of credits:** 3	**L-T-P:** 20-8-28	**Learning hours:** 42
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr Anu Rani Sharma		**Course instructor:** Dr Anu Rani Sharma	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

In this course, we study the art, science, politics, and technologies of cartography, to understand how maps are created and used to represent and communicate spatial phenomena and their relationships. Course lectures, readings, discussions and lab activities will introduce to the concepts, techniques, hardware, and software used for cartography.

Course objectives

1. To apply principles of map preparation techniques
2. To use different thematic mapping techniques to represent spatial phenomena
3. To design maps for effective communication

Course content

SNo	Topic	L	T	P
1	**Introduction to Maps** History of Map making, Basic characters of Map, Type of maps, Cartographic databases	2		
2	**Map direction and Scale** Fundamentals of Map direction & scale; Construction of different types of scales	2	2	
3	**Details of Datum, Geodetics and Spheroid** Basic assumptions, Coordinate System: Polar and Cartesian, Geodesy and Geodetic methods, datum types and elements,	4		
4	**Concept of Map Projections** Map projections-Conic projection, Cylindrical projection, Zenithal Projection; Comparison between these projection, Choosing a Map Projection Mercator, Transverse Mercator, Polyconic, Lambert, Orthographic and UTM	2	2	
5	**Map Preparation Techniques and Map accuracy** Map Preparation Techniques: Cartographic design issues, Map design process and compilation	2	2	
6	**Modern Techniques in Cartography and Computers** Generalization, Symbolization, Multivariate and dynamic mapping, Modern techniques in Cartography	2		
7	**Cartography and GIS** Synergy of Cartography and GIS	2		
8	Introduction to perception, visualization, topographic and thematic mapping and color coding	2		
9	**Evaluation Criteria** Evaluation criteria for maps, Map evaluation guidelines	2	2	
	PRACTICALS			
1	**Topographical sheets** Topographical Sheets: Introduction/comparison with respect to types, scales, grid reference, signs and symbols and colour schemes of SOI			8

	Topographical map interpretation Study and interpretation of Indian topographical maps of survey of India (Series - 1: 50000 or 1: 25000) **Base map and thematic map generation**			
2	Construction of different type of scale			2
3	Construction of Map projections			4
4	Analog to digital conversion			2
5	Map preparation techniques			2
6	Map designing and Symbolization			4
7	Map evaluation			2
8	Geoprocessing tools			4
	Total	**20**	**8**	**28**

Evaluation criteria

- Test1 [Written Exam]: 10%
- Test2 [Written Exam]: 10%
- Tutorials and assignments: 20%
- Practical (Lab exercise and viva) (Practical is conducted at the end of the semester and includes evaluation of the lab exercises student carried out throughout the semester: 20%
- Test 3 (Test 3 is conducted after completion of the course, at the end of the semester): 40%

Learning outcomes

Upon completion of the course, student will be able to:

1. Design and Geovisualize maps and communicate in perspective [Test1, test2, Tutorials and Assignments, Practical]
2. Critically analyze a map to understand its scientific, social and political utility [Test1, Test2, Tutorials and Assignments, Practical, Test3]

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Robinson A. H., Morrison J. L., Muehrcke P. C., Kimerling A. J., Guptill S. C. (1995) Elements of Cartography: Wiley Publishers
2. MacEachren A.M. (1994) Some Truth with Maps: A Primer on Symbolization and Design, University Park: The Pennsylvania State University.
3. Mishra R.P. (2014) Fundamentals of Cartography, Concept Publishing Co.
4. Monmonier M. (1991) How to Lie with Maps, Chicago: University of Chicago Press.

Suggested readings

5. Monmonier M. (1993) Mapping It Out, Chicago: University of Chicago Press.
6. Pickles J. (2003) A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World, Taylor & Francis.
7. Sircar D.C.C. (1990) Studies in the Geography of Ancient and Medieval India, Motilal Banarsidass Publishers.
8. Slocum T. (2003) Thematic Cartography and Geographic Visualization, Upper Saddle River, New Jersey: Prentice Hall.
9. Wilford J.N. (2000) The Mapmakers, Vintage Books.

Journals

1. Asian Journal of Geoinformatics
2. Cartographic Journal
3. Geocarto International
4. International Journal of Goeinformatics
5. International Journal of Remote Sensing
6. ISPRS Journal of Photogrammetry and Remote Sensing
7. Journal of Historical Geography
8. Journal of Indian Society of Remote Sensing

Remote Sensing of Environment
Additional information (if any) **Magazines** 1. Coordinates 2. Geospatial today 3. GIM International 4. GIS World 5. GIS@development 1. GPS World
Student responsibilities Attendance, feedback, discipline, guest faculty etc.

Course Reviewers:

1. Prof. J. K. Garg, Guru Gobind Indraprastha University
2. Dr. Benidhar Deshmukh, IGNOU

Course title: Principles of GIS and GNSS			
Course code: NRG 175	**No. of credits:** 4	**L-T-P:** 38-2-32	**Learning hours:** 56
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr Vinay Sinha		**Course instructor:** Dr Vinay Sinha	
Contact details:			
Course type: Core		**Course offered in:** Semester I	

Course Description

It introduces participant to the fundamentals of GIS, GNSS, data models, data sources, databases, cartography, Overview of Global Navigation Satellite System (GNSS) and geospatial metadata.

Course objectives

1. To provide a firm understanding of the conceptual and technical understanding of GIS and GNSS
2. To prepare students for spatial data analysis and modelling

Course content

Th#	Topic	L	T	P
1	Basic concepts about spatial information: Philosophy, brief history and definition of GIS, Computer Aided Cartography Vs GIS, Manual mapping Vs GIS mapping	2		
2	Geometrical feature and real word Pictures, Variables- Points, Lines and Areas and applications of GIS in various sectors (a case study approach)	2		
3	Basic Objectives and Components of GIS – details of hardware, software and management; Conceptual models of Real world phenomena.	2		
4	Introduction to GIS software; Overview of open source GIS Mercator, Polyconic, Lambert, Orthographic and UTM		2	
5	Information organization and data structure; Basic file structures, Tabular databases and Advantages of databases	2		
6	Spatial and Non-spatial data base, Spatial data model: Geo relational Vector data model, Object based vector data model, Geodatabase	2		
7	Raster data model; Hybrid relational database Vs Object orientation. Comparative analysis of spatial database	2		
8	GIS data Requirement, various sources, Standards and collection of GIS data, Methods of data capture: scanning, digitization and associated errors; Conversion from other digital Sources, Attribute data input and management	2		
9	Different kinds of geospatial data, Sources of errors in GIS database: Errors through processing, Errors associated with overlay issues of features, Detecting and evaluating errors, Edge matching	2		
10	Introduction of Global Navigation Satellite System, Satellite constellation & Segments (Control, Space & User) GNSS signals and data, Geopositioning – Basic concepts (GPS, NAVSTAR, GLONASS and IRNSS /NAVIK)	2		
11	Introduction to Hand held GPS receivers; Initial setting & Creating codes and attribute table in receiver			
12	GNSS Positioning Types-Absolute positioning, Differential positioning	2		
13	GNSS performance and policy (Accuracy, integrity, SPS, PPS DoD & DoT policy, anti-spoof); Positioning Errors: Multi path, Ionosphere, Troposphere, Satellite Geometry, Satellite signals and its strength,	2		
14	Introduction to DGPS, wide area augmentation system (WAAS)	2		
15	Nature of geographic data-Types of uncertainty in a GIS; Data quality parameters: Positional accuracy, Attribute accuracy, Logical consistency, Completeness lineage,	2		

16	Topological relationships; Creation of topology and error correction;	2		
17	Attribute data query, SQL, Logical, Boolean, Arithmetical operation and function,	2		
18	Feature base operation – buffer, eliminate, dissolve	2		
19	Layer based overlay analysis: point to polygon, line to polygon, clip, erase, split, identity, union and intersection, Distance measurement	3		
20	Raster data structure, Local operations, Neighbourhood operations, Zonal operations	3		
Exp #	PRACTICALS			
1	Lab 1. Analog to Digital conversion -Scanning methods			2
2	Lab 2. Introduction to software			
3	Lab 3 Map Rectification, Define projection and Reprojection.			2
4	Lab4: Vector Transformation – Affine and Polynomial, co-ordinate definition. Map Bound.			2
5	Lab 5. Digital database creation -Point features, Line features, Polygon features			2
6	Lab 6. Data editing-Removal of errors -Overshoot & Undershoot, Snapping, Topology Creation			2
7	Lab 7. Data collection and Integration, Non-spatial data attachment working with tables			2
8	Lab 15. Introduction to GPS receiver and initial setting & Creating codes and attribute table in receiver			2
9	Lab 16. Point data collection using GPS with different datum			2
10	Lab 17. Point / Line / Area data collection using GPS and measurements			2
11	Lab 18. GPS data collection in DGPS mode			
12	Lab 19. Post processing of the GPS data			2
13	Lab 20. Image rectification using GPS coordinate data			2
14	Lab 8. Dissolving and Merging			2
15	Lab 9. Clipping, Intersection and Union			
16	Lab 10. Proximity Analysis			2
17	Lab 11. Spatial and Attribute query and Analysis			2
18	Lab12. Creation of Blank Grid/Raster			2
19	Lab13. Map algebra / Math in Raster data			
20	Lab 14. Layout generation and report			2
	Total	**38**	**2**	**32**

Evaluation criteria

- Test 1: Written test [at the end of Th# 9 and Exp# 7] 10%
- Test 2: Written test [at the end of Th# 14 and Exp# No 13] 10%
- Practical: Laboratory + Written test [at the end of practical, full experiment 1-20] -- 40%
- Test 4: Written test [at the end of the semester, full syllabus] -- 40%

Learning outcomes

Upon completion of this course, student will be able to:

1. Create and understand database in spatial platform for analysis and modeling for various applications [test -1]
2. Conduct the GNSS based survey and mapping under variety of planning and management applications [test-2]
3. Capable to understand the use of spatial tools & techniques for analysis and modeling of the spatial data over various natural and human resource mapping, monitoring and management [Practical and test-3]

Pedagogical approach: The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Burrough P.A. and McDonnell R.A. (1998) Principles of Geographical Information Systems, Oxford University Press, Oxford,
2. Chang K. (2007) Introduction to Geographic Information System, 4th Edition, McGraw Hill.

3. Lo C. P and Yeung A. K. W. (2009) Concepts and Techniques of Geographic Information Systems, 2nd Edition, New Jersey, Pearson Prentice Hall
4. Verbyla D. L. (2002) Practical GIS Analysis, London and New York, Taylor and Francis.
5. Berry J.K. (1993) Beyond Mapping: Concepts, Algorithms and Issues in GIS, Fort Collins, CO, GIS World Books.
6. Bolstad P. (2005) GIS Fundamentals: A First Text on Geographic Information Systems, Second Edition, White Bear Lake, MN, Eider Press
7. Kaplan E. D. and Hegarty C J (2006) Understanding GPS Principles and Applications, Second Edition, ARTECH House INC. Norwood.
8. Paul D. Groves (2013) Principles of GNSS, inertial, and multisensor integrated navigation systems, 2nd edition, Artech House, Boston/London

Suggested readings

1. Elangovan K. (2006) GIS: Fundamentals, Applications and Implementations, New India Publishing Agency, New Delhi.
2. Heywood I., Cornelius S. and Carver S. (2006) An Introduction to Geographical Information Systems, Prentice Hall, 3rd Edition.
3. Longley P.A., Goodchild M.F., Maguire D.J. and Rhind D.W. (2005) Geographic Information Systems and Science, Chichester, Wiley, 2nd Edition.
4. Maguire D.J., Goodchild M.F. and Rhind D.W. (1997) Geographic Information Systems: Principles and Applications, Longman Scientific and Technical, Harlow.
5. Ott T. and Swiaczny F. (2001) Time-integrative GIS, Management and Analysis of Spatio-temporal Data, Berlin/Heidelberg/New York, Springer.
6. Thurston J., Poiker T.K. and Moore J.P. (2003) Integrated Geospatial Technologies: A Guide to GPS, GIS and Data Logging, Hoboken, New Jersey, Wiley.
7. Tomlinson R.F. (2005) Thinking about GIS: Geographic Information System Planning for Managers, ESRI Press.
8. Wise S. (2002) GIS Basics, London, Taylor & Francis.
9. Worboys M. and Duckham M. (2004) GIS: A Computing Perspective, Boca Raton, CRC Press.

Case studies

Websites

Journals

1. Asian Journal of Geoinformatics
2. Geocarto International
3. International Journal of Goeinformatics
4. International Journal of Remote Sensing
5. ISPRS Journal of Photogrammetry and Remote Sensing
6. Journal of Indian Society of Remote Sensing
7. Remote Sensing of Environment

Additional information (if any)

Magazines

2. Coordinates
3. Geospatial today
4. GIM International
5. GIS World
6. GIS@development
7. GPS World

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course reviewer:

- Prof. P K Joshi, JNU
- Prof. J. K. Garg, Guru Gobind Singh Indraprastha University

Course title: Principles of Remote Sensing				
Course code: NRG 173	**No. of credits:** 3	**L-T-P:** 24-4-28		**Learning hours:** 42
Pre-requisite course code and title (if any): None				
Department: Department of Natural Resources				
Course coordinator: Dr Chander Kr. Singh		**Course instructor:** Dr Chander Kr. Singh		
Contact details:				
Course type: Core		**Course offered in:** Semester 1		

Course Description

It introduces the participant to the basic concepts and the operational skills necessary to acquire remote sensing data and extract geo-information from them. The course links the theoretical physical principles and its visualization in form of remote sensed images and thereafter develop understanding of it use for different applications of resource management.

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.

Course content

S.No	Topic	L	T	P
1.	Introduction to Remote Sensing, History of Remote Sensing; History of Space programs of India and World;	2		
2.	EMR wavelength regions and their applications, Atmospheric windows, Interaction of EMR with matter;	2		
3.	Fundamentals of Radiometry: Concept & Laws, radiance, reflectance	4	2	
4.	Resolutions–spatial, spectral, radiometric, temporal	2		
5.	Remote Sensing Systems (Active & Passive; Imagining & Non-imaging), Orbit and Platforms of earth Observation, sensors and scanners; Cameras and Sensor classification: Opto-Mechanical & Push-broom; Sensor for Infrared, Thermal and Microwave bands	4		
6.	Introduction to commonly used multi-spectral remote sensing satellite systems: IRS Series of satellites, LANDSAT, SPOT, IKONOS, QUICKBIRD, MODIS, RADARSAT, NOAA, TERRA, SENTINEL Family, RISAT, RESOURCESAT etc	4	2	
7.	Ground Truth Collection, Visual Interpretation, Digital and analog methods of Image Interpretation	4		
8.	Spectral signature and its response for Soil, Vegetation and Water	2		
	PRACTICALS			
1.	Lab 1. Introduction to ERDAS IMAGINE 2011			2
2.	Lab 2. Plotting Spectral Signature using spectroradiometer data			2
3.	Lab 3. Exploring different websites for sensor and data			4
4.	Lab 4. Satellite image; season, location, sensor			4
5.	Lab 5. Display, analysis and interpretation of black & white images, grey image, pseudo image and FCC			2
6.	Lab 6. File formats. Import / Export of files using ERDAS IMAGINE			2
7.	Lab 7. Pre-processing satellite data (stacking, subsetting, mosaicking)			2
8.	Lab 8. Map rectification of Toposheet using Keyboard or GPS data and Geo-referencing of the toposheet and imageries			4
9.	Lab 9. Collection of GPS points. Ground data collection.			2

10.	Lab 10. Study of the Spectral Signature of water, Built-up, Bare Soil, Vegetation, Plantation, Crop land, Snow and Cloud.			4
Total		**24**	**4**	**28**

Evaluation criteria

- Test 1: Written Test 15%
- Test 2: Written Test 15%
- Test 3: Written Test 40%
- Practical: Lab Exercise+Viva 30%

The test 3 will be covering the syllabus in its entirety.

Learning outcomes

Upon completion of this course, student will be able to

1. Apply different type of remote sensing systems for various applications [Test1, Test2, Test3]
2. Operational skills necessary to acquire remote sensing data and learn to extract information from them.[Practical]
3. Develop skill set to deal with different types and forms of satellite data [Test1, Test2, Test3]

Pedagogical approach:

The course will be delivered through class lectures, lab exercise, videos and tutorials.

Materials

Required text

Campbell J.B. (2002) Introduction to Remote Sensing, 3rd ed., The Guilford Press.

Curran P.J., Principles of Remote Sensing, UK, ELBS.

Jensen J.R. (2007) Remote Sensing of the Environment: An Earth Resource Perspective, 2nd ed., Pearson.

Suggested readings

Jensen J.R. (2005) Digital Image Processing: A Remote Sensing Perspective, 3rd ed., Prentice Hall.

Joseph G., Fundamentals of Remote Sensing, Universities Press India.

Kondratyev K.Y., Buznitov A.A. and Pokrovoky O.M., Global Change and Remote Sensing, John Wiley and Sons.

Lillesand T.M., Kiefer R.W. and Chipman J.W. (2003) Remote Sensing and Image Interpretation, 5th ed., Wiley.

Muralikrishna V., Geographical Information Systems and Remote Sensing Applications, Allied Publishers Private Limited.

Sabins F.F., Remote Sensing: Principles and Interpretation New York: WH Freeman and Company.

Case studies

Websites

Journals

1. Geocarto International
2. International Journal of Remote Sensing
3. ISPRS Journal of Photogrammetry and Remote Sensing
4. Journal of Indian Society of Remote Sensing
5. Remote Sensing of Environment

Additional information (if any)

Magazines

1. Coordinates
2. Geospatial today
3. GIM International
4. GIS World
5. GIS@development
6. GPS World

Student responsibilities

Attendance, feedback, discipline

Course Reviewers:

1. Prof. Saumitra Mukherjee, JNU
2. Prof. P K Joshi, JNU
3. Prof. Javed Mallick, King Khalid University, ABHA
4. Prof. Sunil Bhaskaran, Professor and Director, Geospatial Center of the CUNY CREST Institute (BGCCCI)

Course title: Fundamentals of Computers and Programming			
Course code: NRG 101	**No. of credits:** 2	**L-T-P:** 12-4-24	**Learning hours:** 28
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr Neeti	**Course instructor:** Ms. Pooja		
Contact details:			
Course type: Core	**Course offered in:** Semester 1		

Course Description

The module will explore the fundamentals of programming in C. The course will also include basics of data base management system through Oracle/MySQL

Course objectives: The objectives of the course are:

(1) Provide fundamentals of programming

(2) Provide fundamentals of C programming language

(3) Provide fundamental knowledge of database management system which is relevant to GIS

Course content

Module	Topic	L	T	P
1.	History of Programming, Making Flow Chart	2		
	Introduction to C, Structure of C Programme, Data type, Input and Output function, Conditional execution	5	2	
2.	DBMS and RDBMS (MS ACCESS; ORACLE; MySQL)	5	2	
	PRACTICALS			
1	Writing first C Programme			2
2	Using different types of data in C Programme			2
3	Writing a programme to use decision control statements, cases			2
4	Writing a programme using loop structure, nested loop			2
5	Use of Arrays			2
6	Programme using pointers			2
7	Design a Database and create required tables, apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.			2
8	Write a sql statement for implementing ALTER, UPDATE and DELETE, Write the queries to implement the joins			2
9	Write the query for implementing the following functions: • String Function • Numeric/Math Functions			2

	• Aggregate Functions • Date/Time Functions			
10	Create Functions, procedures, packages, triggers, Different types of queries using Cases			4
11	Write the query to create the views, Inline view			2
	Total	**12**	**4**	**24**

Evaluation criteria

- Test1: Written Test: 15%
- Test2: Written Test: 15%
- Lab Assignments: 10%
- Practical: [Lab exam and Viva] 30%
- Test3: Written Test 30%

(Test 3 include entire syllabus)

Learning outcomes: Students will be able to

1. Describe how data are represented, manipulated, and stored in a computer [Test1, Lab Assignments]
2. Design programme using flowchart [Test1, Lab Assignments]
3. Able to write and execute C programme using different logical operators[Test2, Lab Assignments]
4. Able to create database table and perform logical queries with different conditions [Lab Assignments, Test3]

Pedagogical approach: The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Benjamin C.P. (2002) Types and Programming Languages, The MIT Press.
2. Bruce J.M. (1999) Principles of Programming Languages: Design, Evaluation and Implementation, Oxford University Press.
3. Daniel P.F. and Wand M. (2001) Christopher Thomas Haynes: Essentials of Programming Languages, The MIT Press.

Suggested readings

1. Gelernter D. and Jagannathan S. (1990) Programming Linguistics, The MIT Press.
2. Goldschlager L. (1998) A Lister Computer Science - A Modern Introduction Prentice Hall.
3. John C.M. (2002) Concepts in Programming Languages, Cambridge University Press.
4. Michael L. S. (2005) Programming Language Pragmatics, Morgan Kaufmann Publishers.
5. Sethi R. (1996) Programming Languages: Concepts and Constructs, 2nd ed., AddisonWesley.
6. Wexelblat R.L. (1981) History of Programming Languages, Academic Press.

Case studies
Websites
Journals

Additional information (if any)

Magazines

1. Coordinates
2. GIM International
3. GIS World

4. GIS@development 5. Goespatial today 6. GPS World
Student responsibilities Attendance, feedback, discipline, guest faculty etc

Course reviewer:

1. Sanjay Kumar, Team Lead, AWS Software Pvt Ltd.
2. Jagdish Mutharia, Head (IT), TERI



Course title: Fundamentals of Physics

Course code: NRG XXX	**No. of credits**: 2	**L-T-P**: 20-08-0	**Learning hours**: 28

Pre-requisite course code and title (if any): None

Department: Department of Natural Resources

Course coordinator: Dr Nithiyanandam Y | **Course instructor:** Dr Nithiyanandam Y

Contact details: nithiyanandam.y@terisas.ac.in

Course type: Audit | **Course offered in:** Semester 1

Course description: The M.Sc. Geoinformatics course contains intense subjects, those require a basic knowledge in Physics for better understanding. Since, students undertake this course are from diverse backgrounds, a bridge course is required to fill this gap. Hence, a compulsory audit course of two credits is offered for students who have not done a course in Physics at 10+2 / bachelor's level.

Class objectives:

Develop an understanding of

- Selected fundamental concepts and principles in physics.
- How these concepts are used in practical applications.

Course content

S no	Topic	L	T	P
1	Measurement: The International system of Units, Changing units, length, time and mass; Motion along a straight line, two and three dimensions: Motion, position and displacement, average velocity and speed, instantaneous velocity and speed, acceleration, constant and free fall accelerations, momentum, projectile motion, circular motion, and relative motion.	2	1	0
2	Force and motion: Newtonian mechanics, Newton's first law, force, mass, Newton's second law, Newton's third law, friction, drag force.	2	0	0
3	Energy: what is energy? Kinetic energy, Work and kinetic energy, work done by the gravitational and general variable forces, and power; Potential energy, work and potential energy, determining potential energy values, conservation of energy.	2	1	0
4	Gravitation: Newton's law of gravitation, gravitation and the principle of superposition, gravitation near earth's surface, gravitation inside earth, gravitation potential energy, planets and satellites: Kepler's law, Satellites: orbits and energy, Einstein and gravitation.	2	1	0
5	Oscillation: simple harmonic oscillation, energy in simple harmonic motion, pendulums and circular motion, forced oscillation and resonance. Waves: types of wave, wavelength and frequency, the speed of a travelling wave, the wave equation, interference of waves, sound waves, travelling sound waves, intensity and sound level, the Doppler effect, supersonic speeds and shock waves.	2	1	0
6	Thermodynamics: Temperature, the zeroth law of thermodynamics, measuring temperature, thermal expansion, temperature and heat, first and second laws of thermodynamics, heat transfer mechanisms.	2	1	0
7	Electromagnetic waves: Maxwell's rainbow, the travelling electromagnetic wave, radiation pressure, reflection and refraction, total internal reflection, polarization by reflection; Optics: Types of images, mirrors, interference, diffraction and polarization, Geometrical optics, dispersion of lights and optical instruments; Interference, diffraction and relativity.	4	2	0
8	Energy from nucleus: Nuclear fission, nuclear reactor, thermonuclear fusion, cosmology, the cosmic background radiation, dark matter, the big bang.	2	0	0
9	Applications of physics fundamentals in geospatial technologies.	2	1	0
	Total	**20**	**8**	**0**

Evaluation criteria

Test 1: Written Test: 15%

Test 2: Written Test: 15%
Test 3: Written Test: 40%
Tutorials/assignments/Quizzes: 30%

Learning outcomes:

Upon completion of this course, a student will be able to:

- Understand basic concepts and principles in different branch of physics like energy, thermodynamics, waves, and optics. [Test1, Test2, Tutorials/assignments/Quizzes]
- Realise the physics behind remote sensing thought in other courses. [Test3]

Pedagogical approach: : The course will be delivered through class lectures and tutorials.

Materials:

Books:

1. Christman, J. R. *et al.* (1997) *Student's companion, Fundamentals of physics*. Wiley.
2. Elachi, C. and van Zyl, J. J. (2006) *Introduction To The Physics and Techniques of Remote Sensing*. Wiley (Wiley Series in Remote Sensing and Image Processing).
3. Giambattista (2010). *Fundamentals Of Physics (sie)* McGraw-Hill Education (India) Pvt Limited.
4. Halliday, D., Resnick, R. and Walker, J. (2010) *Fundamentals of Physics*. John Wiley & Sons.
5. Rees, G. and Rees, W. G. (2012) *Physical Principles of Remote Sensing*. Cambridge University Press.

Additional information (if any)

Student responsibilities:

Attendance, Feedback, discipline, and timely submission of assignments.

Course Reviewers:

- Dr A.R.Prabhakaran, Associate professor of Physics, Pachaiyappa's College, University of Madras.
- Mr. Samudraiah, Former Deputy Director, Space Application Center, ISRO.



Minutes of the meeting of BOS Meeting for MSc Geoinformatics program review

The second meeting of Board of Studies for MSc Geoinformatics programme review was conducted on Sep 26, 2018 to review the course content of second semester. The meeting was attended by

Three external experts

(1) Dr. J. K. Garg (Professor, Indraprastha University)
(2) Dr. R. B. Sharma (Professor, Delhi University)
(3) Dr. P L N Raju (Director, NESAC) (Over the Skype)

TERI SAS Faculty members

(4) Dr. Prateek Sharma
(5) Dr. Sudipta Chatterjee
(6) Dr. Vinay Sinha
(7) Dr. Neeti
(8) Dr. Nithiyanandam
(9) Dr. Chander Kr Singh

Dr. Anu and Dr. Vishnu could not attend the meeting.

Dr. Sudipta initiated the board of meeting by welcoming all the experts.
Dr. Neeti provided the details of all the steps carried out until now for reviewing the MSc Geoinformatics programme along with revised course outlines for second semester courses.

The Course Content for the second semester was discussed in the meeting:

Detail comments on individual points are given below:

Course Content for first semester of MSc Geoinformatics Programme:

a) Photogrammetry:
   i. Mix of tools and techniques for analog and digital photogrammetry is required in the syllabus.
   ii. Digital photogrammetry need to be taught in theory: Data collection and analysis of data
   iii. Cartosat2 data can be used for Photogrammetry lab exercise.
   iv. Latest book need to be added in reference such as Campbell (4th Edition), Book by George Joseph and Jeganathan (2018 Edition)

b) Programming in Geoinformatics:
   a. Instead of vegetation index, syllabus should have different types of indices including vegetation, water etc.
   b. GIS journals that could be useful for the course may be added

c) Spatial Data Modeling and Applications
   i. First two modules on matrices and PCA are taught in Applied Mathematics and Multivariate Data Analysis respectively. These two modules may be removed or contextualized in the syllabus to reflect how it is different compared to the one taught in other two courses.
   ii. Some of lab exercised need to be there using open source software

d) Digital Image Processing and Information Extraction
   i. Instead of using vegetation indices, the module should be on different types of indices.
   ii. Formatting of reference. Reference book on Jensen need to be cited.

e) Law and Policy for Maps and remote Sensing
   i. The name should be Laws and Policies for Maps and remote sensing and it should be consistent across course outline.
   ii. Wetland laws, national water policy need to be added.
   iii. Book on Environmental Law by Gurdeep Singh need to be added in reference.
   iv. National bill on geospatial regulation may be considered for removal as it is not yet law.

f) Multivariate Data Analysis: No suggestion





10, INSTITUTIONAL AREA, VASANT KUNJ, NEW DELHI

44th MEETING OF THE ACADEMIC COUNCIL

MINUTES OF THE FORTY FOURTH MEETING OF THE ACADEMIC COUNCIL HELD ON 13 NOVEMBER, 2018 AT 11.00 A.M.

PRESENT

The following members of the Academic Council attended the meeting:

Members		**Invitees**
Prof Leena Srivastava	Chairperson	Dr Ritika Mahajan
Prof Rajiv Seth		Dr Neeti
Prof Arun Kansal		
Prof TC Kandpal		
Prof Vivek Suneja		
Dr J K Garg		
Mr Rakesh Mehrotra		
Prof Manipadma Datta		
Prof Anandita Singh		
Prof Atul Kumar		
Dr Sapna A Narula		
Dr Vishnu Konoorillam		
Dr Nandan Nawn		
Dr Sudipta Chatterjee		
Dr Chaithanya Madhurantakam		
Dr Smriti Das		
Dr Vinay Shankar P Sinha		
Dr Sukanya Das		
Capt. Pradeep Kumar Padhy (Retd.)	Secretary	

Prof Malathi Lakshmikumaran, Prof Anubha Kaushik, Prof Prateek Sharma, Prof Ramakrishna Sitaraman and Dr Akash Sondhi could not attend the meeting.

The Chairperson welcomed the new members and placed on record the contributions made by the outgoing members.

Item No. 1. **To confirm the minutes of the forty third meeting of the Academic Council held on 12 June 2018.** The Registrar informed that the minutes of the 43rd meeting of the Academic Council, held on 12 June 2018, were circulated to the members and no comments have been received so far.

TS/AC/44.1.1 The Council resolved that the minutes of the meeting of the 43rd Academic Council held on 12 June 2018 be confirmed.

Action Taken Report

Item No.2(i) **A report on the structured feedback from various stakeholders in respect of the revised structure of MBA (Business Sustainability).** A report on structured feedback for MBA (Business Sustainability) programme collected from different stakeholders including academia, industry, alumni and students was presented by Dr Ritika Mahajan on behalf of the Department of Business and Sustainability. Key findings from the survey for revision of the curriculum, and improving the pedagogy were presented. These findings form the basis of changes made in the MBA (BS) program from January 2018 onward. A snapshot of the changes was also presented.

TS/AC/44.2(i). The council made following recommendations: -

- To reconsider total credits for the program to provide an opportunity to the students to opt for open electives.
- To consider increasing the number of feedbacks from peers and employers in such stakeholder surveys in future, not just for MBA (BS) but as a principle.
- To take into account continuous engagement of the faculty members with different stakeholders for revising the program structure and curriculum.
- Segmentation, targeting and positioning of the MBA (Business Sustainability) program for big multinational companies and corporates.

Item 2(ii) **A report on the structured feedback from various stakeholders in respect of the revised structure of MSc Economics:** A report on the structured feedback sought from the stakeholders on the matter of modification in the structure of the MSc Economics programme was placed on the table by Dr Nandan Nawn. The salient points from the report were presented by Head of the Department of Policy Studies and Programme Coordinator, MSc Economics. It was emphasized that during the restructuring the features which form the backbone of the programme were given priority and they are: to include all the core courses offered in competing programmes from institutions elsewhere in the city of Delhi; Master's Thesis; and specialization of Environment and Resource Economics. He informed that these have resulted in limiting the credit for optional Courses only to 8. Prof. Kandpal commented that, similar to MBA (BS), participation of peers and employers in the survey is low and this may be given due importance in such surveys in the future.

The Academic Council noted the action taken.

Item No.3: **To consider and approve the outlines of a few courses proposed by Department of Business and Sustainability.** The outlines of a few courses proposed by the Department of Business and Sustainability were placed before the Council for

approval. A presentation was given by Dr Ritika Mahajan regarding the proposed courses and following which a detailed discussion was held. The following suggestions were provided by the members: -

(i) **Management Information System:-**

- To reconsider the content and distribution of hours in the course as it seems quite extensive to be covered in 28 hours.
- To include the topic of 'Cyber Security'.
- More focus on practical applications, less on theory.
- More focus on the last module.
- Some hours to be devoted to Practicals/Tutorials for the last module.

(ii) **Legal Aspects of Business:-**

- Introduce a module on Introduction to Social and Environmental Laws.
- Retitle 'Module 1' as it also includes Fundamental right to carry on business-constitutional aspects.
- Provide editions of the books.
- Reconsider evaluation criteria and propose at least three Tests- Test 1, Test 2, and Test 3
- Total credits be reduced from 3 to 2. The objective is to trim the course and make it more focused. There could be a different course on social and environmental laws.
- 'Fundamental right to carry on business' be removed.
- In case of legal subjects, books are always to be of latest edition.

TS/AC/44.3.1 The Council resolved that the Course outline of the following courses submitted by Dept of Business and Sustainability placed at Annexure 1 be accepted and approved as amended: -

Ser No.	Course	Type	Cr
(i)	Management Information System	Core	2
(ii)	Legal Aspects of Business	Core	2

Item No.4: **To consider and approve the outline of a few courses for MSc (Geoinformatics) Programme.** The outlines of the few courses proposed by the Department of MSc (Geoinformatics) were presented by Dr Neeti. A detailed discussion was held and following suggestions were made: -

(i) In the Photogrammetry course, Satellite Photogrammetry and satellite (e.g., Cartosat) based data lab assignment needs to be added.

(ii) Prof. Kandpal suggested that the following aspects regarding course outlines be considered.

a) Typo errors to be checked.
b) LTP distribution structure to be looked at.

c) Writing the specific name of course coordinator and instructor can be omitted.
d) Semester in which course offered need not be mentioned.
e) Sub-division of time for topics would be enough.
f) Evaluation of two tests not enough.
g) Specific material details can be deleted.

TS/AC/44.4.1 The Council resolved that the Course outline of following courses in MSc (Geoinformatics) placed at Annexure 2 be accepted and approved as amended: -

Ser No.	Course	Type	Cr
i	Photogrammetry (3)	Core	3
ii	Digital Image Processing and Information Extraction (4)	Core	4
iii	Spatial Data Modelling and its Applications (4)	Core	4
iv	Programming in Geoinformatics (3)	Core	3
v	Law and Policy for Maps and Remote Sensing (2)	Core	2

Item No 5(a). Convocation 2018. The Registrar briefed the Council about the 11th Convocation of the TERI School of Advanced Studies to be held on 15th Nov 2018. He intimated that Shri Adi Godrej, Chairperson, Godrej Group would be the Chief Guest at the Convocation and mentioned that a total of 01 PG Diploma, 249 masters and 12 doctoral students would receive their diploma/degrees. He also informed the council that Mr Adi Godrej would be conferred the degree of Doctor of Philosophy, honoris causa.

The Council noted the matter.

Item No 5(b) NAAC Accreditation. The Registrar informed the Council about the 2nd Cycle accreditation by the NAAC. He further stated that the University has been awarded with B++ grading in its 2nd Cycle accreditation by NAAC. The Chair informed that an appeal is being submitted to NAAC by 02nd December 2018 for reassessment of the grades.

The Council agreed and recommended that an appeal for reassessment of GPA be submitted.

Item No 6. Extension of maximum period for submission of Thesis. The Registrar informed the Council that a doctoral candidate is expected to submit his/her thesis within five years from the date of registration and the period might be extended by Academic Council as a special case. He stated that Ms. Sneha Singh (1036 RBB) who had registered for PhD programme in Department of Biotechnology completed her five-year period in September 2017 and was given one-year extension by AC upto 28 Sep 2018. He submitted that the DRC has recommended a post facto sanction of six months for the submission of the thesis, for consideration of Academic Council.

TU/AC/44.6.1 The Council resolved that six months extension be accorded to Ms Sneha Singh.

Item No.7. Independent Study. Dr. Nandan Nawn informed that the 'Independent Study' was discussed internally in the executive committee of the Academic Council and a process of grading the same had been worked out. He stated as suggested by the EC, a DPEC consisting of one representative from each department had been constituted at University level to supervise the PhD programme issues. He stated that the University offers 'Independent Study' to PhD Students like all other courses and it had been decided that the its would be approved by the DPEC provided the method of evaluation was in consonance with the assessment criteria. He sought the approval of the Academic Council for the process recommended by the EC. Members opined that 'Independent Study' would vary from student to student and if a PhD student had to complete core credit then s/he should be allowed to do a course from the list of courses, as decided by the SRC. It was felt that if a new topic had to be decided for 'Independent Study' then there would be grey areas in respect of course contents, performance evaluation modalities etc. which would have to be taken care of. Members opined that 'Independent Study' should not be offered to PhD students.

TS/AC/44.6.1 The Council resolved that 'Independent Study' will not be offered to doctoral students.

There being no other items for discussion, the meeting ended with vote of thanks to all present.

Sd/
Capt Pradeep Kumar Padhy (retd.)
Registrar

Enclosures:-
Annexure 1
Annexure 2

Distribution: -
Electronic Copy:
1. Vice Chancellor, TERI School of Advanced Studies
2. All members of Academic Council
3. Website

Printed Copy:
Registrar Office

Annexure 2
(Refer to TS/AC/44.4.1)

Course title: Photogrammetry			
Course code: NRG 170	**No. of credits:** 3	**L-T-P:** 26-2-28	**Learning hours:** 42
Pre-requisite course code and title (if any): NRG 178 Principles of remote sensing, NRG 176 Principles of GIS and GPS			
Department: Department of Natural Resources			
Course coordinator: Dr Anu Rani Sharma		**Course instructor:** Dr Anu Rani Sharma	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description
This course introduces photogrammetry as a data acquisition tool and provides a general overview of its theory and working principles. This course covers the factors that influence the formation of the photographs, and the process of reconstructing the three-dimensional model for the real world. Students will gain the ability to extract data from aerial photography.

Course objectives
1. To develop understanding about basic concepts of image geometry and measurement of aerial photograph.
2. To get acquainted with image interpretation and information extraction

Course content

SNo	Topic	L	T	P
1	**Introduction to Photogrammetry** History of Aerial Photographs, Fundamentals of Aerial Photographs, Basics concepts of Perspective projection and Orthographic projection	2		
2	Aerial Cameras and Photographs (Types, acquisition, scanning)	2		
3	Planning Aerial Photography and elements of aerial photograph	4	2	
4	Stereoscopic photographs and Parallax	4		
5	**Geometry of Aerial Photograph** Basic of Optics: Reflection, refraction and lens distortion Photographic scale; Object height and Length	 2 2		
6	**Introduction to Ortho-photos and DEM/contour extraction** Photo mosaic, Ortho photo, Photograph co-ordinate and ground coordinate of Vertical photograph Digital Photogrammetry: Block adjustment, Ortho-rectification Digital Terrain Model and Terrain editing, Satellite Photogrammetry	 2 2 2		
7	**Interpretation techniques and tools** Aerial Photo Interpretation techniques and tools	2		
8	Applications and limitation of Aerial Photography	2		

	PRACTICALS			
1	Interpreting an Aerial photograph			2
2	Stereovision exercise and 3D model perception in stereoscope			4
3	Photo and Image coordinate calculation for vertical photographs			2
4	Parallax bar operation and height calculation			4
5	Introduction to Leica Photogrammetry suite (LPS)			2
6	Orthorectification of aerial photographs / satellite datasets			8
7	DEM generation using ortho images and Flight map generation			4
8	Introduction to Stereoanalyst			2
	Total			**28**

Evaluation criteria

- **Test1: 10%**
- **Test2: 10%**
- **Practical (Lab exercise and viva) (Practical is conducted at the end of the semester and includes evaluation of the lab exercises student carry out throughout the semester: 30%**
- **Test 3 (Test 3 is conducted after completion of the course, at the end of the semester): 50%**

Learning outcomes

Upon completion of the course, student will be able to:

1. Extract data from aerial photography
2. Understand the process of reconstructing three-dimensional model for the real world

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Moffitt F.H. (1980) Photogrammetry, 3rd Ed, Harper & Row, NY.
2. *Campbell J.B. (2002) Introduction to Remote Sensing, 3rd ed., The Guilford Press.*
3. Paine D. P., Kiser J. D. (2012) Aerial Photography and Image Interpretation, John Wiley & Sons, Inc.
4. Wolf P.R. (1983) Elements of Photgrammetry, McGraw-Hill, NY
5. Joseph, G. and Jeganathan, C. (2018) Fundamentals of Remote Sensing. By. Universities Press (India) Private Limited, Hyderabad, India. ISBN 978-93-86235-46-6.

Suggested readings

1. George J. (2005) Fundamentals of Remote Sensing Universities Press India
2. *Lillesand T.M., Kiefer R.W. and Chipman J.W. (2003) Remote Sensing and Image Interpretation, 5th ed., Wiley.*
3. Floyd F.S. (2007) Remote Sensing: Principles and Interpretation New York, WH Freeman and Company.
4. Zorn H.C. (1980) Introductory Course in Photogrammetry, 6th Ed. ITC, Netherlands.

Journals

1. Asian Journal of Geoinformatics
2. Geocarto International
3. International Journal of Goeinformatics

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4. International Journal of Remote Sensing 5. ISPRS Journal of Photogrammetry and Remote Sensing 6. Journal of Indian Society of Remote Sensing
Additional information (if any) **Magazines** 1. Coordinates 2. Geospatial today 3. GIM International 4. GIS World 5. GIS development 6. GPS World
Student responsibilities Attendance, feedback, discipline, guest faculty etc.

Course Reviewer:

- Prof. J. K. Garg, Indraprastha University, Dwarka
- Dr. P.L.N. Raju, NESAC, Shillong

Course title: Digital Image Processing and Information Extraction			
Course code: NRG 172	**No. of credits:** 4	**L-T-P:** 28-10-36	**Learning hours:** 56
Pre-requisite course code and title (if any): NRG 178 Principles of remote sensing			
Department: Department of Natural Resources			
Course coordinator: Dr Chander Kumar Singh		**Course instructor:** Dr Chander Kumar Singh	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description

This course will introduce fundamental technologies for digital image, compression, analysis, and processing. Students will gain understanding of algorithm, analytical tools, and practical implementations of various digital image applications.

Course objectives

1. Fundamental technologies for digital image, compression, analysis, and processing
2. Gain understanding of algorithm, analytical tools, and practical implementations of various digital image applications

Course content

SNo	Topic	L	T	P
1	Introduction to Digital Image Processing & Information Extraction	2		
2	Digital Data Formats; Image data storage and retrieval; Concepts about digital image and its characteristics, Spectral, Spatial, Radiometric and Temporal resolution,	2		
3	Types of image displays, Colour port and spectral band, B/W image, Gray Image, True/Pseudo Image and Standard FCC.	2		2
4	Radiometric and Geometric correction technique, Atmospheric correction	2	2	2
5	Interpolation methods – linear and nor linear transformation for geometric corrections. Spatial and Spectral interpolation	2		
6	Look-up Tables (LUT) and Image display, Radiometric enhancement techniques, Spatial profile and Spectral profile, Spatial enhancement techniques,	2	2	
7	Contrast stretching: Linear and non-linear methods.	2	2	2
8	Low pass filtering: Image smoothing, High pass filtering: Edge enhancement and Edge detection, Gradient filters, Directional and non-directional filtering.	4		2
9	Band ratio, NDVI, NDBI, VCI, EVI, SAVI, NDSI etc, TCA	2		2
10	Principal component analyses; Texture analysis	2	2	2
11	Concept of pattern recognition, Multi-spectral pattern recognition; Spectral discrimination, Signature bank, Parametric and Non-Parametric classifiers	2		4
12	Unsupervised classification methods, Supervised classification techniques, Limitations of standard classifiers	2		6
13	Artificial intelligence, Fuzzy logic, Neural networks, Expert systems	2		6
14	Accuracy Assessment: User and Producer accuracy, Kappa accuracy.	2	2	4
	Total	**30**	**10**	**32**
	List of Experiment			

	Lab 1. Study of the various contrast enhancement techniques			2
	Lab 2. Haze and Noise reduction			2
	Lab 3. Stacking, Mosaic and Subset of imagery, geometric and radiometric correction			4
	Lab 4. Perform the various band ratio calculation			2
	Lab 5. Low Pass Filter: Compression of the high frequency component and enhancement of the low frequency component			2
	Lab 6. High Pass Filter: Compression of the low frequency component and enhancement of the high frequency component			2
	Lab 7. Data compression techniques			1
	Lab 8. Resolution merging			1
	Lab 9. Supervised classification			3
	Lab 10. Unsupervised classification			3
	Lab 11 Knowledge base classification			6
	Lab 12. Accuracy Assessment			3
	Lab 13. Visualisation and presentation			1
	Total Hours			**32**

Evaluation criteria

- **Test 1: 10% (Learning outcomes 1)**
- **Test 2: 10% (Learning outcomes 1)**
- **Test 3: 40% (Learning outcomes 1 and 2)**
- **Practical: 40% (Learning outcomes 1 and 2)**

Learning outcomes

1. Gain knowledge and practical experience in digital image processing
2. Learn practical skills and analytical background for information extraction from digital data and its application

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Jensen J.R. (2016) Introductory Digital Image Processing: Remote Sensing Perspective New Jersey, Prentice Hall.
2. Umbaugh S.E. (2005) Computer Imaging: Digital Image Analysis and Processing.
3. Wilhelm B. and Burge M.J. (2007) Digital Image Processing: An Algorithmic Approach Using Java,
Springer.

Suggested readings

1. Bart M.R. (2003) Front-End Vision and Multi-Scale Image Analysis.
2. Campbell J.B. (2002) Introduction to Remote Sensing, 3rd ed., The Guilford Press.
3. Lillesand T.M. Kiefer R.W. and Chipman J.W. (2003) Remote Sensing and Image Interpretation, 5th ed., Wiley.
4. William K.P. (1978) Digital Image Processing.

Case studies

Websites

Journals

1. International Journal of Applied Earth Observation and Geoinformation 2. ISPRS Journal of Photogrammetry and Remote Sensing 3. International Journal of Remote Sensing 4. Journal of Indian Society of Remote Sensing 5. Remote Sensing of Environment 6. Geocarto International 7. International Journal of Geoinformatics
Additional information (if any) Magazines 1. Coordinates 2. GIM International 3. GIS World 4. GIS@development 5. Geospatial today
Student responsibilities Attendance, feedback, discipline, guest lecture etc

Course Reviewer:

- Prof. Javed Mallick, King Khalid University, Saudi Arabia
- Prof. Saumitra Mukherjee, Jawaharlal Nehru University

Course title: Spatial Data Modeling and Applications			
Course code: NRG 174	**No. of credits:** 4	**L-T-P:** 32-08-32	**Learning hours:** 56
Pre-requisite course code and title (if any): NRG 176 Principles of GIS and GPS			
Department: Department of Natural Resources			
Course coordinator: Dr Vinay Sinha		**Course instructor:** Dr Vinay Sinha	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description

The course covers fundamental aspects of spatial data modeling specifically to enhance the capability of spatial modelling, spatial database analysis concept, design and format under different natural resource assessment planning and monitoring. It introduces the participant to the basic concepts of Matrix & PCA, map algebra, decision making criteria, spatial analysis of discrete and continuous datasets, geo-statistics, decision-making, conflict resolution. It also considers integration of non-spatial data and application developed based on the concepts by software developers, photogrammetrists, land surveyors, mapping specialists, researchers, post-graduate students, and lecturers.

Course objectives

1. To introduce fundamental aspects of spatial data modeling.
2. To understand the natural and social resource assessment, planning and monitoring for National development process.
3. To create a firm basis for successful integration of natural / human resources using spatial modelling in any field of application.

Course content

SNo	Topic	L	T	P
1	Introduction to geospatial modeling and interpretation	2		
2	Raster data and Matrix application: Addition, subtraction, multiplication, Identity and Inverse for Spatial analysis concept;	2		
3	Raster and Vector data Geometry and Intensity transformation using Principle Component Analysis: Eigenvectors and Eigen values	2		
4	Applications of GIS models, case exercise	2	2	
5	Geospatial models – types and Modelling: Descriptive, prescriptive and predictive; Normalization, level of measurement	2		
6	Spatial analysis concept: Distance, Adjacency, Interaction and neighbourhood	2		
7	Introduction to modeling & flowcharting, Map algebra-operators & operations, Functional operations, Spatial interaction models	2		
8	Point Analysis: Coordinate, Distance – Nearest Neighbour Distance, Density – Quadrant and other methods, Clustering - K- mean, Thiessen and Buffer	2	2	
9	Address Geocoding, Optimum Routing Closest facilities, Resource Allocation, Network Analysis	2		
10	Dynamic Segmentation: Route, Section, Events and its application.	2		
11	Local neighbourhood operation – Reclassification, filter, slope, Aspect, curvature, view shed	2		

12	Spatial Interpolation and Geostatistics: Local and global methods, Gravity model, Regression model, Pattern analysis, Moran's I, Cluster analysis, Trend surface Analysis,	2	2	
13	Thiessen polygon, Density estimation, Inverse Distance Weight (IDW), Thin – plate Spline,	2		
14	Kriging – ordinary and Universal, Semivariogram; Spatial Autocorrelation	2	2	
15	Single criteria vs. Multiple criteria, Decision-making, Conflict resolution and Prescriptive modeling, Model verification	2		
16	Spatial decision support system and thematic areas (application of MCDM/AHP in spatial modeling)	2		
Exp	PRACTICALS			
1	Lab 1. Performing various actions over table			2
2	Lab 2. Merging of tables by using primary key			
3	Lab 3. Maintaining database			2
4	Lab 4. Point pattern analysis			2
5	Lab 5. Terrain Analysis			2
6	Lab 6. Hydrological modelling			4
7	Lab 7. Geostatistics (Surface generation)			6
8	Lab 8. Cluster Analysis			4
9	Lab 9. Site suitability analysis			4
10	Lab 10. Network analysis			2
11	Lab 11. Dynamic segmentation			4
	Total	**32**	**08**	**32**

Evaluation criteria

- **Test1: 10%**
- **Test2: 10%**
- **Practical: 40%**
- **Test3: 40%**

Learning outcomes

1. Equip with analysis, description and modeling of geospatial data.
2. The practical applications of software tools, underlying theory, and the correct application of

these tools to analyze and model data

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. O' Sullivan D. and Unwin D. (2003) Geographical Information Analysis, John Wiley and Sons.
2. Verbyla D. L. (2002) Practical GIS Analysis, London and New York, Taylor and Francis.
3. Burrough P.A. and McDonnell R.A. (1998) Principles of Geographical Information Systems, Oxford University Press, Oxford, 327 pp.
4. Longley P.A., Goodchild M.F., Maguire D.J. and Rhind D.W. (2005) Geographic Information Systems and Science, Chichester, Wiley, 2nd edition.
5. Longley P.A., Goodchild M.F., Maguire D.J. and Rhind D.W. (2005) Geographic Information Systems and Science, Chichester, Wiley, 2nd edition.

Suggested readings

1. Andrew S. (2002) Environmental Modeling with GIS and Remote Sensing, Taylor and Francis.
2. David W. and Mark G. (2002) Spatial Technology and Archaeology, The Archaeological Application of GIS. London, New York, Taylor & Francis.
3. Goodrich M. (2000) Data Structures and Algorithms in Java, 2nd Edition Wiley.
4. Malczewski J. (1999) GIS and Multicriteria Decision Analysis, New York, John Wiley and Sons.
5. Michael W. and Duckham M. (2004) GIS: A Computing Perspective, Boca Raton, CRC Press, Asrar Ghassem Theory and Applications of Optical Remote Sensing New York, John Wiley and Sons.
6. Ott T. and Swiaczny F. (2001) Time-integrative GIS, Management and Analysis of Spatio-temporal Data, Berlin/Heidelberg/New York, Springer.
7. Steven M.D. and Clark J.A. (1990) Applications of Remote Sensing in Agriculture London Butterworths.
8. Johnson L. E (2009) Geographical Information System in Water Resource Engineering, Taylor and Francis.
9. Thurston J., Poiker T.K. and Moore J.P. (2003) Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging, Hoboken, New Jersey, Wiley.
10. Vincent R.K. (1997) Fundamentals of Geological and Environmental Remote Sensing New Jersey, Prentice Hall.

Case studies

Websites

Journals

11. Advances in Water Resources
12. Agricultural and Forest Meteorology
13. Asian Journal of Geoinformatics
14. Ecological Modelling
15. Geocarto International
16. International Journal of Geoinformatics
17. International Journal of Remote Sensing
18. ISPRS Journal of Photogrammetry and Remote Sensing

19. Journal of Indian Society of Remote Sensing 20. Remote Sensing of Environment
Additional information (if any) Magazines 6. Coordinates 7. GIM International 8. GIS World 9. GIS@development 10. Geospatial today 11. GPS World
Student responsibilities Attendance, feedback, discipline, guest faculty etc

Course Reviewer:

- Prof M P Punia, Head & Sr Scientific Officers, Department of Remote Sensing, BIT, Mesra-Jaipur
- Prof P K Joshi, SES, JNU, New Delhi

Course title: Programming in Geoinformatics

Course code:	**No. of credits:** 3	**L-T-P:** 12-3-54	**Learning hours:** 42

Pre-requisite course code and title (if any): NRG 176: Principles of GIS and GNSS, NRG 178: Principles of Remote Sensing, NRG 106: Fundamentals of Computers and Programming

Department: Department of Natural Resources

Course coordinator(s): Dr. Neeti | **Course instructor(s):** Dr. Neeti

Contact details:

Course type: Core | **Course offered in:** Semester 2

Course Description

The course introduces programming required for both GIS and remote sensing analysis to the students. The fundamentals of programming in GIS using Python language. The coding for analysis of remotely sensed dataset will be taught using Google Earth Engine.

Course objectives

- To introduce Python programming
- To integrate programming with GIS analysis
- To introduce Google Earth Engine for Image processing

Course content

SNo	Topic	L	T	P
1.	Introduction: Automation in GIS, Introduction to Python, variables, object oriented programming, classes	2		
2.	Basics of Python programming: List, loops, decision structures, string manipulation, debugging in Python	2	1	
3.	GIS Data Access and manipulation with Python: Raster and Vector	2	1	
4.	GIS analysis using Python	2	1	
5.	Functions and Modules in Python, Python dictionaries, writing geometries, Batch files, working with map documents	2		
6.	Introduction to Google Earth Engine for image processing	2		
	PRACTICALS			
1	Writing first programme in Python			2
2.	Passing a value to a script as a parameter, reporting spatial reference of feature class, creating buffers			4
3.	Performing map algebra			2
4.	Creating a script using multiple GIS operation			4
5.	Creating and combining list			2
6.	Working with different types of loop			4
7.	Looping over records in shapefile in Python			2
8.	String manipulation in a shapefile in Python			2
9.	Debugging a programme			2
10.	Reading and Writing vector data in Python			4
11.	Query and updation of vector data using cursor in Python			4
12	Raster based analysis in Python			2
13.	Writing functions and creating modules in Python			4
14.	Creating dictionary, reading and writing text using Python csv module			2
15.	Writing geometry of point, polygon and line shapefile			4
16.	Running python script in batch file, scheduling tasks			2

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17.	Updating map document (mxd file) using Python			2
18.	Writing first programme in GEE			2
19	Display of an image, image computation, spatial reducer using GEE			2
20.	Creating a composite image, creating profile, vegetation indices creation using GEE			2
	Total	**12**	**3**	**54**

Evaluation criteria

- Assignments: 20%
- Test 1: 20% (Learning Outcome 1)
- Test 2: 20% (Learning Outcome 2)
- Test 3: 40% (All the learning outcomes)

Learning outcomes

At the end of the course, students will be able to:

1. Automate geoprocessing tasks using Python
2. Understand, write, debug and execute python programme
3. Write and execute basic image analysis using GEE

Pedagogical approach:

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Gries, P., Campbell, J., and Montojo, J. (2013) Practical Programming: An Introduction to Computer Science Using Python, Pragmatic Programmers.
2. Zandbergen, Python Scripting for ArcGIS, Esri Press, 2013.

Suggested readings

1. Python official homepage - http://www.python.org/
2. Python document - http://www.python.org/doc/
3. The Python Tutorial - http://docs.python.org/tutorial/ A Byte of Python (an online wikibook) - http://swaroopch.com/notes/Python/ How to think like a computer scientist: learning with Python, 2nd edition by Jeffrey Elkner et. al. - http://openbookproject.net//thinkCSpy/ ArcGIS 10 Desktop Help: Geoprocessing with Python - http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What_is_Python/002z000000 01000000/ Geoprocessing Model and Script Tool Gallery - http://blogs.esri.com/Dev/blogs/arcgisdesktop/archive/2010/11/09/Geoprocessing-Model-and-ScriptTool-Gallery.aspx
4. Lutz, M. and Ascher, D. (1999) Learning Python, O'Reilly Media.
5. Zelle, J. M. (2003) Python Programming: An Introduction to Computer Science, Franklin Beedle
6. & Associates.
7. Tucker (2004) Writing Geoprocessing Scripts in ArcGIS, ESRI Press (available online).

Journals

1. International Journal of Applied Earth Observation and Geoinformation
2. ISPRS Journal of Photogrammetry and Remote Sensing
3. International Journal of Remote Sensing
4. Journal of Indian Society of Remote Sensing
5. Remote Sensing of Environment
6. Geocarto International

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when

provided.

Course Reviewer:

1.Dr. Kangping Si, Big Data Software Engineer, TiVo Inc., San Jose, USA

2. Mr. Ujaval Gandhi, Google Earth Engine, Hyderabad



Course title: Law and Policy for Maps and Remote Sensing			
Course code: NRG 160	**No. of credits:** 2	**L-T-P:** 28-0-0	**Learning hours: 28**
Pre-requisite course code and title (if any):			
Department: Department of Natural Resources			
Course coordinator:	**Course instructor:**		
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course Description: This course focuses on the evolving laws, policies, and institutions that have long-term ramifications for earth mapping and remote Sensing. It also deals with legal systems, related linkages with land use/cover systems, remote sensing & map policy. It provides an overall guiding framework for development and implementation of remotely sensed data to make it useful in geographic information systems. The course structure further helps to critically assess the strengths and weaknesses of legal instruments of remote sensing and platforms for a variety of application scenarios viz; geosciences, water resources, land use planning, forests, Agriculture and Environmental Management.

Course objectives

1. To introduce the law and policy both at the national and international level relating to remote sensing and maps.
2. To explain the role of legal regulations, policy and institutions in the conservation and management of natural resources.
3. To understand the significance of regulations on remote sensing and mapping and its impact on regional and international discourses/debates. It will appraise the students about government policies both macro and micro to deal with the issues of environmental monitoring and assessment.

Course content

SNo	Topic	L	T	P
1.	**Introduction to the Legal System**: Meaning and functions of Law, Difference between International Law & Municipal Law; Introduction to Primary and Secondary Sources of Law; Introduction to different types of laws (Criminal Law, Civil Law, Torts, Human Rights etc.)	5		
2.	**Relevant Laws:** • **Forest and Wildlife Law**: Indian Forest Act, 1927- Legal classification of forests, Restrictions on the rights, Forest Conservation Act, 1980; Wildlife Protection Act 1972. • **Land Law**: Concepts in land related rights; easement rights-tenured rights–community rights–restrictions on the rights relating to land, National Land Use Policy • **Intellectual Property Law**: Relevant to maps, information and data	5		
3.	**National Law and Policy on Remote sensing and Mapping:** National Drone Policy, The National Geospatial Policy-2016, Geospatial Information Regulations Bill- 2016, The National Map Policy -2005, Guidelines for Implementing National Map Policy, Civil	5		

	Aviation Rules, The Civil Aviation Requirements- 2012, The Remote Sensing Data Policy 2001-2011, National data Sharing and Accessibility Policy-2012.			
4.	**Application of Remote sensing in Natural Resources & Natural hazards:** Law relating to renewable and non-renewable Resources, the Environment Protection Act, 1986; Disaster Management Act, 2005; Coastal Regulation Zone Notification/Draft-2018; Use of Remote sensing in exploration of minerals and mining law and policies; Use of Remote Sensing in other areas such as wetlands, water resources etc.	5		
5.	**International Instruments relating to law and policy on Remote Sensing & Mapping**: The Convention on International Liability and Damage caused by Space objects, 1972; Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1967; Montreal Convention on Unification of Certain Rules for International Carriage by Air, 1999; UN Principles relating to Remote Sensing of the Earth from Outer Space, **Laws in other Jurisdictions**: U. K. National Remote Sensing Policy 1984, U.S., Canada, Security Issues &Evidentiary value (Case studies- *Dow* v. *U.S.*, *EOSAT* v. *NASA & NOAA*.)	8		
	Total	**28**		

Evaluation criteria

- **Test 1: 15%**
- **Test 2: 15%**
- **Assignments: 20%**
- Test 3: 50%

Learning outcomes

By the end of the course, the students are expected to:

1. be familiar with the laws, policies and institutions in the field of maps and remote sensing both at the national and international level
2. understand the significance of regulations on remote sensing and mapping in the conservation of natural resources, land use & planning, agriculture, forests and overall environmental monitoring & assessment
3. acquire the ability to critically evaluate the role of law and policy in conservation and management of environment

Pedagogical approach

The course will be delivered through class lectures.

Materials

Required text

1. Patricia Birnie, Alan Boyle, and Catherine Redgwel (2009) ***International Law and the Environment,*** 3rd Ed. Oxford University Press.
2. James B. Campbell & Randolph H. Wynne., ***Introduction to Remote Sensing***, The Guilford Press, 2011.
3. Ackerman B., Ellickson R. and Rose C.M. (2002) *Perspectives on Property Law*, 3rd ed. Aspen Law and Business.

4. Stoebuck W.B. and Dale A.W. (2000) The Law of Property, 3rd. ed. St. Paul MN, West Group Publishing.
5. Gurdip Singh (2016) Environmental Law, 2nd ed. Eastern Book Company.

Suggested readings

1. A. Orhan, R. Backhaus, P. Boccardo, S. Zlatanova (eds.), ***Geoinformation for Disaster and Risk Management*** Examples and Best Practices, Joint Board of Geospatial Information Societies and United Nations Office for Outer Space Affairs, Denmark, 2010.
2. ***Unmanned Aircraft in the National Airspace: Critical Issues, Technology and the Law*** by Donna A. Dulo, Editor, 2015, 1st Edition. Publisher: ABA Publishing. ISBN 13: 978-1-62722-998-2
3. E.C. Barrett & L.F Curtis, ***Introduction to Environmental Remote Sensing***, Chapman and Hall, London.
4. George Cho, ***Geographic Information Systems and the Law: Mapping the Legal Frontiers***, Wiley, 1998

Case studies

1. *Dow* v. *U.S.*
2. *EOSAT* v. *NASA & NOAA*
3. *J. Mohanraj v. Google and Others*

Websites

Web resources of Govt. Of India, Ministries of S&T, Earth Sciences, IMD, ISRO, Env,& Forest *etc.*

Journals

1. Journal of Environmental Law
2. Journal of Environmental Law & Policy
3. Asian Journal of Geoinformatics
4. Geocarto International
5. International Journal of Geoinformatics
6. International Journal of Remote Sensing
7. ISPRS Journal of Photogrammetry and Remote Sensing
8. Remote Sensing of Environment

Additional information (if any)

Magazines

1. Coordinates
2. GIM International
3. GIS World
4. GIS@development
5. Goespatial today
6. GPS World

Student responsibilities

Attendance, feedback, discipline, guest faculty etc.

Reviewers:

Dr. Shiju MV, Associate Professor, Christ University, Bangalore
Dr. Risham Garg, Associate Professor, National Law University, Delhi



MINUTES OF THE FORTY-THIRD MEETING OF THE ACADEMIC COUNCIL HELD ON 12 JUNE 2018 AT 10.30 A.M.

PRESENT

The following members of the Academic Council attended the meeting:

Members
Dr Leena Srivastava, Chairperson
Dr Rajiv Seth
Dr Prateek Sharma
Dr J K Garg
Mr Rakesh Mehrotra
Dr Vivek Suneja
Dr Suresh Jain
Dr Sapna A Narula
Dr Nandan Nawn
Dr Chaithanya Madhurantakam
Dr Vishnu Konoorayar
Dr Manipadma Datta
Dr Atul Kumar
Dr Kamna Sachdeva
Dr Naqui Anwer
Dr Anandita Singh
Dr Anu Rani Sharma
Capt. Pradeep Kumar Padhy (Retd.), Secretary

Invitees
Dr. Soumendu Sarkar;
Mr Sapan Thapar
Dr Neeti
Dr Chubamenla Jamir
Dr Akash Sondhi
Dt Montu Bose
Dr Abhijit Datey
Dr C K Singh
Dr VSP Sinha
Dr Nithiyanandam Yogeswaran

Prof TC Kandpal, Dr Malathi Lakshmikumaran, Dr Anubha Kaushik, Dr Arun Kansal, Dr Shaleen Singhal, Dr Ramakrishnan Sitaraman and Ms Fawzia Tarannum could not attend the meeting.

The Vice Chancellor welcomed all the new members of the Academic Council and Invitees. The Council placed on record its deep sense of appreciation of the services rendered by outgoing members Dr Rakesh Kosha and Dr Kanchan Chopra during their tenure as member of the Academic council.

ITEM NO.1 To confirm the minutes of the forty second meeting of the Academic Council held on 02 Apr 2018. The minutes of the forty second meeting of the Academic Council held on 02 Apr 2018, were circulated to the members and no comments have been received.

TS/AC 41.1.1 The Council resolved that the minutes of the meeting of the Academic Council held on 02 April 2018 be confirmed.

ITEM NO. 2 To consider and approve Course Participation Certificate for Distance Education Programmes. Mr Sapan Thapar Coordinator, Open and Distance Learning, intimated that a large number of students undergoing programmes conducted under the open and distance learning format were not able to complete their programmes because of various extraneous reasons. He proposed that a Certificate of Participation be issued to these students to help them join back the programmes at a time of their choosing within the permissible limits. He stated that this certificate would be issued to students who could score a minimum of 50% in all the assignments submitted. He presented the draft certificate to the Council. After deliberating the issue, the members recommended that instead of a certificate a letter of participation be issued to such students.

TS/AC 43.2.1 The Council resolved that the participation letter as amended be accepted and approved (Annexure 1).

ITEM NO.3. To consider and approve the outline of a few courses proposed by Department of Policy Studies. The recommendations of the meeting of the Board of Studies of Department of Policy Studies held on 25 April 18 were placed before the Council. The following suggestions were provided:

(a) **Growth Economics**

(i) To add a module and associated references on Kaldorian and Kaleckian growth models.

(ii) Format of references to be made as per a citation style.

(iii) Description and indicators of evaluation to be added.

(b) **Development Economics**

(i) Assessment title to be changed "preparation of policy brief" to "policy brief" in the Evaluation section.

(ii) Description regarding practical in Module 1 to be added.

(iii) Description and indicators of evaluation to be added.

(iv) References are to be formatted as per a given citation style.

(c) **Introduction to Mathematical Methods in Economics**

(i) Additional textbooks to be mentioned.

(ii) The word 'Introduction to' be dropped from the title.

(iii) Last module title to be changed to Application'.

(d) **Microeconomics**

(i) Transaction costs to be introduced. In Module VIII "Markets as Institutions" to be introduced. Three papers were included in the list of readings as essential for this module.

(ii) Details of tutorials to be added in the section on "Pedagogical Approach".

(e) **Probability and Statistics**

(i) Goal of practical is to be reflected in the course objectives.

(ii) References are to be formatted as per a given citation style.

(f) **Application of Quantitative Data Analysis in Development Practice**

(i) The word 'advanced level' in the 2nd bullet point of course objectives must be removed.

(ii) Details of 'Tutorials' (T) and Practical (P) (i.e. what is to be taught in Tutorials and Practical) are to be mentioned in the specific modules.

(iii) In the large-scale survey, 'Census Surveys/Data' may be included along with other surveys.

(The course already included three large scale nationally reported surveys (NFHS, IHDS & NSSO). These three surveys are conducted by Govt. of India in a timely and systematic manner and are useful to the students of

development practice. Further, SDP students get detailed exposure to Census Data during the course on Population and Health: Techniques of Analysis and Policy Perspectives (MPD 124)offered in the 2nd semester. Considering the credit limit and no. of hours, feasibility of additional surveys is also difficult.)

(iv) The proposed evaluation criteria follow continuous evaluation system with terms paper presentation and submission. It was decided that students would be asked to present and submit first term paper by middle of the semester and another one by the end of the semester.

(v) The evaluation criteria be mapped as per the course outline. Two separate evaluation tasks provided to the students to match the two different modules. One module covers application of statistical analysis for small scale survey, while another covers use of large scale surveys for development practice.

(g) **Art and Sustainability**

(i) Course Matching with the university USP and a continuous evaluation system. The course description indicates that - This course is geared towards sensitizing students on different dimensions of sustainability by creating varying art forms through the core philosophical principles of introspection, reflection, action and liberation. While applying the four core principles of introspection, reflection, action and liberation, this course will delve into a liberating journey from the bonded sense of materialism by integrating notions of sustainability, efficiency and sufficiency while connecting with notions of human welfare and quality of life. This indicates that the basic premise of the course is based on the USP of the university. In the evaluation system the following tests are put in place -

- Test 1: A Book Review, Critical Analysis: 40% weightage
- Test 2: A sustainability product formation (short story, poetry, any type of literary output, painting, short documentary, dance video, music composition, any other art form according to the interest of the student): 40% weightage
- Test 3: Class Room Participation: 20% weightage. Class room participation will be captured by discussing issues of artefacts, tribal arts and how in the context of an issue of equity and justice these arts have a valuable contribution.
- These tests will ensure that all sustainability products are opened for an online voting and display on the campus for voting by faculties and management to ensure transparent, fair assessment of students. No marking system will be done on the sustainability product. Based on the votes gathered by each sustainability product the performance of the students will be continuously assessed. For the book review and class room participation, the student with more original, out of the box thinking and perspectives will be graded higher. This will ensure that constant evaluation takes place.
- As a part of Test 3, within the class room 5 groups will be created and a question related to certain themes surrounding sustainability will be asked. Each group will be then asked to present their narration of the exploration done by the group collectively while addressing the question on a particular theme centering around sustainability by using any art form of their interest which they will present to all the other groups. If a group does well, then all group members in that group will be rewarded for

giving incentives of collective thinking while addressing sustainability questions.

- This is done to create a continuous evaluation system.

(ii) Course is mapped with learning outcomes: -

- The course will have three tests. The three tests will comprise of - a) Test 1: A Book Review, Critical Analysis: 40% weightage, b) Test 2: A sustainability product formation (short story, poetry, any type of literary output, painting, short documentary, dance video, music composition, any other art form according to the interest of the student): 40% weightage and c) Test 3: Class Room Participation: 20% weightage. Class room participation will be captured by discussing issues of artefacts, tribal arts and how in the context of an issue of equity and justice these arts have a valuable contribution.
- Each test has been linked to the learning outcomes in the following manner:
- Have the ability to create and sustain a self – reflective **(Test 1& 3),** empathetic **(Test 2),** experimental perspective **(Test 2)** about bridging philosophies between the theoretical, experimental and practical aspects of social, economic and environmental domains of sustainability.
- Will be able to create application of different art forms in their professional and public life with three main components viz. reflection, action and liberation **(Test 2).**
- Will be able to create a collective thinking around issues and principles of equity and justice surrounding sustainability by using different art forms **(Test 3).**

(iii) Course is fair, transparent and unbiased in the assessment of students: The tests will be opened up through online voting and peer review based collective performance system within the classroom to ensure a transparent, fair and unbiased assessment of students and their performance in the class.

TS/AC 43.3.1 The Council resolved that the outlines of the following Courses placed at Annexure 2 be accepted as amended and approved: -

Ser	Course	Type	Credits
M.Sc (Economics)			
1	Growth Economics*	Core	4
2	Development Economics*	Core	4
3	Mathematical Methods for Economics**	Core	4
4	Microeconomics	Core	4
5	Environment and Economic Development	Core	4
6	Probability and Statistics**	Core	4
7	Econometrics	Core	4
MA (SDP)			
1	Application of Quantitative Data Analysis in Development Practice (SDP)**	Elective	2
Common			
1	Art and Sustainability*	Elective	2

* *New Courses*

** *New Title*

ITEM NO. 4. To consider and approve the revision in the programme structure of MSc (Economics) Programme. The recommendations of the meeting of the Board of Studies of Department of Policy Studies held on 25 Apr 18 w.r.t. MSc (Economics) programmes were placed before the Council. The following suggestions were given:-

(a) Economics of Natural Resource title be changed to Natural Resource Economics.

(b) Economics of the Environment title be changed to Environmental Economics.

TU/AC 43.4.1 The Council resolved that revised structure of MSc (Economics) programme as under be accepted as amended and approved. The Council recommended that the structured feedback from various stakeholders be obtained in order to take inputs on the programme structure and analysis of the same be presented in the next Academic Council:-

Restructured **Outline** of **MSc Economics programme**		
Year/Semester	**Courses**	**Credits**
First year		**32**
1st Semester	**4 Core courses of 4 credits**	**16**
	Probability and Statistics	4
	Macroeconomics	4
	Microeconomics	4
	Introduction to Mathematical Methods for Economics	4
2nd Semester	**4 Core courses of 4 credits**	**16**
	Environment and Economic Development	4
	Growth Economics	4
	Development Economics	4
	Econometrics	4
Second year		**40**
3rd Semester	**3 Core courses of 4 credits + Elective courses of 8 credits**	**20**
	Core 1: Methods of Research in Economics	4
	Core 2: Environmental Economics	4
	Core 3: Natural Resource Economics	4
	Elective courses from those offered in the MSc Economics programme or open electives	8
4th Semester	**Master's Thesis**	**20**

ITEM NO.5. To consider and approve the revised structure of M.Sc (Geoinformatics) Programme. The recommendations of the meeting of the Board of Studies of Department of Natural Resources held on 16 Mar 18 w.r.t. M.Sc (Geoinformatics) were placed before the Council.

TU/AC 43.5.1 The Council resolved that the following revised structure of MSc (Geoinformatics) programme be accepted as amended and approved: -

Year/ Semester	**Courses**	**Type**	**Credits**
1st year			
1st Semester	Total credits (5+0/1/2 Core Courses + 1 Core Audit)		**15**
	Principles of Cartography	Core	3

	Principles of Remote Sensing	Core	3
	Principles of GIS and GNSS	Core	4
	Environmental Statistics	Core	3
	Fundamentals of Computers and Programming	Core	2
	Applied Mathematics	Core* (Audit)	-
	Fundamentals of Physics	Core** (Audit)	-
	Technical Writing	Core (Audit)	-
2nd Semester	Total credits		**19**
	Photogrammetry	Core	3
	Digital Image Processing and Information Extraction	Core	4
	Spatial Data Modelling and its Applications	Core	4
	Multivariate Data Analysis	Core	3
	Programming in Geoinformatics	Core	3
	Law and Policy for Maps and Remote Sensing	Core	2
	Project Management	Core (Audit)	-
	Research Methodology and Thesis Writing	Core (Audit)	-
2nd year			
3rd Semester	Total Credits		**21**
	Advances in Remote Sensing	Core	4
	Advances in GIS and current trend	Core	4
	Geoinformatics Applications for Land Resources	Core	3
	Geoinformatics Applications for Water Resources	Core	3
	Geoinformatics Applications for Atmosphere	Core	3
	Minor Project (during summer break)	Core	2
	Geocomputation	Elective	3
4th Semester	Total Credits		**15**
	Major Project		15

ITEM NO. 6 To consider and approve the outline of a few courses for MSc (Geoinformatics) Programme. The recommendations of the meeting of the Board of Studies of Department of Natural Resources held on 16 March 18 w.r.t. MSc (Geoinformatics) were placed before the Council. Dr Garg informed that a thorough review of the individual modules has been carried out by the BoS and the external faculty. A detailed discussion was held on the course outlines. As per the suggestion of Dean Academic, learning outcomes and evaluation criteria for all the five courses were revisited and revised.

TU/AC 43.6.1 The Council resolved that outlines of the following five courses of MSc (Geoinformatics) programme be accepted as amended (vide Annexure 3) and approved: -

Ser	Course	Type	Credit
1	Principles of Cartography	Core	3
2	Principles of GIS and GNSS	Core	4
3	Principles of Remote Sensing	Core	3

4	Fundamentals of Computers and Programming	Core	2
5	Fundamentals of Physics	Audit	2

ITEM NO. 7 To consider and approve revised structure of MBA (Business Sustainability) Programme.. The recommendations of the meeting of the Board of Studies of Department of Business & Sustainability held on 22 May 18 w.r.t. MBA (Business Sustainability) were placed before the Council. A detailed discussion was held on the programme structure.

TU/AC 43.7.1 The Council resolved that revised structure of MBA (Business Sustainability) programme as under be accepted as amended and approved. The Council recommended that the structured feedback from various stakeholders be obtained in order to take inputs on the programme structure and analysis of the same be presented in the next Academic Council: -

Year/Semester	**Course Title**	**Type**	**Credits**
1st Year			
1st Semester	Total Credits		23
	Principles and concepts of sustainability	Core	2
	Business ethics	Core	2
	Sustainability Reporting	Core	2
	Managerial economics	Core	3
	Marketing management	Core	3
	Fundamentals of Management	Core	2
	Business communication	Core	3
	Statistical methods for management	Core	3
	Corporate accounting and reporting	Core	3
2nd Semester	Total Credits		21
	Legal aspects of business	Core	2
	Qualitative research methods in management	Core	2
	Strategies for Sustainable Business	Core	3
	Macroeconomic Environment	Core	3
	Corporate Finance	Core	3
	Management Information System	Core	2
	Advanced statistical methods for management	Core	2
	Corporate Social Responsibility	Core	2
	Organizational behaviour and leadership	Core	2
2nd year			
3rd Semester	Total Credits		21 (15+6)
	Accounting and finance for sustainability	Core	3
	Minor Project	Core	6
	Entrepreneurship	Core	2
	Supply chain management	Core	2
	Business, Natural Ecosystems and Community	Core	2
	Health Finance	Elective	3
	Corporate governance	Elective	2
	Sustainable consumption and production	Elective	2
	Techniques of environmental valuation	Elective	4
	Financial intermediaries, institutions and	Elective	2

	regulations		
	Integrated impact assessment	Elective	4
	Derivatives and risk management	Elective	2
	International financial management	Elective	2
	Business to business marketing	Elective	2
	Urban Governance	Elective	4
	Environmental management system	Elective	4
	Brand management	Elective	2
	Security Analysis and portfolio management	Elective	2
	Production and Operations Management	Elective	3
	Consumer behavior	Elective	2
	Project design and management for sustainable development practice	Elective	4
	Social Entrepreneurship	Elective	2
	Design Thinking	Elective	2
4th Semester	Major project	Core	14

ITEM NO.8 To consider and approve the revised programme structure of MBA (Infrastructure). The recommendations of the meeting of the Board of Studies of Department of Business & Sustainability held on 22 May 18 w.r.t. MBA (Infrastructure) were placed before the Council. A detailed discussion was held on the programme structure.

TU/AC 43.8.1 The Council resolved that revised structure of MBA (Infrastructure) programme as under be accepted as amended and approved. The Council recommended that the structured feedback from various stakeholders be obtained in order to take inputs on the programme structure and analysis of the same be presented in the next Academic Council:-

Year/ Semester	**Course Title**	**Type**	**Credits**
1st year			
1st Semester	Total Credits		20
	Module 1 Basics of Infrastructure Business		
	Introduction to Infrastructure Business	Core	2
	Economics of Infrastructure and Pricing Strategies	Core	2
	Infrastructure project finance	Core	2
	Corporate Accounting and Reporting	Core	2
	Corporate Finance	Core	2
	Statistical methods for management	Core	3
	Module 2 Law & Policy Framework for Infrastructure Business		
	Legal & Regulatory aspects of infrastructure	Core	2
	Business Laws and Infrastructure projects	Core	2
	Contracts Laws	Core	2
	Environmental and Social Laws	Core	1
2nd Semester	Total Credits		20
	Module 1 Strategy and Risk		
	Business Ethics	Core	1
	Strategic planning	Core	2

	Risk analysis and Implementation Management	Core	3
	Project planning and management	Core	2
	Bidding System Management	Core	1
	Module 2 Operational aspects of Infrastructure		
	Quality Management	Core	2
	Management information systems	Core	2
	Infrastructure organization and HR	Core	3
	Logistics and supply chain management	Core	2
	Macroeconomic Environment	Core	3
2nd Year			
3rd Semester	Total Credits		23 (17+6)
	Minor Project	Core	6
	Integrated impact assessment	Core	3
	Public Private Partnership	Core	2
	Corporate governance	Core	2
	Innovation and change management for infrastructure projects	Core	2
	Strategic communication and stakeholder engagement	Core	2
	Advanced Logistics and Supply Chain Management	Elective	2
	Accounting and finance for sustainability	Elective	3
	Financial intermediaries, institutions and markets	Elective	2
	Sustainable Urban Transport	Elective	2
	Entrepreneurship	Elective	2
	Urban water supply and waste management	Elective	2
	Business to business marketing	Elective	2
	Total credits		
4th Semester	Major Project	Core	14

ITEM NO. 9 To consider and approve the outlines of new Courses for MBA (Business Sustainability/ Infrastructure). The recommendations of the meeting of the Board of Studies of Department of Business & Sustainability held on 22 May 18 w.r.t. MBA (Business Sustainability/ Infrastructure) were placed before the Council. A detailed discussion was held on the course outlines. The following suggestions were provided:

(a) **Health Finance**

(i) The title of the course may be revised for alignment with the content of the course.

(ii) Learning outcomes to be linked with evaluation.

(iii) Health care system should be discussed before we talk about the financing.

(iv) Different financing mechanism like – publicly funded, provided by the private sector and PP should be included.

(v) Other issues of health system like insurance coverage, availability of the healthcare services could be discussed.

(vi) If the course title includes the word "sustainable" then sustainability for whom should be clearly mention.

(vii) Pricing mechanism of insurance company, their profitability etc. should be taught in the course.

(b) **Fundamentals of Management**

(i) Management of family owned businesses, contemporary forms of organizations, platforms and networks including blockchains, and usage of AI/analytics to be included.

(ii) Title of module 6 to be rephrased.

(iii) Focus on inter-firm linkages and management of such linkages to be added.

(iv) Title of the course to be revisited for specificity/alignment with course content.

(v) Learning outcomes to be linked with evaluation components; details for evaluation to be added.

(vi) Presentations by students to be included over and above 28 hours of teaching.

(c) **Organisational Behaviour and leadership**

(i) The title of the course must be Organisational Behaviour and Leadership.

(ii) Topics on Trust in organizational context, corporate governance and leadership, and followership, sexual harassment may be added.

(iii) Learning outcomes to be linked with evaluation components; details for evaluation to be added.

(iv) Presentations by students to be included over and above 28 hours of teaching.

(d) **Sustainability Reporting**

(i) Learning outcomes to be linked with evaluation components.

(ii) Topic on Science based targets may be added.

(e) **Advanced Logistics and Supply Chain Management**

(i) Suggestion to incorporate (a) the usage of IT/AI/Analytics in Logistics and Supply Chain Management and (b) linking of regional value chains with global value chains.

(ii) Learning pack to be elaborated in terms of suggested books, weblinks, articles, research papers, case studies etc.

(iii) Learning outcomes to be defined and linked with evaluation.

(f) **Design Thinking**

(i) Suggestion to increase the number of credits from 1 to 2 to cover the course content intensively.

(ii) Learning outcomes to be linked with evaluation components.

(g) **Social Entrepreneurship**

(i) The course needs major revision as it lacks theoretical grounding in the present form. To incorporate the same, the number of credits may be increased from 1 to 2.

(ii) Learning outcomes to be linked with evaluation components.

(h) **Corporate Social Responsibility**

(i) Learning outcomes to be linked with evaluation components.

(ii) Suggestion to keep philanthropy out of the context of this course.

(i) **Business, Ecosystem and Community**

(i) Suggested title for the course- Business, Natural Ecosystems and Community.

(ii) The title of the first module of the course may be revised.

(iii) Aquatic systems/ wetlands ecosystems; abiotic structure to be added.

(iv) First module to be focused on imparting fundamental knowledge of ecosystem structure and functioning.

(v) Social cost benefit analysis, basic duties of corporate citizens, valuation of externalities may be added as some sub-topics.

(vi) Formatting may be revisited and learning outcomes to be linked with evaluation components.

(vii) The course content may be revisited in places for more clarity Linkage/collaboration with organizations like Tatas to be explored for practical exposure.

(j) **Additional Comments**

(i) Nomenclature of the individual courses in MBA (Business Sustainability) and MBA (Infrastructure) to be revisited.

(ii) A course on Business Analytics could be introduced as an elective in the MBA programmes.

TU/AC 43.9.1 The Council resolved that outlines of the following courses of MBA (Business Sustainability/Infrastructure) programme be accepted as amended (vide Annexure 4) and approved: -

Ser	Course	Type	Credit
Business Sustainability/Infrastructure			
1	Health Finance	Elective	3
2	Fundamentals of Management	Core	2
3	Organizational Behaviour and Leadership	Core	2
4	Sustainability Reporting	Core	2
5	Advanced Logistics & Supply Chain Management	Elective	2
6	Design Thinking	Elective	1
7	Social Entrepreneurship	Elective	1
8	Corporate Social Responsibility	Core	2
9	Business, Natural Ecosystems and Community	Core	2

ITEM NO. 10 : To consider and approve the outlines of new Courses for M.Tech (UDM). The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. M.Tech (UDM) were placed before the Council. A detailed discussion was held on the course outlines.

TU/AC 43.10.1: The Council resolved that outlines of the following courses of M.Tech (UDM) programme be accepted as amended (vide Annexure 5) and approved: -

Ser	Course	Type	Credit
1	Urban Governance	Core	3
2	Introduction to Geographic Information System (GIS)	Core	1

ITEM NO. 11 To consider and approve the outlines of new Courses for 3rd Semester of MSc (CSP). The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. 3rd Semester of MSc (CSP) were placed before the Council. A detailed discussion was held on the structure.

TU/AC 43.11.1 The Council resolved that the following revised structure for 3rd Semester of MSc (CSP) programme be accepted as amended and approved:-

Ser	Courses	Type	Cr
3rd Semester	1 Core course of 3 credits + Electives courses of 12 credits (can choose any four from this		15

	bouquet) The electives are grouped into two streams; (i) Climate Science and technology, and (ii) Climate Policy and Development. Students will be asked to choose any four from these electives		
	Seminar course on Global environmental change	Core	3
	Climate Science and Technology		
	Ecosystem and Climate Change	Elective	3
	Advanced Climate Modelling	Elective	3
	Aerosol Science	Elective	3
	Renewable Energy Technologies	Elective	3
	Geoinformatics for Natural resource management	Elective	3
	Glacier hydrology	Elective	3
	Satellite Meteorology	Elective	3
	Energy System Modeling	Elective	3
	Independent study	Elective	3
	Climate Policy and Development		
	Climate Change and Disaster Risk Reduction	Elective	3
	Economics of Climate Change	Elective	3
	Food Security and Agriculture	Elective	3
	Public Health and Development: Issues and Methods	Elective	3
	Accounting and Finance for Sustainability	Elective	3
	Governance of Climate Change	Elective	3
	Independent study	Elective	3

ITEM NO. 12(a) To consider and approve the outlines of new Courses for MSc (CSP). The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. MSc (CSP) were placed before the Council. A detailed discussion was held on the course outlines and following suggestions were provided:-

(a) **Ecosystem and Climate Change**:

(i) map outcomes of the course with given modules. Also, if practical component is involved then its list should be provided.

(ii) The topic on theory of Assembly Rules be incorporated in Model 2.

(iii) The Learning Outcomes to be mapped with the Course Objectives.

(iv) Details of the Evaluation Criteria to be provided.

(b) **Disaster Risk Reduction.** Headings to each module should be provided. Ecosystem approach (Eco DRR) of disaster reduction should be incorporated.

(c) **Advance Climate modeling.** map outcomes of the course with given modules. Also, if practical component is involved then its list should be provided.

(c) **Economics of Climate Change:**

(i) Discussion around nomenclature happened and it was suggested that Economics of Environment and Climate change cannot be used together: The nomenclature was therefore changed to "Economics of Climate Change".
(ii) Last module of the course needs major changes as currently it does not cover economics at all.
(iii) Outcomes of the course and evaluation should be mapped.
(iv) The last model considers the economic principles that have been applied in devising the institutional mechanisms for dealing with climate change. I
(v) Term Paper – mapped with points (2) & (3) of Course Objectives and point (2) of Learning Outcomes. End-Semester Major Exam – Mapped with points (1), (2) & (3) of Course Objectives and point (1) of Learning Outcomes. Assignments – Mapped with point (1) of Course Objectives and point (1) of Learning Outcomes.

(d) **Renewable Energy and Technologies**. Need to define how this course is different from other renewable energy courses offered in REEM program. Objective of the course should clearly define this aspect. Moreover, this needs to realign with respect to CSP program.

TU/AC 43.12(a).1 The Council resolved that outlines of the following six courses of MSc (CSP) programme be accepted as amended (vide Annexure 6) and approved: -

Ser.	Course	Type	Credit
1	Ecosystems and Climate Change*	Elective	3
2	Climate Change and Disaster Risk Reduction*	Elective	3
3	Advance Climate Modelling*	Elective	3
4	Economics of Climate Change	Elective	3
5	Renewable Energy Technologies*	Elective	3
6	Energy Systems Modeling*	Elective	3

ITEM NO. 12 (b): To consider and approve Change of teaching hours of Applied mathematics bridge Audit course for M.Sc (CSP) programme. Dr Kamana informed that during earlier program revision, 10 hours of bridge course was introduced in CSP program for new students who had not studied mathematics up to 10+2 standard. She stated that it was realized that students needed additional hours to grasp sufficient knowledge of mathematics. She therefore proposed that 3 credit course (NRE 113) which was initially part of the program be restored.

TU/AC 43.12(b) The Council resolved the changes of teaching hours of Applied mathematics bridge Audit course of MSc (CSP) programme be accepted as amended and approved.

ITEM NO.13 To consider and approve the outline of courses for MTech (REEM) Programme. The recommendations of the meeting of the Board of Studies of Department of Energy & Environment held on 17 May 18 w.r.t. MTech (REEM) were placed before the Council. A detailed discussion was held on the course outlines. The followings were suggested and action has been taken accordingly: -

(a) **Energy audit and management**
(i) Best practices for ECM in industries to be added.
(ii) Programmes like EESL to be introduced.
(iii) Distribution of contact hours for each module to be revisited with emphasis on experiential learning.

(b) **Energy Simulation Laboratory**
(i) Rationale for allocating lecture hours in a laboratory course.

(ii) Distribution of contact hours for each module to be revisited.

(c) **Grid Integration of Renewable Energy.** The word "etc" to be removed from the Module 6, in a way, the topics of the case studies should be explicitly mentioned.

(d) **Waste to Energy**

(i) Whether the course is technology centric or project centric?

(ii) Financial/economic analysis of waste to energy plant to be included.

(e) **Solar Photovoltaic Power Generation**

(i) In Module 6, the topics of case studies to be explicitly mentioned. One suggestions is to write "Case Studies based on module 1, 2, 3, 4 and 5", if deemed fit.

(ii) In Module 7 (Financial analysis and environmental benefits), the topics i.e. performance analysis and energy payback, financial analysis, and CO_2 mitigation needs further explanation like which financial tool is to be used.

(f) **Independent Study**

(i) The eligibility criteria of CGPA to be 7.5 or above to be revisited and rationale for it to be mentioned.

(ii) Since the course is not a project work, then why a report is required to be submitted at the end for final evaluation? In this way the evaluation criteria and procedure to be revisited.

(g) **Smart Grid.** The Module 6 to be modified, no need to mention the word Rural. It could be 'application of smart grids' or something like that.

TU/AC 43.13.1: The Council resolved that outlines of the following eight courses of MTech (REEM) programme be accepted as amended (vide Annexure 7) and approved: -

Ser	Course	Type	Credit
1	Energy Audit and Management	Elective	3
2	Energy Simulation Laboratory	Core	3
3	Grid Integration of Renewable Energy	Elective	3
4	Waste to Energy	Elective	2
5	Solar Thermal Power Generation	Elective	3
6	Solar Photovoltaic Power Generation	Elective	3
7	Independent Study	Elective	3
8	Smart Grid	Elective	2

ITEM NO. 14. Extension of maximum period for submission of thesis. The Registrar informed the council that a doctoral candidate was expected to submit his/her thesis within five years from the date of registration and the period might be extended by Academic Council as a special case. He stated that the following candidates who had registered for PhD programme require extension since they have completed the 5 years period as indicated below.

Ms Achla Khanna (1011RPA) - Extension of a year w.e.f 02 July 2017#

Mr Vipan Kumar (1031RPB) - Extension of a year w.e.f 12 July 2017#

Ms Tanu Sri (1124RBB) – Extension of a year w.e.f.07 July 2018

#: *Synopsis submitted in July, 2017. Thereafter thesis not submitted. New Synopsis being submitted*

The Registrar informed that on the recommendation of the supervisor, approval was sought for an extension of one year in respect of above candidates for the submission of their theses.

TU/AC 43.14.1 The Council resolved that one-year extension be accorded to:-

Ms Achla Khanna (1011RPA) - w.e.f 02 July 2017
Mr Vipan Kumar (1031RPB) - w.e.f 12 July 2017
Ms Tanu Sri (1124RBB) – w.e.f.07 July 2018

Sd/
Capt Pradeep Kumar Padhy (retd.)
Registrar

Enclosures:-

Annexure 1
Annexure 2
Annexure 3
Annexure 4
Annexure 5
Annexure 6
Annexure 7

Distribution:-

Electronic Copy
1. Vice-Chancellor, TERI School of Advanced Studies
2. All members of the Academic Council
3. Website

Printed Copy
4. Registrar, TERI School of Advanced Studies

Course title: Technical Writing			
Course code: NRE 101	**No. of credits:** 2	**L-T-P:** 23-05-0	**Learning hours:** 28
Pre-requisite course code and title (if any):			
Department: Department of Energy Environment			
Course coordinator: Mr Yateendra Joshi	**Course instructor:** Mr Yateendra Joshi		
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course Description

Students in the technology professions are proficient in their particular disciplines, but often unable to communicate effectively through reports or even scientific publications. Given that many students taking this course will not have a strong background in English, we propose to tackle this course in two ways.

One, by exposing the student to the requirements of technical writing as opposed to other kinds of formal writing and two, by providing a large number of exercises aimed at improving basic grammar, which will be assessed.

The student should be able to organize information for a report, a scientific paper and a proposal. He should be able to proofread his work, write concise emails and make technical presentations in PowerPoint. The use of graphs, tables and illustrations will also be taught.

Course objectives

Course content

SNo	Topic	L	T	P
1.	The content (reports and scientific papers) How formal, professional writing differs from technical writing. Organizing, developing and writing technical information for a report and a scientific paper: starting with defining the audience, storyboarding, writing a draft, revising, editing, proofreading, reference-writing, getting an outside opinion. (context is specificallyscientific)	12		
2.	The form Layout, style, graphs, tables, charts, fonts, illustrations.	5		
3.	Presentations Organizing the information to be presented, summarizing, choosing the right colours, fonts, images.	6		
4.	The basics of grammar and email writing		5	
	Total	**23**	**5**	

Evaluation criteria

- Assignments: 35%
- Presentations: 15%
- Major Test: 50%

Learning outcomes

Pedagogical approach

Materials

Required text

1. Beer D. (1991) ***Writing and Speaking in the Technology Professions: A Practical Guide,*** Wiley-IEEE Press.
2. Markel M. (2009) *Technical Communications*, 9th Edition, Bedford/St Martin's.
3. Markel M. (1994) ***Writing in the Technical Fields: A Step-by-Step Guide for Engineers,*** **Scientists and Technicians**, publisher.

Suggested readings

1. http://courses.washington.edu/hcde231/Readings.html
2. http://www.writing.engr.psu.edu/
3. http://owl.english.purdue.edu/owl/resource/629/01/
4. http://www.writing.engr.psu.edu/exercises/

Case studies

Websites

Journals

1. Journal of Technical Writing and Communications

Additional information (if any)

Student responsibilities

Attendance, feedback, discipline, guest facultyetc

Course title: Environmental statistics

Course code: NRE 111	**No. of credits:** 3	**L-T-P:** 28-14-0	**Learning hours:** 42

Pre-requisite course code and title (if any): No pre-requisite required

Department: Department of Energy and Environment

Course coordinator(s):	**Course instructor(s):** Prof. Prateek Sharma
Contact details:	
Course type: Elective	**Course offered in:** Semester 1

Course description

As the world gets more crowded and technology continues to develop, environmental problems multiply. There are many aspects of these problems–economic, political, psychological, medical, scientific and technological. Addressing such problems often involves quantitative aspects; in particular, the acquisition and analysis of environmental data. Treating these quantitative problems effectively involves the use of statistics. When one is confronted with a new problem that involves the collection and analysis of data, two crucial questions exist: "How will using statistics help this problem?" and "Which techniques should be used?"

The course has been designed and intended to help budding environmental scientists/managers to answer these questions in order better to understand and design systems for environmental protection. The course is about how to extract information from data and how informative data are generated in the first place. Analysing data is part science, part craft and part art. An effort has been made through this course to provide some useful tools 'to get to the grips' of environmental problems and to encourage the students to develop the necessary craft and art.

Course objectives

- Need for studying statistics
- Become aware of a wide range of applications of statistics in environmental management, life sciences & decision making
- Define statistics
- Understand the relation between probability and statistics
- Differentiate between descriptive and inferential statistics

Course content

Module	Topic	L	T	P
1.	**Introduction** Mathematical models–deterministic and stochastic; generation of environmental data; stochastic processes in environment; the nature of random variables; populations and samples; parameters and statistics.	1		
2.	**Review of basic concepts** Measurement theory, levels of measurement; statistical descriptors of environmental data–numerical and graphical; Chebyshev's theorem; measurement uncertainty–accuracy, precision and bias. Probability theory: probability concepts; probability distribution functions and their applications–discrete and continuous distributions.	3 3	2 2	
3.	**Data sampling** Methods for selecting sampling locations and times; types of sampling designs–probability and non-probability sampling; sampling theory, sampling distributions; parameter estimation, point and interval estimates; confidence interval estimation of–means, differences of means, proportions, difference of proportions, variances, ratio of variances sample size determination for different sampling designs	10	5	
4.	**Tests of hypothesis** Hypothesis testing–parametric and non-parametric tests (concerning means, differences of means, proportions, difference of proportions, variances, ratio of variances)	8	4	
5.	**Correlation and simple regression analysis** Correlation analysis: graphical analysis, bivariate correlation, covariance, correlation coefficient, distribution of correlation coefficient and its statistical significance. Simple regression analysis: assumptions and definitions, principle of least	3	1	

	squares, regression parameters their distribution and statistical significance, applications in process description and prediction			
		28	**14**	

Evaluation criteria

- 2 minor test: 20% each
- Tutorials: 20%
- Major test: 40%

Learning outcomes

After completing this course the students will be able to

- develop an intuitive statistical sense
- analyse, model and quantify uncertainty
- extract information and draw scientific inference from large amount of data collected to solve environmental problems
- take informed decisions under uncertainty

Pedagogical approach

Materials

Textbooks

Ayyub, B.M. and McCuen, R.H. (2011) *Probability, Statistics and Reliability for Engineers and Scientists,* CRC Press, Boca Raton, FL.

Helsel D.R. and Hirsch R.M. (1997) *Statistical Methods in Water Resources*, Elsevier Science Ltd., UK.

Hoshmand A.R. (1997) *Statistical Methods for Environmental and Agricultural Sciences*, CRC Press, Boca Raton, FL.

Kottegoda N.T. and Rosso R. (2008) *Applied Statistics for Civil and Environmental Engineers*, McGraw-Hill, International Edition.

Shaefer S.J. and Theodore L. (2007) *Probability and Statistics Applications for Environmental Science,* CRC Press, Boca Raton, FL.

Suggested Readings

Berthouex P.M. and Brown L.C. (1994) *Statistics for Environmental Engineers*, Lewis Publishers, CRC Press, Boca Raton, FL.

Caulcutt R. and Boddy R. (1983) *Statistics for Analytical Chemists*, Chapman & Hall, London.

Cothern C.R. and Ross N.P. (1994) *Environmental Statistics, Assessment and Forecasting*, Lewis Publishers, Boca Raton, FL.

Csuros M. (1997) *Environmental Sampling and Analysis, Lab Manual*, Lewis Publishers, Boca Raton, FL.

Ebdon D. (1984) *Statistics in Geography*, 2nd edn., Blackwell, Oxford.

Everitt B.S. (1999) *Chance Rules: An Informal Guide to Probability*, Risk and Statistics, Springer-Verlag, New York.

Fisher L.D. and Van Belle G. (1993) *Biostatistics: A Methodology for the Health Sciences*, John Wiley & Sons, New York.

Gibbons R.D. (1994) *Statistical Methods for Groundwater Monitoring*, John Wiley & Sons, New York.

Gibbons R.D. and Coleman D.E. (2001) *Statistical Methods for Detection and Quantification of Environmental Contamination,* John Wiley & Sons, Inc., New York.

Gilbert R.O. (1987) *Statistical Methods for Environmental Pollution Monitoring*, New York, Van Nostrand Reinhold.

Ginevan M.E., Splistone D.E. (2004) *Statistical Tools for Environmental Quality Measurement.* John Wiley & Sons Hoboken, NJ.

Graham R.C. (1993) *Data Analysis for the Chemical Sciences: A Guide to Statistical Techniques*, VCH Publishers, New York.

Gregoire T.M. and Valentine H.T. (2008) *Sampling Strategies for Natural Resources and the Environment,* Chapman & Hall/CRC, Boca Raton.

Keith L.H. (1991) *Environmental Sampling and Analysis: A Practical Guide,* Lewis Publishers, Boca Raton, FL.

Keith L.H. (ed) (1996) *Principles of Environmental Sampling,* Second Edition, American Chemical Society, Washington, D.C., Distributed by Oxford University Press, New York.

Manly B.F.J. (2001) *Statistics for Environmental Science and Management*. Chapman & Hall/CRC, Boca Raton, FL.

McBean E.A. and Rovers R.A. (1998) *Statistical Procedures for Analysis of Environmental Monitoring Data & Risk Assessment,* Prentice-Hall PTR, Upper Saddle River, NJ.

McBride G.B. (2005) *Using Statistical Methods for Water Quality Management: Issues, Problems and Solutions,* John Wiley & Sons, Hoboken, NJ, USA.
Meier P.C. and Zund R.E. (1993) *Statistical Methods in Analytical Chemistry,* John Wiley & Sons, New York.
Moore D.S., McCabe G.P. and Craig B.A. (2009) *Introduction to the Practice of Statistics,* W.H. Freeman and Co., New York.
Ott W.R. (1995) *Environmental Statistics and Data Analysis,* Lewis Publishers, Boca Raton, FL.
Piegorsch W.W. and Bailer A.J. (1997) *Statistics for Environmental Biology and Toxicology,* Chapman & Hall, New York.
Reichman W.J. ((1961) *Use and Abuse of Statistics*, Penguin, Harmondsworth.
Rogerson P.A. (2006) *Statistical Methods for Geographers: A Student's Guide*, Los Angeles, CA.
Taylor J.K. (1987) *Quality Assurance of Chemical Measures,* Lewis Publishers, CRC Press, Boca Raton, FL.
Walford N. (2011) *Practical Statistics for Geographers and Earth Scientists,* John Wiley & Sons, New Jersey, USA.
Williams R.B.G. (1984) *Introduction to Statistics for Geographers and Earth Scientists*, Macmillan, London.
Wrigley N. (1985) *Categorical Data Analysis for Geographers and Environmental Scientists*, Longman, Harlow.
Zhang C. (2007) *Fundamentals of Environmental Sampling and Data Analysis*, John Wiley & Sons, NJ, USA.

Journals

Applied Statistics
Biometrika
Environmental and Ecological Statistics
Environmetrics
International Statistical Review
Journal of Statistical Computing and Simulation
Journal of the American Statistical Association
Risk Analysis
Statistical Science
Technometrics
The American Statistician

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course Reviewers

1. Prof. Bilal M. Ayyub, University of Maryland, College Park, USA.
2. Prof. Richard H. McCuen, Department of University of Maryland, College Park, USA.

Course title: Applied Mathematics

Course code: NRE 113	**No. of credits:** 3	**L-T-P:** 31-11-0	**Learning hours:** 42

Pre-requisite course code and title (if any): For students who have not done courses in mathematics at 10+2/bachelor's level, a boot camp of 2 weeks will be held in the beginning of each academic session. Passing the course will be a mandatory requirement for such candidates, prior to registration for the programme.

Department: Energy and Environment

Course coordinator:	**Course instructor:** Ms I.Y. Bhanu Sree Rao
Contact details:	
Course type: Audit	**Course offered in:** Semester 1

Course Description

The course is designed to serve as a foundation course in order to meet the requirement of mathematical knowledge in various subsequent courses offered in the master's degree program.

Course objectives

Course content

Module	Topic	L	T	P
1.	Introduction: Quantitative aspects in decision making, tools available–deterministic (analytical and numerical), stochastic processes	1		
2.	Review of trigonometry, logarithms and quadratic equations	3		
3.	Linear algebra: Linear algebraic equations, solution methods, system conditioning, applications	6	2	
4.	Differential calculus: Relations and functions, limits and continuity, derivatives and differentiation, applications of differential calculus	7	3	
5.	Integral calculus: Indefinite integrals, methods of integration–integration by substitution, by parts, decomposition into sums etc, applications. Definite integrals, theorems of definite integrals and evaluation of definite integrals, applications	7	3	
6.	Differential equations: Ordinary differential equations, partial differential equations, applications	7	3	
	Total	**31**	**11**	

Evaluation criteria

- Tutorials/assignment: 20%
- Test 1: 30%
- Test 3: 50%

Learning outcomes

Pedagogical approach

Materials

1. Mackenzie A. (2005) *Mathematics and Statistics for Life Scientists*, Taylor & Francis, New York.
2. Parkhurst D.F. (2006) *Introduction to Applied Mathematics for Environmental Science*, Springer, New York.

Suggested Readings

1. Prasad G. (2004) *Differential Calculus*, Pothishala Pvt. Ltd., Allahabad
2. Prasad G. (2004) *Integral Calculus*, Pothishala Pvt. Ltd., Allahabad.

Additional information (if any)

Student responsibilities

Attendance, feedback, discipline, guest faculty etc.

Course title: Introduction to Sustainable Development			
Course code: NRE 165	**No. of credits:** 1	**L-T-P:** 14-0-0	**Learning hours:** 14
Pre-requisite course code and title (if any):			
Department: Energy and Environment			
Course coordinator:		**Course instructor:** Dr Akash Sondhi	
Contact details: akash.sondhi@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 1	

Course Description

The course seeks to build an inter-disciplinary perspective on understanding sustainable development concerns and challenges. This course familiarizes students with current debates and perspectives in analyzing constraints and opportunities for sustainable development. It also aims to provide students with a general introduction to the basic core competencies and practical skills required of a "generalist" development practitioner.

Course topics will be grounded in a practical, multi-disciplinary approach that will focus on the inter-relationship of each of the following core fields of study (Agriculture and Nutrition, Economics, Environment and Climate Science, Management, Policy, Anthropology and Social Studies, Public Health and Technology and Engineering), thereby exposing students to the complex relationships between social, economic and environmental processes.

Course objectives

1. The course seeks to build an inter-disciplinary perspective on understanding sustainable development concerns and challenges.
2. It also aims to provide students with a general introduction to the basic core competencies and practical skills
3. This course familiarizes students with current debates and perspectives in analyzing constraints and opportunities for sustainable development.

Course content

Module	Topic	L	T	P
1.	Changing Perspectives • Definitions & Principles of Sustainable Development • Millennium Development Goals: Status (global and Indian), Inclusive Growth and Poverty Reduction, Impact on approach to development policy and practice in India, future directions	3		
2.	Challenges to Sustainable Development • Agriculture, Population & Food Security • Public Health and Nutrition • Education • Natural Resources (Forests, Energy, Water) • Climate Change	6		
3.	Responses to Sustainable Development Challenges • Public Policy (Community Participation and Participatory Learning) • Gender and Human Rights • Technology and Engineering • Economics and Policy Coherence	5		

	Total	14		

Evaluation criteria

- Written Review: 60%
- Presentation: 40%

Learning outcomes

1. The students will have a "generalist" development practitioner's perspective towards environmental management.
2. The students will have fairly good understanding of the current debates around concepts of sustainable development and practices.

Pedagogical approach

Materials

Required text

1. Hazell P. and Diao X. (2005) *The Role of Agriculture and Small Farms in Economic Development*, Washington, D.C.: International Food Policy Research Institute.
2. Sachs J. (2006) *The End of Poverty: Economic Possibilities for Our Time*, Penguin (Chapters 1-4, 8, 14-18).

Suggested readings

1. Cornwall A. and Brock K. (2005) What Do Buzzwords Do for Development Policy? A Critical Look at 'Participation', 'Empowerment' and 'Poverty Reduction', *Third World Quarterly* 26(7), 1043–1060.
2. Human Development Reports
3. IPCC (2007) Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report.
4. Johnson J.D. and Louka K. (2006) *Migration, Aid and Trade: Policy Coherence for Development*, OECD Development Centre Policy Brief No 28.
5. Laurence W.F. et al. (2001) The Future of the Brazilian Amazon, *Science*, Vol. 291 (5503), 438-439.
6. Luboobi L. and Mugisha J.T. (2005) *HIV/AIDS Pandemic in Africa: Trends and Challenges*, FondazioneEni Enrico Mattei.
7. Sachs D.J. and Wing T.W. (1994) *Structural Factors in the Economic Reforms of China, Eastern Europe and the Former Soviet Union,* Economic Policy, 9 (18), pp. 101-145.
8. Sachs J. and Malaney P. (2002) The Economic and Social Burden of Malaria, *Nature*, 415 (7).
9. Sarah D. (2004) *Key Policy Coherence Issues in Agriculture and Migration*, OECD.
10. UN Millennium Project (2005) *Innovation: Applying Knowledge in Development*, Science, Technology and Innovation Task Force Report.
11. UN Millennium Project (2005) *Investing in Development: A Practical Plan to Achieve the Millennium Development Goals, Overview.*
12. World Bank (2006) *Enhancing Agricultural Innovation: How to Go beyond the Strengthening of Research Systems,* World Bank: Agriculture and Rural Development
13. World Commission on Environment and Development (1987) *Our Common Future*, Oxford, OUP.

Case studies

Websites

Journals 1. Development and Change 2. Economic and Political Weekly
Additional information (if any)
Student responsibilities Attendance, feedback, discipline, guest facultyetc



Course title: Fundamentals of Physics			
Course code: NRG 102	**No. of credits**: 2	**L-T-P**: 20-08-0	**Learning hours**: 28
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr Nithiyanandam Y		**Course instructor:** Dr Nithiyanandam Y	
Contact details: nithiyanandam.y@terisas.ac.in			
Course type: Audit		**Course offered in:** Semester 1	
Course description: The M.Sc. Geoinformatics course contains intense subjects, those require a basic knowledge in Physics for better understanding. Since, students undertake this course are from diverse backgrounds, a bridge course is required to fill this gap. Hence, a compulsory audit course of two credits is offered for students who have not done a course in Physics at 10+2 / bachelor's level.			
Class objectives: Develop an understanding of • Selected fundamental concepts and principles in physics. • How these concepts are used in practical applications.			

Course content

S no	Topic	L	T	P
1	Measurement: The International system of Units, Changing units, length, time and mass; Motion along a straight line, two and three dimensions: Motion, position and displacement, average velocity and speed, instantaneous velocity and speed, acceleration, constant and free fall accelerations, momentum, projectile motion, circular motion, and relative motion.	2	1	0
2	Force and motion: Newtonian mechanics, Newton's first law, force, mass, Newton's second law, Newton's third law, friction, drag force.	2	0	0
3	Energy: what is energy? Kinetic energy, Work and kinetic energy, work done by the gravitational and general variable forces, and power; Potential energy, work and potential energy, determining potential energy values, conservation of energy.	2	1	0
4	Gravitation: Newton's law of gravitation, gravitation and the principle of superposition, gravitation near earth's surface, gravitation inside earth, gravitation potential energy, planets and satellites: Kepler's law, Satellites: orbits and energy, Einstein and gravitation.	2	1	0
5	Oscillation: simple harmonic oscillation, energy in simple harmonic motion, pendulums and circular motion, forced oscillation and resonance.	2	1	0

	Waves: types of wave, wavelength and frequency, the speed of a travelling wave, the wave equation, interference of waves, sound waves, travelling sound waves, intensity and sound level, the Doppler effect, supersonic speeds and shock waves.			
6	Thermodynamics: Temperature, the zeroth law of thermodynamics, measuring temperature, thermal expansion, temperature and heat, first and second laws of thermodynamics, heat transfer mechanisms.	2	1	0
7	Electromagnetic waves: Maxwell's rainbow, the travelling electromagnetic wave, radiation pressure, reflection and refraction, total internal reflection, polarization by reflection; Optics: Types of images, mirrors, interference, diffraction and polarization, Geometrical optics, dispersion of lights and optical instruments; Interference, diffraction and relativity.	4	2	0
8	Energy from nucleus: Nuclear fission, nuclear reactor, thermonuclear fusion, cosmology, the cosmic background radiation, dark matter, the big bang.	2	0	0
9	Applications of physics fundamentals in geospatial technologies.	2	1	0
	Total	**20**	**8**	**0**

Evaluation criteria

Test 1: Written Test: 15%
Test 2: Written Test: 15%
Test 3: Written Test: 40%
Tutorials/assignments/Quizzes: 30%

Learning outcomes:

Upon completion of this course, a student will be able to:

- Understand basic concepts and principles in different branch of physics like energy, thermodynamics, waves, and optics. [Test1, Test2, Tutorials/assignments/Quizzes]
- Realise the physics behind remote sensing thought in other courses. [Test3]
-

Pedagogical approach:

The course will be delivered through class lectures and tutorials.

Materials:

Books:

1. Christman, J. R. *et al.* (1997) *Student's companion, Fundamentals of physics*. Wiley.
2. Elachi, C. and van Zyl, J. J. (2006) *Introduction To The Physics and Techniques of Remote Sensing*. Wiley (Wiley Series in Remote Sensing and Image Processing).
3. Giambattista (2010). *Fundamentals Of Physics (sie)* McGraw-Hill Education (India) Pvt Limited.
4. Halliday, D., Resnick, R. and Walker, J. (2010) *Fundamentals of Physics*. John Wiley & Sons.

5. Rees, G. and Rees, W. G. (2012) *Physical Principles of Remote Sensing*. Cambridge University Press.
Additional information (if any)
Student responsibilities: Attendance, Feedback, discipline, and timely submission of assignments.

Course Reviewers:

- Dr A.R.Prabhakaran, Associate professor of Physics, Pachaiyappa's College, University of Madras.
- Mr. Samudraiah, Former Deputy Director, Space Application Center, ISRO.

Course title: Fundamentals of Computers and Programming			
Course code: NRG 106	**No. of credits:** 2	**L-T-P:** 12-4-24	**Learning hours:** 28
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr Neeti		**Course instructor:** Ms. Pooja Chaudhary	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

The module will explore the fundamentals of programming in C. The course will also include basics of data base management system through Oracle/MySQL

Course objectives:

The objectives of the course are:

(1) Provide fundamentals of programming
(2) Provide fundamentals of C programming language
(3) Provide fundamental knowledge of database management system which is relevant to GIS

Course content

Module	Topic	L	T	P
1.	History of Programming, Making Flow Chart	2		
	Introduction to C, Structure of C Programme, Data type, Input and Output function, Conditional execution	5	2	
2.	DBMS and RDBMS (MS ACCESS; ORACLE; MySQL)	5	2	
	PRACTICALS			
1	Writing first C Programme			2
2	Using different types of data in C Programme			2
3	Writing a programme to use decision control statements, cases			2
4	Writing a programme using loop structure, nested loop			2
5	Use of Arrays			2
6	Programme using pointers			2

7	Design a Database and create required tables, apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.			2
8	Write a sql statement for implementing ALTER, UPDATE and DELETE, Write the queries to implement the joins			2
9	Write the query for implementing the following functions: • String Function • Numeric/Math Functions • Aggregate Functions • Date/Time Functions			2
10	Create Functions, procedures, packages, triggers, Different types of queries using Cases			4
11	Write the query to create the views, Inline view			2
	Total	**12**	**4**	**24**

Evaluation criteria

- Test1: Written Test: 15%
- Test2: Written Test: 15%
- Lab Assignments: 10%
- Practical: [Lab exam and Viva] 30%
- Test3: Written Test 30%

(Test 3 include entire syllabus)

Learning outcomes: Students will be able to

1. Describe how data are represented, manipulated, and stored in a computer [Test1, Lab Assignments]
2. Design programme using flowchart [Test1, Lab Assignments]
3. Able to write and execute C programme using different logical operators[Test2, Lab Assignments]
4. Able to create database table and perform logical queries with different conditions [Lab Assignments, Test3]

Pedagogical approach:

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Benjamin C.P. (2002) Types and Programming Languages, The MIT Press.
2. Bruce J.M. (1999) Principles of Programming Languages: Design, Evaluation and Implementation, Oxford University Press.
3. Daniel P.F. and Wand M. (2001) Christopher Thomas Haynes: Essentials of Programming Languages, The MIT Press.

Suggested readings

1. Gelernter D. and Jagannathan S. (1990) Programming Linguistics, The MIT Press.
2. Goldschlager L. (1998) A Lister Computer Science - A Modern Introduction Prentice Hall.
3. John C.M. (2002) Concepts in Programming Languages, Cambridge University Press.
4. Michael L. S. (2005) Programming Language Pragmatics, Morgan Kaufmann Publishers.
5. Sethi R. (1996) Programming Languages: Concepts and Constructs, 2nd ed., AddisonWesley.
6. Wexelblat R.L. (1981) History of Programming Languages, Academic Press.

Case studies
Websites
Journals

Additional information (if any)

Magazines

1. Coordinates
2. GIM International
3. GIS World
4. GIS@development
5. Goespatial today
6. GPS World

Student responsibilities

Attendance, feedback, discipline, guest faculty etc

Course reviewer:

1. Sanjay Kumar, Team Lead, AWS Software Pvt Ltd.
2. Jagdish Mutharia, Head (IT), TERI

Course title: Principles of Cartography			
Course code: NRG 171	**No. of credits:** 3	**L-T-P:** 20-8-28	**Learning hours:** 42
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr Vinay Sinha		**Course instructor:** Dr Vinay Sinha	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

In this course, we study the art, science, politics, and technologies of cartography, to understand how maps are created and used to represent and communicate spatial phenomena and their relationships. Course lectures, readings, discussions and lab activities will introduce to the concepts, techniques, hardware, and software used for cartography.

Course objectives

1. To apply principles of map preparation techniques
2. To use different thematic mapping techniques to represent spatial phenomena
3. To design maps for effective communication

Course content

S.No	Topic	L	T	P
1	**Introduction to Maps** History of Map making, Basic characters of Map, Type of maps, Cartographic databases.	2		
2	**Map direction and Scale** Fundamentals of Map direction & scale; Construction of different types of scales.	2	2	
3	**Details of Datum, Geodetics and Spheroid** Basic assumptions, Coordinate System: Polar and Cartesian, Geodesy and Geodetic methods, datum types and elements.	4		
4	**Concept of Map Projections** Map projections-Conic projection, Cylindrical projection, Zenithal Projection; Comparison between these projection, Choosing a Map Projection Mercator, Transverse Mercator, Polyconic, Lambert, Orthographic and UTM	2	2	
5	**Map Preparation Techniques and Map accuracy** Map Preparation Techniques: Cartographic design issues, Map design process and compilation	2	2	
6	**Modern Techniques in Cartography and Computers**	2		

	Generalization, Symbolization, Multivariate and dynamic mapping, Modern techniques in Cartography			
7	**Cartography and GIS** Synergy of Cartography and GIS	2		
8	Introduction to perception, visualization, topographic and thematic mapping and color coding	2		
9	**Evaluation Criteria** Evaluation criteria for maps, Map evaluation guidelines	2	2	
	PRACTICALS			
1	**Topographical sheets** Topographical Sheets: Introduction/comparison with respect to types, scales, grid reference, signs and symbols and colour schemes of SOI **Topographical map interpretation** Study and interpretation of Indian topographical maps of survey of India (Series - 1: 50000 or 1: 25000) **Base map and thematic map generation**			8
2	Construction of different type of scale			2
3	Construction of Map projections			4
4	Analog to digital conversion			2
5	Map preparation techniques			2
6	Map designing and Symbolization			4
7	Map evaluation			2
8	Geoprocessing tools			4
	Total	20	8	28

Evaluation criteria

- Test1 [Written Exam]: 10%
- Test2 [Written Exam]: 10%
- Tutorials and assignments: 20%
- Practical (Lab exercise and viva) (Practical is conducted at the end of the semester and includes evaluation of the lab exercises student carried out throughout the semester: 20%
- Test 3 (Test 3 is conducted after completion of the course, at the end of the semester): 40%

Learning outcomes

Upon completion of the course, student will be able to:

1. Design and Geovisualize maps and communicate in perspective [Test1, test2, Tutorials and Assignments, Practical]
2. Critically analyze a map to understand its scientific, social and political utility [Test1, Test2, Tutorials and Assignments, Practical, Test3]

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Robinson A. H., Morrison J. L., Muehrcke P. C., Kimerling A. J., Guptill S. C. (1995) Elements of Cartography: Wiley Publishers
2. MacEachren A.M. (1994) Some Truth with Maps: A Primer on Symbolization and Design, University Park: The Pennsylvania State University.
3. Mishra R.P. (2014) Fundamentals of Cartography, Concept Publishing Co.
4. Monmonier M. (1991) How to Lie with Maps, Chicago: University of Chicago Press.

Suggested readings

5. Monmonier M. (1993) Mapping It Out, Chicago: University of Chicago Press.
6. Pickles J. (2003) A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World, Taylor & Francis.
7. Sircar D.C.C. (1990) Studies in the Geography of Ancient and Medieval India, Motilal Banarsidass Publishers.
8. Slocum T. (2003) Thematic Cartography and Geographic Visualization, Upper Saddle River, New Jersey: Prentice Hall.
9. Wilford J.N. (2000) The Mapmakers, Vintage Books.

Journals

1. Asian Journal of Geoinformatics
2. Cartographic Journal
3. Geocarto International
4. International Journal of Goeinformatics
5. International Journal of Remote Sensing
6. ISPRS Journal of Photogrammetry and Remote Sensing
7. Journal of Historical Geography
8. Journal of Indian Society of Remote Sensing
   Remote Sensing of Environment

Additional information (if any)

Magazines

1. Coordinates
2. Geospatial today
3. GIM International
4. GIS World
5. GIS@development
6. GPS World

Student responsibilities

Attendance, feedback, discipline, guest faculty etc.

Course Reviewers:

1. Prof. J. K. Garg, Guru Gobind Indraprastha University
2. Dr. Benidhar Deshmukh, IGNOU

Course title: Principles of GIS and GNSS			
Course code: NRG 176	**No. of credits:** 4	**L-T-P:** 38-2-32	**Learning hours:** 56
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr Vinay Sinha		**Course instructor:** Dr Vinay Sinha	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

It introduces participant to the fundamentals of GIS, GNSS, data models, data sources, databases, cartography, Overview of Global Navigation Satellite System (GNSS) and geospatial metadata.

Course objectives

1. To provide a firm understanding of the conceptual and technical understanding of GIS and GNSS
2. To prepare students for spatial data analysis and modelling

Course content

Th#	Topic	L	T	P
1	Basic concepts about spatial information: Philosophy, brief history and definition of GIS, Computer Aided Cartography Vs GIS, Manual mapping Vs GIS mapping.	2		
2	Geometrical feature and real word Pictures, Variables- Points, Lines and Areas and applications of GIS in various sectors (a case study approach)	2		
3	Basic Objectives and Components of GIS – details of hardware, software and management; Conceptual models of Real world phenomena.	2		
4	Introduction to GIS software; Overview of open source GIS Mercator, Polyconic, Lambert, Orthographic and UTM		2	
5	Information organization and data structure; Basic file structures, Tabular databases and Advantages of databases	2		
6	Spatial and Non-spatial data base, Spatial data model: Geo relational Vector data model, Object based vector data model, Geodatabase	2		
7	Raster data model; Hybrid relational database Vs Object orientation. Comparative analysis of spatial database	2		
8	GIS data Requirement, various sources, Standards and collection of GIS data, Methods of data capture: scanning, digitization and	2		

	associated errors; Conversion from other digital Sources, Attribute data input and management			
9	Different kinds of geospatial data, Sources of errors in GIS database: Errors through processing, Errors associated with overlay issues of features, Detecting and evaluating errors, Edge matching	2		
10	Introduction of Global Navigation Satellite System, Satellite constellation & Segments (Control, Space & User) GNSS signals and data, Geopositioning – Basic concepts (GPS, NAVSTAR, GLONASS and IRNSS /NAVIK)	2		
11	Introduction to Hand held GPS receivers; Initial setting & Creating codes and attribute table in receiver			
12	GNSS Positioning Types-Absolute positioning, Differential positioning	2		
13	GNSS performance and policy (Accuracy, integrity, SPS, PPS DoD & DoT policy, anti-spoof); Positioning Errors: Multi path, Ionosphere, Troposphere, Satellite Geometry, Satellite signals and its strength,	2		
14	Introduction to DGPS, wide area augmentation system (WAAS)	2		
15	Nature of geographic data-Types of uncertainty in a GIS; Data quality parameters: Positional accuracy, Attribute accuracy, Logical consistency, Completeness lineage,	2		
16	Topological relationships; Creation of topology and error correction;	2		
17	Attribute data query, SQL, Logical, Boolean, Arithmetical operation and function,	2		
18	Feature base operation – buffer, eliminate, dissolve	2		
19	Layer based overlay analysis: point to polygon, line to polygon, clip, erase, split, identity, union and intersection, Distance measurement	3		
20	Raster data structure, Local operations, Neighbourhood operations, Zonal operations	3		
Exp #	PRACTICALS			
1	Lab 1. Analog to Digital conversion -Scanning methods			
2	Lab 2. Introduction to software			2
3	Lab 3 Map Rectification, Define projection and Reprojection.			2

4	Lab4: Vector Transformation – Affine and Polynomial, co-ordinate definition. Map Bound.			2
5	Lab 5. Digital database creation -Point features, Line features, Polygon features			2
6	Lab 6. Data editing-Removal of errors -Overshoot & Undershoot, Snapping, Topology Creation			2
7	Lab 7. Data collection and Integration, Non-spatial data attachment working with tables			2
8	Lab 15. Introduction to GPS receiver and initial setting & Creating codes and attribute table in receiver			2
9	Lab 16. Point data collection using GPS with different datum			2
10	Lab 17. Point / Line / Area data collection using GPS and measurements			2
11	Lab 18. GPS data collection in DGPS mode			
12	Lab 19. Post processing of the GPS data			2
13	Lab 20. Image rectification using GPS coordinate data			2
14	Lab 8. Dissolving and Merging			2
15	Lab 9. Clipping, Intersection and Union			
16	Lab 10. Proximity Analysis			2
17	Lab 11. Spatial and Attribute query and Analysis			2
18	Lab12. Creation of Blank Grid/Raster			2
19	Lab13. Map algebra / Math in Raster data			
20	Lab 14. Layout generation and report			2
	Total	**38**	**2**	**32**

Evaluation criteria

- Test 1: Written test [at the end of Th# 9 and Exp# 7] 10%
- Test 2: Written test [at the end of Th# 14 and Exp# No 13] 10%
- Practical: Laboratory + Written test [at the end of practical, full experiment 1-20] -- 40%

- Test 4: Written test [at the end of the semester, full syllabus] -- 40%

Learning outcomes

Upon completion of this course, student will be able to:

1. Create and understand database in spatial platform for analysis and modeling for various applications [test -1]
2. Conduct the GNSS based survey and mapping under variety of planning and management applications [test-2]
3. Capable to understand the use of spatial tools & techniques for analysis and modeling of the spatial data over various natural and human resource mapping, monitoring and management [Practical and test-3]

Pedagogical approach:

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. Burrough P.A. and McDonnell R.A. (1998) Principles of Geographical Information Systems, Oxford University Press, Oxford,
2. Chang K. (2007) Introduction to Geographic Information System, 4th Edition, McGraw Hill.
3. Lo C. P and Yeung A. K. W. (2009) Concepts and Techniques of Geographic Information Systems, 2nd Edition, New Jersey, Pearson Prentice Hall
4. Verbyla D. L. (2002) Practical GIS Analysis, London and New York, Taylor and Francis.
5. Berry J.K. (1993) Beyond Mapping: Concepts, Algorithms and Issues in GIS, Fort Collins, CO, GIS World Books.
6. Bolstad P. (2005) GIS Fundamentals: A First Text on Geographic Information Systems, Second Edition, White Bear Lake, MN, Eider Press
7. Kaplan E. D. and Hegarty C J (2006) Understanding GPS Principles and Applications, Second Edition, ARTECH House INC. Norwood.
8. Paul D. Groves (2013) Principles of GNSS, inertial, and multisensor integrated navigation systems, 2nd edition, Artech House, Boston/London

Suggested readings

1. Elangovan K. (2006) GIS: Fundamentals, Applications and Implementations, New India Publishing Agency, New Delhi.
2. Heywood I., Cornelius S. and Carver S. (2006) An Introduction to Geographical Information Systems, Prentice Hall, 3rd Edition.
3. Longley P.A., Goodchild M.F., Maguire D.J. and Rhind D.W. (2005) Geographic Information Systems and Science, Chichester, Wiley, 2nd Edition.
4. Maguire D.J., Goodchild M.F. and Rhind D.W. (1997) Geographic Information Systems: Principles and Applications, Longman Scientific and Technical, Harlow.
5. Ott T. and Swiaczny F. (2001) Time-integrative GIS, Management and Analysis of Spatio-temporal Data, Berlin/Heidelberg/New York, Springer.
6. Thurston J., Poiker T.K. and Moore J.P. (2003) Integrated Geospatial Technologies: A Guide to GPS, GIS and Data Logging, Hoboken, New Jersey, Wiley.
7. Tomlinson R.F. (2005) Thinking about GIS: Geographic Information System Planning for Managers, ESRI Press.
8. Wise S. (2002) GIS Basics, London, Taylor & Francis.

9. Worboys M. and Duckham M. (2004) GIS: A Computing Perspective, Boca Raton, CRC Press.

Case studies

Websites

Journals

1. Asian Journal of Geoinformatics
2. Geocarto International
3. International Journal of Goeinformatics
4. International Journal of Remote Sensing
5. ISPRS Journal of Photogrammetry and Remote Sensing
6. Journal of Indian Society of Remote Sensing
7. Remote Sensing of Environment

Additional information (if any)

Magazines

1. Coordinates
2. Geospatial today
3. GIM International
4. GIS World
5. GIS@development
6. GPS World

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course reviewer:

- Prof. P K Joshi, JNU
- Prof. J. K. Garg, Guru Gobind Singh Indraprastha University

Course title: Principles of Remote Sensing				
Course code: NRG 178	**No. of credits:** 3	**L-T-P:** 24-4-28		**Learning hours:** 42
Pre-requisite course code and title (if any): None				
Department: Department of Natural Resources				
Course coordinator: Dr Chander Kr. Singh		**Course instructor:** Dr Chander Kr. Singh		
Contact details:				
Course type: Core		**Course offered in:** Semester 1		

Course Description

It introduces the participant to the basic concepts and the operational skills necessary to acquire remote sensing data and extract geo-information from them. The course links the theoretical physical principles and its visualization in form of remote sensed images and thereafter develop understanding of it use for different applications of resource management.

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.

Course content

S.No	Topic	L	T	P
1.	Introduction to Remote Sensing, History of Remote Sensing; History of Space programs of India and World;	2		
2.	EMR wavelength regions and their applications, Atmospheric windows, Interaction of EMR with matter;	2		
3.	Fundamentals of Radiometry: Concept & Laws, radiance, reflectance	4	2	
4.	Resolutions–spatial, spectral, radiometric, temporal	2		
5.	Remote Sensing Systems (Active & Passive; Imagining & Non-imaging), Orbit and Platforms of earth Observation, sensors and scanners; Cameras and Sensor classification: Opto-Mechanical & Push-broom; Sensor for Infrared, Thermal and Microwave bands	4		
6.	Introduction to commonly used multi-spectral remote sensing satellite systems: IRS Series of satellites, LANDSAT, SPOT, IKONOS, QUICKBIRD, MODIS, RADARSAT, NOAA, TERRA, SENTINEL Family, RISAT, RESOURCESAT etc	4	2	

7.	Ground Truth Collection, Visual Interpretation, Digital and analog methods of Image Interpretation	4		
8.	Spectral signature and its response for Soil, Vegetation and Water	2		
	PRACTICALS			
1.	Lab 1. Introduction to ERDAS IMAGINE 2011			2
2.	Lab 2. Plotting Spectral Signature using spectroradiometer data			2
3.	Lab 3. Exploring different websites for sensor and data			4
4.	Lab 4. Satellite image; season, location, sensor			4
5.	Lab 5. Display, analysis and interpretation of black & white images, grey image, pseudo image and FCC			2
6.	Lab 6. File formats. Import / Export of files using ERDAS IMAGINE			2
7.	Lab 7. Pre-processing satellite data (stacking, subsetting, mosaicking)			2
8.	Lab 8. Map rectification of Toposheet using Keyboard or GPS data and Geo-referencing of the toposheet and imageries			4
9.	Lab 9. Collection of GPS points. Ground data collection.			2
10.	Lab 10. Study of the Spectral Signature of water, Built-up, Bare Soil, Vegetation, Plantation, Crop land, Snow and Cloud.			4
Total		**24**	**4**	**28**

Evaluation criteria

- Test 1: Written Test 15%
- Test 2: Written Test 15%
- Test 3: Written Test 40%
- Practical: Lab Exercise+Viva 30%

The test 3 will be covering the syllabus in its entirety.

Learning outcomes

Upon completion of this course, student will be able to

1. Apply different type of remote sensing systems for various applications [Test1, Test2, Test3]

2. Operational skills necessary to acquire remote sensing data and learn to extract information from them.[Practical]
3. Develop skill set to deal with different types and forms of satellite data [Test1, Test2, Test3]

Pedagogical approach:
The course will be delivered through class lectures, lab exercise, videos and tutorials.

Materials
Required text
Campbell J.B. (2002) Introduction to Remote Sensing, 3rd ed., The Guilford Press.
Curran P.J., Principles of Remote Sensing, UK, ELBS.
Jensen J.R. (2007) Remote Sensing of the Environment: An Earth Resource Perspective, 2nd ed., Pearson.
Suggested readings
Jensen J.R. (2005) Digital Image Processing: A Remote Sensing Perspective, 3rd ed., Prentice Hall.
Joseph G., Fundamentals of Remote Sensing, Universities Press India.
Kondratyev K.Y., Buznitov A.A. and Pokrovoky O.M., Global Change and Remote Sensing, John Wiley and Sons.
Lillesand T.M., Kiefer R.W. and Chipman J.W. (2003) Remote Sensing and Image Interpretation, 5th ed., Wiley.
Muralikrishna V., Geographical Information Systems and Remote Sensing Applications, Allied Publishers Private Limited.
Sabins F.F., Remote Sensing: Principles and Interpretation New York: WH Freeman and Company.
Case studies
Websites
Journals
1. Geocarto International
2. International Journal of Remote Sensing
3. ISPRS Journal of Photogrammetry and Remote Sensing
4. Journal of Indian Society of Remote Sensing
5. Remote Sensing of Environment

Additional information (if any)
Magazines
1. Coordinates
2. Geospatial today
3. GIM International
4. GIS World
5. GIS@development
6. GPS World

Student responsibilities
Attendance, feedback, discipline

Course Reviewers:

1. Prof. Saumitra Mukherjee, JNU
2. Prof. P K Joshi, JNU
3. Prof. Javed Mallick, King Khalid University, ABHA
4. Prof. Sunil Bhaskaran, Professor and Director, Geospatial Center of the CUNY CREST Institute (BGCCCI)



Course title: Multivariate Data Analysis

Course code: NRE 112	**No. of credits:** 3	**L-T-P:** 28-14-0	**Learning hours:** 42

Pre-requisite course code and title (if any): NRE 115 Environmental Statistics

Department: Department of Energy and Environment

Course coordinator(s): **Course instructor(s):** Dr Neeti

Contact details:

Course type: Elective **Course offered in:** Semester 3

Course Description

Large amount of data is collected on many different variables across disciplines in order to understand the underlying process(es). The multivariate analysis of data deals with examining interrelationship between three or more equally important variables or explaining of variation in, usually one (or more than one) dependent variable(s) on the basis of two or more independent (explaining) variables. With the availability of inexpensive, fast and efficient computing resources and statistical packages there has been a growth in the application of these techniques. This course introduces the student to various multivariate data analysis tools. The focus is on cross-disciplinary application of these techniques.

Course objectives

- Introduce the language of multivariate data analysis
- Understand the characteristics of multivariate quantitative research, including strengths and weaknesses
- Understand the principles and characteristics of the multivariate data analysis techniques

Course content

SNo	Topic	L	T	P
1.	**Introduction** Basic multivariate statistics–mean, variance, ovariance, correlation, linear combination of variables, geometric concepts, distances	4	2	
2.	**Interdependence methods** Principal component analysis, factor analysis, cluster analysis, correspondence analysis, multidimensional scaling	12	6	
3.	**Dependence methods** Multiple regression models, logistic regression canonical correlation, discriminant analysis.	12	6	
	Total	**28**	**14**	

Evaluation criteria

- 2 minor test: 15% each
- Assignment + viva voce: 20
- Major test: 50

Learning outcomes

- distinguish between dependence and interdependence methods in multivariate data analysis
- identify the most appropriate statistical techniques for a multivariate dataset
- carry out and apply commonly used multivariate data analysis techniques, and interpret results
- use statistical software packages for the analysis of multivariate data

Pedagogical approach

Materials

Required text

Afifi A., May S. and Clark V.A. (2012) *Practical Multivariate Analysis*, CRC Press, Taylor &Francis, Boca Raton.

Johnson R.A. and Wichern D.W. (2002) *Applied Multivariate Statistical Analysis*, Prentice Hall of India Pvt Ltd., New Delhi.

Sharma S. (1996) *Applied Multivariate Techniques*, John Wiley and Sons, New York.

Suggested readings

Alt M. (1990) *Exploring Hyperspace–A Non-mathematical Explanation of Multivariate Analysis,* McGraw-Hill Book Company, New York
Everitt B.S. and Dunn G. (2001), *Applied Multivariate Data Analysis*, Arnold, London.
Haan C.T. (1977) *Statistical Methods in Hydrology*, The Iowa State University Press/Ames.
Harris R.J. (1985) *A Primer in Multivariate Statistics*, Academic Press, New York.
Manly B.F.J. (1994) *Multivariate Statistical Methods–A Primer*, Chapman and Hall, London.

Case studies
Websites

Journals

Applied Statistics
Biometrics
Biometrika
Environmental and Ecological Statistics
Environmetrics
Journal of the American Statistical Association
Psychometrika
Statistical Science
Technometrics
The American Statistician

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course Reviewers

Course title: Research Methodology and Thesis Writing			
Course code: NRE 173	**No. of credits:** 2	**L-T-P:** 14-14-0	**Learning hours:** 28
Pre-requisite course code and title (if any):			
Department: Department of Energy and Environment			
Course coordinator: Dr Chubamenla Jamir		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description

The emphasis throughout the course is on students developing individual hypotheses and then applying appropriate research methods to test those hypotheses. Students will select an area of interest and develop a research question and a hypothesis concerning how two concepts relate to each other. They will use tools as discussed in class and understand the appropriate methodology followed while conducting independent research. The final output of the course will be a proposal that briefly outlines (10 pages) background, introduction, methodology that could potentially serve as the main proposal for a Master's thesis. The grade will be heavily dependent on the quality of this proposal and thus literary review, writing skill and ability to coherently test a hypothesis. A PowerPoint presentation at the 7th week mark will test how far the student has been able to achieve this goal.

Course objectives

1. Introducing the student to the fundamental concepts and terminology of research as they relate to the field of research;
2. Prepare the student to write and propose research ideas and
3. Develop students' skills in using library and web resources

Course content

SNo	Topic	L	T	P
1.	**What is a Master's Thesis:** ▪ Sample proposals and what the thesis looked like upon completion **Assignment: 3-4 research ideas (1/2-1 page)**	2	1	
2.	**Introduction:** How to frame a statement of the problem as precisely as possible & discuss: ▪ What the Study is about; ▪ Major objectives of the Study; and ▪ Justification of the choice for your topic. **Assignment: Based on selected idea write an introduction + hypothesis (1 page)**	2	4	
3.	**Background to the Study:** How to provide background information in as much detail as appropriate, but as precisely as possible. Eg. A study on water pollution, the background information could include: When the pollution was discovered; Source (if known); Geographic location and extent of contamination;	2	3	

	Number of people affected; etc. Impacts on environment and human health effects **Assignment: Write a background for the research idea and hypothesis (1 /2 pages)**			
4.	**Literature Review:** What are the components of a good literary review? How to selectively discuss the literature pertaining to study, with 2 critical components: ▪ Previous studies related are examined and analyzed; ▪ Gaps left behind by such studies, which you seek to bridge in your study. **Assignment: Distinguish between Background and Introduction sections (3 pages each)**	2	2	
5.	**Methodology:** ▪ All methods used in collecting your data (e.g. structured survey, elite interviews, aggregate data, focus group, etc.), with a justification for each method used; ▪ If questionnaires, general contents and how it will be administered and how to appendix for the report; ▪ Sample studied by addressing the following: (i) What is the total population from which the sample will be selected? (ii) How to select the final sample to make it representative? **Assignment: Write the methodology section to include all possible analysis to be used (2 page)**	4	3	
6.	**Pitfalls:** What are the likely pitfalls one may encounter ▪ Case studies **Assignment: 1 page list**	2	1	
	Total	**14**	**14**	

Evaluation criteria

- Class participation: 20%
- 1 PowerPoint/presentation: 20%
- 1 paper: 60% (10% each assignment)

Learning outcomes

1. Students should be able to identify a research problem stated in a study and define it.
2. Students should be able to distinguish a purpose statement, a research question or hypothesis, and a research objective
3. Students should be familiar with the steps involved in identifying and selecting a good instrument to use in a study

Pedagogical approach

Materials

Required text

Strunk W. and White E.B. (1999) The Elements of Style, Longman; 4th Edition.

Suggested readings Case studies Websites Journals International Journal of Social Research Methodology Journal of Mixed Methods Research
Additional information (if any)
Student responsibilities The students are expected to submit assignments in time and come prepared with readings when provided.

Course Reviewers



Course title: Project Management			
Course code: NRG 103	**No. of credits:** 3	**L-T-P:** 28-14-0	**Learning hours:** 42
Pre-requisite course code and title (if any):			
Department: Department of Natural Resources			
Course coordinator: Dr Vinay Sinha	**Course instructor:** Dr Subodh Jain		
Contact details:			
Course type: Core	**Course offered in:** Semester 1		

Course Description

The course is designed for the students to prepare them for the working in various projects right from conceptualization to delivery of products. It will be applicable regardless of the size and scope of the project one is handling with and will ensure the appropriate processes and tools for the job.

Course objectives

Course content

SNo	Topic	L	T	P
1.	Introduction to Project Management (Definition, Need/Benefits, achieve business objective, role of Project Manager, project Life Cycle, Integrative approach, process group)	2		
2.	Creating a Project Proposal (Establishing Objectives, scoping the boundaries, priorities strategic development, WBS/PBS, responsibility, communication plan)	2	2	
3.	Estimation in Project Proposal (Basic, Time, Cost, Resource, Techniques, Guidelines)	2		
4.	Developing Project Plan (Evaluating and Constructing network, Schedule, Criticality, Gantt Charts, Techniques)	2	2	
5.	Project Proposal Evaluation (Reading, evaluating feasibility-resource, time, cost, idea, quality)	2		
6.	Project Resource Management (Overview and types of resource, Resource constraints & scheduling, Allocation methods, resource vis-à-vis other activities of project planning)	2		
7.	Preparation for presentation (Designing small write-ups-introduction, literature review, materials, methods, results, discussion, summary, conclusions)	2	2	
8.	Presentation skills development (Presenting in a formal meeting with-data, figures, graphs, tables, contents etc.)	2		
9.	Attending presentation and meetings (Expressing freethinking, opinions, judgments (written and oral) and analyses; Formulation of questions; Responding comments and critique given by other)	2	2	
10.	Risk Management	2		

	(Concept, process, PERT, Contingency planning, funds, time, unexpected changes in control and management)			
11.	Time Management (Rationale, Options, Time compression techniques, mapping and managing project cost and time, trade-offs)	2	2	
12.	Project Monitoring and Controlling (Monitoring process (time, cost, resource), control processes, earned value cost/schedule system, variance analysis, CBA and other techniques)	2	2	
13.	Project Closure (Quality assurance, auditing (resources, time, cost), submission, auditing, closure)	2		
14.	Group discussions	2	2	
	Total	**28**	**14**	

Evaluation criteria

- 2 minor tests: 10% each
- Practical: 40%
- Major exam: 40%

Learning outcomes

Pedagogical approach

Materials

Required text

1. *Kevin A. (2005) Managing Agile Projects, Oshawa, ON, Multi-Media Publications Inc..*
2. *Scott B. (2005) Art of Project Management, Cambridge, MA, O'Reilly Media.*
3. *Fred B. (1995) The Mythical Man-Month, 20th Anniversary Edition, Adison Wesley.*
4. *Comninos D. and Frigenti E. (2002) The Practice of Project Management - A Guide to the Business-Focused Approach, Kogan Page.*

Suggested readings

1. *Andrew S. and Jennifer G. (2005) Applied Software Project Management, Cambridge, MA, O'Reilly Media.*
2. *Bent F. (2006) From Nobel Prize to Project Management: Getting Risks Right, Project Management Journal, 37(3), pp. 5-15.*
3. *Eric V. (2005) The Fast Forward MBA in Project Management, 2nd, Wiley.*
4. *Gary H. (2001) Project Management (The Briefcase Book Series), McGraw-Hill.*
5. *Harold K. (2003) Project Management: A Systems Approach to Planning, Scheduling and Controlling, 8th Ed., Wiley.*
6. *Jack R.M. and Samuel J.M. (2002) Project Management: A Managerial Approach, 5th ed., Wiley.*
7. *James L. (2002) Fundamentals of Project Management, 2nd ed., American Management Association.*
8. *Project Management Institute (2003) A Guide To The Project Management Body of Knowledge, 3rd ed., Project Management Institute.*
9. *Richard H.T. and Edward Y. (2000) Software Engineering Project Management, 2nd Ed., Wiley-IEEE Computer Society Press.*
10. *Stephen R.P. (2005) As-builts–Problems and Proposed Solutions, Construction Management Association of America.*

11. Tomlinson R.F. (2005) Thinking about GIS: Geographic Information System Planning for Managers, ESRI Press, 328 pp.
12. *Yamal C. (2006) Professional Project Management, The Guide, 1st Edition, Monterrey, NL MEXICO, McGraw Hill.*

Case studies
Websites

Journals
1. *International Journal of Project Management*
2. *Project Management Journal*

Additional information (if any)
Magazines
1. Coordinates
2. GIM International
3. GIS World
4. GIS@development
5. Goespatial today
6. GPS World

Student responsibilities
Attendance, feedback, discipline, guest faculty etc.

Course title: Programming in Geoinformatics			
Course code: NRG 108	**No. of credits:** 3	**L-T-P:** 12-3-54	**Learning hours:** 42
Pre-requisite course code and title (if any): NRG 176: Principles of GIS and GNSS, NRG 178: Principles of Remote Sensing, NRG 106: Fundamentals of Computers and Programming			
Department: Natural Resources			
Course coordinator(s): Dr. Neeti		**Course instructor(s):** Dr. Neeti	
Contact details: neeti@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 2	

Course description

The course introduces programming required for both GIS and remote sensing analysis to the students. The fundamentals of programming in GIS using Python language. The coding for analysis of remotely sensed dataset will be taught using Google Earth Engine.

Course objectives

- To introduce Python programming
- To integrate programming with GIS analysis
- To introduce Google Earth Engine for Image processing

Course content

Module	Topic	L	T	P
1.	Introduction: Automation in GIS, Introduction to Python, variables, object oriented programming, classes	2		
2.	Basics of Python programming: List, loops, decision structures, string manipulation, debugging in Python	2	1	
3.	GIS Data Access and manipulation with Python: Raster and Vector	2	1	
4.	GIS analysis using Python	2	1	
5.	Functions and Modules in Python, Python dictionaries, writing geometries, Batch files, working with map documents	2		
6.	Introduction to Google Earth Engine for image processing	2		
	PRACTICALS			
1	Writing first programme in Python			2
2.	Passing a value to a script as a parameter, reporting spatial reference of feature class, creating buffers			4
3.	Performing map algebra			2
4.	Creating a script using multiple GIS operation			4
5.	Creating and combining list			2
6.	Working with different types of loop			4
7.	Looping over records in shapefile in Python			2

8.	String manipulation in a shapefile in Python			2
9.	Debugging a programme			2
10.	Reading and Writing vector data in Python			4
11.	Query and updation of vector data using cursor in Python			4
12	Raster based analysis in Python			2
13.	Writing functions and creating modules in Python			4
14.	Creating dictionary, reading and writing text using Python csv module			2
15.	Writing geometry of point, polygon and line shapefile			4
16.	Running python script in batch file, scheduling tasks			2
17.	Updating map document (mxd file) using Python			2
18.	Writing first programme in GEE			2
19	Display of an image, image computation, spatial reducer using GEE			2
20.	Creating a composite image, creating profile, vegetation indices creation using GEE			2
	Total	12	3	54

Evaluation criteria:

- Assignments: 20% [Every week] (All the learning outcomes)
- Test 1: 20% [End of Module 1 and Module 2] (learning outcome 1)
- Test 2: 20% [End of modules 2, 3, and 4] (learning outcome 2)
- Test 3: 40% [At the end of all the modules] (All the learning outcomes)

Learning outcomes

At the end of the course, students will be able to:

- Automate geoprocessing tasks using Python
- Understand, write, debug and execute python programme
- Write and execute basic image analysis using GEE

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials

Course Reading Materials (* = compulsory readings)

Module 1 -5

1. Gries, P., Campbell, J., and Montojo, J. (2013) Practical Programming: An Introduction to Computer Science Using Python, Pragmatic Programmers.
2. *Zandbergen, Python Scripting for ArcGIS, Esri Press, 2013.

Module 6.

https://developers.google.com/earth-engine/edu

Advanced Reading Material

1. Python official homepage - http://www.python.org/
2. Python document - http://www.python.org/doc/
3. The Python Tutorial - http://docs.python.org/tutorial/ A Byte of Python (an online wikibook) - http://swaroopch.com/notes/Python/ How to think like a computer scientist: learning with Python, 2nd edition by Jeffrey Elkner et. al. - http://openbookproject.net//thinkCSpy/ ArcGIS 10 Desktop Help: Geoprocessing with Python - http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/What_is_Python/002z000000 01000000/ Geoprocessing Model and Script Tool Gallery - http://blogs.esri.com/Dev/blogs/arcgisdesktop/archive/2010/11/09/Geoprocessing-Model-and-ScriptTool-Gallery.aspx
4. Lutz, M. and Ascher, D. (1999) Learning Python, O'Reilly Media.
5. Zelle, J. M. (2003) Python Programming: An Introduction to Computer Science, Franklin Beedle
6. & Associates.
7. Tucker (2004) Writing Geoprocessing Scripts in ArcGIS, ESRI Press (available online).

Recommended journals for reference

1. International Journal of Applied Earth Observation and Geoinformation
2. ISPRS Journal of Photogrammetry and Remote Sensing
3. International Journal of Remote Sensing

Additional information

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course reviewers:

1. Dr. Kangping Si, Big Data Software Engineer, TiVo Inc., San Jose, USA
2. Mr. Ujaval Gandhi, Google Earth Engine, Hyderabad



Course title: Law and Policy for Maps and Remote Sensing			
Course code: NRG 162	**No. of credits:** 2	**L-T-P: 28**-0-0	**Learning hours: 28**
Pre-requisite course code and title (if any): None			
Department: Department of Natural Resources			
Course coordinator: Dr. Saravanan A		**Course instructor:** Dr. Saravanan A	
Contact details: saravanan@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 2	

Course Description: This course focuses on the evolving laws, policies, and institutions that have long-term ramifications for earth mapping and remote Sensing. It also deals with legal systems, related linkages with land use/cover systems, remote sensing & map policy. It provides an overall guiding framework for development and implementation of remotely sensed data to make it useful in geographic information systems. The course structure further helps to critically assess the strengths and weaknesses of legal instruments of remote sensing and platforms for a variety of application scenarios viz; geosciences, water resources, land use planning, forests, Agriculture and Environmental Management.

Course objectives

1. To introduce the law and policy both at the national and international level relating to remote sensing and maps.
2. To explain the role of legal regulations, policy and institutions in the conservation and management of natural resources.
3. Application of Remote sensing in Natural Hazards.
4. To understand the significance of regulations on remote sensing and mapping and its impact on regional and international discourses/debates. It will appraise the students about government policies both macro and micro to deal with the issues of environmental monitoring and assessment.

Course content

Module	Topic	L	T	P
1.	**Introduction to the Legal System** The objective of this module is to gain greater familiarity with different legal terms, legal systems, sources of law, and hierarchy of courts in India. Further underscores the difference between International and Municipal Law. This module also addresses the following questions. • What are the primary and secondary sources of Law? • Which law prevails in the event of conflict between International law and Domestic Law?	5		
2.	**Relevant Laws** This module discusses various laws related to land use & planning, agriculture, forests and environmental conservation. There is long debate on protection of data obtained by remote sensing, that still necessitates further attention in this module. **Subtopics** • **Forest and Wildlife Law**: Indian Forest Act, 1927- Legal classification of forests, Restrictions on the rights, Forest Conservation Act, 1980, Wildlife Protection Act 1972. • **Land Law**: Concepts in land related rights; easement rights-	5		

	tenured rights–community rights–restrictions on the rights relating to land, National Land Use Policy. • **Intellectual Property Law**: Relevant to maps, information and data.			
3.	**National Law and Policy on Remote sensing and Mapping** The main objective of the module is to examine laws and policies related to Mapping and Remote Sensing in India. It further examines the issues arising from commercialization of remote sensing. Following developments also discussed in this module. National Drone Policy, The National Geospatial Policy-2016, Geospatial Information Regulations Bill- 2016, The National Map Policy -2005, Guidelines for Implementing National Map Policy, Civil Aviation Rules, The Civil Aviation Requirements- 2012, The Remote Sensing Data Policy 2001-2011, National data Sharing and Accessibility Policy-2012.	5		
4.	**Application of Remote sensing in Natural Resources & Natural hazards** Law relating to renewable and non-renewable Resources, the Environment Protection Act, 1986; Disaster Management Act, 2005; Coastal Regulation Zone Notification/Draft-2018.	5		
5.	**International Instruments relating to law and policy on Remote Sensing & Mapping** This module focusses on the international regulations on remote sensing and maps. **Subtopics** The Convention on International Liability and Damage caused by Space objects, 1972; Montreal Convention on Unification of Certain Rules for International Carriage by Air, 1999; UN Principles relating to Remote Sensing of the Earth from Outer Space. *Laws in other Jurisdictions* U. K. National Remote Sensing Policy 1984, U.S., Canada, Security Issues &Evidentiary value (Case studies- *Dow* v. *U.S.*, *EOSAT* v. *NASA & NOAA*)	8		
	Total	**28**		

Evaluation criteria

- **Test 1:** **15%** [Syllabus- Modules 1 & 5] (Third week of February)
- **Test 2:** **15%** [Syllabus- Modules 2 & 3] (First week of April)
- **Assignments:** **20%** [Third week of April]
- **Test 3:** **50%** [Syllabus- Modules 1-5] (Second week of May]

Learning outcomes

By the end of the course, the students are expected to:

1. Be familiar with the laws, policies and institutions in the field of maps and remote sensing both at the national and international level.
2. Understand the significance of regulations on remote sensing and mapping in the conservation of natural resources, land use & planning, agriculture, forests and overall environmental monitoring & assessment.
3. Acquire the ability to critically evaluate the role of law and policy in conservation and management of environment.

Pedagogical approach

The course will be delivered through class lectures.

Course Reading Materials

Module 1:

1. Bryan A. Garner, *Black's Law Dictionary, Abridged, 9th Volume* (2010)
2. Ugo Mattei & Luca G. Pes, *Civil Law and Common Law: Toward Convergence? in The Oxford Handbook of Law and Politics*, Gregory Caldeira et.al 267-280 (eds., OUP 2008)
3. William Tetley, *Mixed Jurisdictions: Common Law v. Civil Law (Codified and Uncodified)*, 60(3) Louisiana Law Review 669-738 (2000)
4. M.P Singh, *Securing the Independence of The Judiciary- The Indian Experience* 10(2) Indiana International & Comparative Law Review 245-292 (2000)
5. Arghya Sengupta & Akriti Gaur, *Treaty-making and implementation in India: a constitutional paradox* 57(1-2) Indian Journal of International Law 47-61 (2017)

Module 2:

1. Atsuyo Ito, *Legal Aspects of Satellite Remote Sensing*, 99-147 & 199-241 (BRILL 2011)
2. Ramachandra Guha, *Forestry in British and Post-British India: A Historical Analysis*, 18(44) Economic and Political Weekly 1882-1896 (1983)
3. Armin Rosencranz & Sharachchandra Lele, *Supreme Court and India's Forests*, 43(5) Economic and Political Weekly 11-14 (2008)
4. Sudhakar Reddy et.al., *Nationwide classification of forest types of India using remote sensing and GIS, Environmental Monitoring and Assessment* 187:777 (2015)
5. Neelotpalam Tiwari & Himanshu Pabreja, *India's Protected Areas: Are They Really Protected or at the Mercy of Wildlife Boards?* 21(1) Journal of International Wildlife Law & Policy, 23-45 (2018)
6. Meenakshi Gogoi, *The Nexus between Sovereignty and 'Eminent Domain' under the Land Acquisition Act, 1894, and the Land Act, 2013*, 48(2) Social Change (2018)
7. Robert Barr, *Spatial Data and Intellectual Property Rights, in The Map Library in the New Millennium* 176-187(eds Robert Parry & CR Perkins, American Library Association, 2001)
8. P Jothimani & K Venugopal, *GIS Data Dissemination and Intellectual Property Rights,* Indian Cartographer 336-341 (2002)
9. J. Richard West, *Copyright Protection for Data Obtained by Remote Sensing: How the Data Enhancement Industry Will Ensure Access for Developing Countries*, 11(2) Northwestern Journal of International Law & Business 403-441 (1990)
10. Malay Adhikari, *Legal Regime of Intellectual Property Rights of Spatial Data with Special Reference to India*, Geospatial World Forum (Conference Proceedings, 2011)

Module 3:

1. Ranjana Kaul, *A Review of India's Geospatial Policy, in Space India 2.0: Commerce, Policy, Security and Governance Perspectives* (Rajeswari Pillai Rajagopalan & Narayan Prasad eds., ORF 2017)

2. Jayanta Kumar Ghosh & Abhishek Dubey, *Impact of India's New Map Policy on Accuracy of GIS Theme*, 37 (1) Journal of Indian Society of Remote Sensing 1-7 (2009)
3. Adya Garg, *Legal Challenges to Mapping in India- Laws, Policies, and Cases,* The Centre For Internet & Society (11 May 2016)
4. Anuj Srivas, *How the Controversial Geospatial Bill Snowballed – And Was Then Shoved Into Cold Storage*, The Wire (07 Mar 2017)

Module 4:

1. Orhan et. al., *Geoinformation for Disaster and Risk Management Examples and Best Practices, Joint Board of Geospatial Information Societies and United Nations Office for Outer Space Affairs* (Denmark, 2010)
2. Atsuyo Ito, *Legal Aspects of Satellite Remote Sensing*, 149-194 (BRILL 2011)
3. Manikiam, *Remote Sensing Applications in Disaster Management*, 54(1) Mausam 173-182 (2003)
4. Olalekan Mumin Bello & Yusuf Adedoyin Ainab, *Satellite Remote Sensing as a Tool in Disaster Management and Sustainable Development: Towards a Synergistic Approach*, 120(19) Procedia - Social and Behavioral Sciences, 365-373 (2014)

Module 5:

1. Carl Q. Christol, *International Liability for Damage Caused by Space Objects*, 74(2) American Journal of International Law 346-371 (1980)
2. Alexander F. Cohen, *Cosmos 954 and the International Law of Satellite Accidents*, 10(7) Yale Journal of International Law 78-91 (1984)
3. *International Space Law: United Nations Instruments*, UN Office for Outer Space Affairs (2017)
4. Joseph A. Burke, *Convention on International Liability for Damage Caused by Space Objects: Definition and Determination of Damages After the Cosmos 954 Incident*, 8(2) Fordham International Law Journal 255-285 (1984)
5. Deekshatulu, B.L., Raghu, V. & Chandrasekhar, M.G., *Overview of the Legal Aspects of Remote Sensing*, 25(3) Journal of the Indian Society of Remote Sensing 1250138 (1995)
6. Atsuyo Ito, *Legal Aspects of Satellite Remote Sensing,* 17-98 & 244-298 (BRILL 2011)
7. Bin Cheng, *A New Era in the Law of International Carriage by Air: From Warsaw (1929) to Montreal (1999)*, 53(4) International and Comparative Law Quarterly833-859 (2004)
8. JC Batra, *Modernization of the Warsaw System - Montreal 1999*, 65(3) Journal of Air Law and Commerce 429-444 (2000)
9. Frans von der Dunk, *United Nations Principles on Remote Sensing and the User, in Earth Observation Data Policy and Europe*, edited by Ray Harris (Lisse: A Balkema eds., 2002), pp. 29–40

Advanced Reading Materials

1. George Cho, *Geographic Information Systems and the Law: Mapping the Legal Frontiers* (Wiley 1998)
2. Patricia Birnie, Alan Boyle & Catherine Redgwel, *International Law and the Environment,* (3rd edn. OUP 2009)
3. James B. Campbell & Randolph H. Wynne., *Introduction to Remote Sensing*, The Guilford Press,

2011

4. Shyam Divan & Armin Rosencranz, *Environmental Law and Policy in India: Cases, Materials, and Statutes* 288- 365 (OUP 2001)
5. Rajeswari Pillai Rajagopalan & Narayan Prasad, *Space India 2.0: Commerce, Policy, Security and Governance Perspectives* (Observer Research Foundation, 2017)

Cases

1. *Dow v. U.S.*
2. *EOSAT v. NASA & NOAA*
3. *J. Mohanraj v. Google and Others*

Journals

1. Journal of Environmental Law & Policy
2. International Journal of Remote Sensing
3. Air & Space Law
4. Remote Sensing of Environment

Student responsibilities

Attendance, feedback, discipline, guest faculty etc.

Reviewers

Dr. Shiju MV, Associate Professor, Christ University, Bangalore
Dr. Risham Garg, Associate Professor, National Law University, Delhi

Course title: Spatial Data Modeling and Applications			
Course code: NRG 163	**No. of credits:** 4	**L-T-P:** 32-08-32	**Learning hours:** 56
Pre-requisite course code and title (if any): NRG 176 Principles of GIS and GPS			
Department: Natural Resources			
Course coordinator: Dr Vinay Sinha		**Course instructor:** Dr Vinay Sinha	
Contact details: sinhav@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 2	

Course Description

The course covers fundamental aspects of spatial data modeling specifically to enhance the capability of spatial modelling, spatial database analysis concept, design and format under different natural resource assessment planning and monitoring. It introduces the participant to the basic concepts of Matrix & PCA, map algebra, decision making criteria, spatial analysis of discrete and continuous datasets, geo-statistics, decision-making, conflict resolution. It also considers integration of non-spatial data and application developed based on the concepts by software developers, photogrammetrists, land surveyors, mapping specialists, researchers, post-graduate students, and lecturers.

Course objectives

1. To introduce fundamental aspects of spatial data modeling.
2. To understand the natural and social resource assessment, planning and monitoring for National development process.
3. To create a firm basis for successful integration of natural / human resources using spatial modelling in any field of application.

Course content

Module	Topic	L	T	P
1	Introduction to geospatial modeling and interpretation	2		
	Raster data and Matrix application: Addition, subtraction, multiplication, Identity and Inverse for Spatial analysis concept;	2		
3	Raster and Vector data Geometry and Intensity transformation using Principle Component Analysis: Eigenvectors and Eigen values	2		
4	Applications of GIS models, case exercise	2	2	
5	Geospatial models – types and Modelling: Descriptive, prescriptive and predictive; Normalization, level of measurement	2		
6	Spatial analysis concept: Distance, Adjacency, Interaction and neighbourhood	2		
7	Introduction to modeling & flowcharting, Map algebra-operators & operations, Functional operations, Spatial interaction models	2		
8	Point Analysis: Coordinate, Distance – Nearest Neighbour Distance, Density – Quadrant and other methods, Clustering - K-mean, Thiessen and Buffer	2	2	
9	Address Geocoding, Optimum Routing Closest facilities, Resource Allocation, Network Analysis	2		
10	Dynamic Segmentation: Route, Section, Events and its application.	2		

11	Local neighbourhood operation – Reclassification, filter, slope, Aspect, curvature, view shed	2		
12	Spatial Interpolation and Geostatistics: Local and global methods, Gravity model, Regression model, Pattern analysis, Moran's I, Cluster analysis, Trend surface Analysis,	2	2	
13	Thiessen polygon, Density estimation, Inverse Distance Weight (IDW), Thin – plate Spline,	2		
14	Kriging – ordinary and Universal, Semivariogram; Spatial Autocorrelation	2	2	
15	Single criteria vs. Multiple criteria, Decision-making, Conflict resolution and Prescriptive modeling, Model verification	2		
16	Spatial decision support system and thematic areas (application of MCDM/AHP in spatial modeling)	2		
Exp	PRACTICALS			
1	Lab 1. Performing various actions over table			2
2	Lab 2. Merging of tables by using primary key			
3	Lab 3. Maintaining database			2
4	Lab 4. Point pattern analysis			2
5	Lab 5. Terrain Analysis			2
6	Lab 6. Hydrological modelling			4
7	Lab 7. Geostatistics (Surface generation)			6
8	Lab 8. Cluster Analysis			4
9	Lab 9. Site suitability analysis			4
10	Lab 10. Network analysis			2
11	Lab 11. Dynamic segmentation			4
	Total	**32**	**08**	**32**

Evaluation criteria

- Test1: 10% [module no.s 1to 5] [5-6 week]
- Test2: 10% [module no.s 7to 11] [10-12 week]
- Practical: 40% [Module no. 1-15] [End Semester]

- Test3: 40% [Experiment no. 1-15] [End Semester]

Learning outcomes

1. Equip with analysis, description and modeling of geospatial data.
2. The practical applications of software tools, underlying theory, and the correct application of these tools to analyze and model data

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials.

Materials

Required text

1. O' Sullivan D. and Unwin D. (2003) Geographical Information Analysis, John Wiley and Sons.
2. Verbyla D. L. (2002) Practical GIS Analysis, London and New York, Taylor and Francis.
3. Burrough P.A. and McDonnell R.A. (1998) Principles of Geographical Information Systems, Oxford University Press, Oxford, 327 pp.
4. Longley P.A., Goodchild M.F., Maguire D.J. and Rhind D.W. (2005) Geographic Information Systems and Science, Chichester, Wiley, 2nd edition.
5. Longley P.A., Goodchild M.F., Maguire D.J. and Rhind D.W. (2005) Geographic Information Systems and Science, Chichester, Wiley, 2nd edition.

Suggested readings

1. Andrew S. (2002) Environmental Modeling with GIS and Remote Sensing, Taylor and Francis.
2. David W. and Mark G. (2002) Spatial Technology and Archaeology, The Archaeological Application of GIS. London, New York, Taylor & Francis.
3. Goodrich M. (2000) Data Structures and Algorithms in Java, 2nd Edition Wiley.
4. Malczewski J. (1999) GIS and Multicriteria Decision Analysis, New York, John Wiley and Sons.
5. Michael W. and Duckham M. (2004) GIS: A Computing Perspective, Boca Raton, CRC Press, Asrar Ghassem Theory and Applications of Optical Remote Sensing New York, John Wiley and Sons.
6. Ott T. and Swiaczny F. (2001) Time-integrative GIS, Management and Analysis of Spatio-temporal Data, Berlin/Heidelberg/New York, Springer.
7. Steven M.D. and Clark J.A. (1990) Applications of Remote Sensing in Agriculture London Butterworths.
8. Johnson L. E (2009) Geographical Information System in Water Resource Engineering, Taylor and Francis.
9. Thurston J., Poiker T.K. and Moore J.P. (2003) Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging, Hoboken, New Jersey, Wiley.
10. Vincent R.K. (1997) Fundamentals of Geological and Environmental Remote Sensing New Jersey, Prentice Hall.

Case studies

Websites

Journals

11. Advances in Water Resources 12. Agricultural and Forest Meteorology 13. Asian Journal of Geoinformatics 14. Ecological Modelling 15. International Journal of Geoinformatics 16. International Journal of Remote Sensing
Additional information (if any) Magazines 1. Coordinates 2. GIM International 3. GIS World 4. GIS@development 5. Geospatial today 6. GPS World
Student responsibilities Attendance, feedback, discipline, guest faculty etc

Course Reviewer:

- Prof M P Punia, Head & Sr Scientific Officers, Department of Remote Sensing, BIT, Mesra-Jaipur
- Prof P K Joshi, SES, JNU, New Delhi

Course title: Photogrammetry			
Course code: NRG 170	**No. of credits:** 3	**L-T-P:** 26-2-28	**Learning hours:** 42
Pre-requisite course code and title (if any): NRG 178 Principles of remote sensing, NRG 176 Principles of GIS and GPS			
Department: Natural Resources			
Course coordinator(s): Dr Anu Rani Sharma		**Course instructor(s):** Dr Anu Rani Sharma	
Contact details: anu.sharma@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 2	

Course Description

This course introduces photogrammetry as a data acquisition tool and provides a general overview of its theory and working principles. This course covers the factors that influence the formation of the photographs, and the process of reconstructing the three-dimensional model for the real world. Students will gain the ability to extract data from aerial photography.

Course objectives

1. To develop understanding about basic concepts of image geometry and measurement of aerial photograph.
2. To get acquainted with image interpretation and information extraction

Course content

Module	Topic	L	T	P
1	**Introduction to Photogrammetry** • History of Aerial Photographs • Fundamentals of Aerial photographs • Basic concepts of Perspective projection and Orthographic projection	2		
2	**Aerial cameras and Photographs** (Types, acquisition, scanning)	2		
3	**Photogrammetric project planning** • Planning Aerial Photography • Elements of aerial photograph	4	2	
4	**Stereoscopy** • Stereoscopic photographs • Parallax	4		
5	**Geometry of Aerial Photograph** • Basic of Optics: Reflection, refraction and lens distortion • Photographic scale; Object height and Length	2 2		
6	**Introduction to Ortho-photos and DEM/contour extraction** • Photo mosaic and Ortho photo • Photograph co-ordinate and ground coordinate of Vertical photograph • Digital Photogrammetry: Block adjustment, Ortho-rectification • Digital Terrain Model and Terrain editing, • Satellite Photogrammetry	2 2 2		
7	Aerial Photo Interpretation techniques and tools	2		
8	Applications and limitation of Aerial Photography	2		

	PRACTICALS			
1	Interpreting an Aerial photograph			2
2	Stereovision exercise and 3D model perception in stereoscope			4
3	Photo and Image coordinate calculation for vertical photographs			2
4	Parallax bar operation and height calculation			4
5	Introduction to Leica Photogrammetry suite (LPS)			2
6	Orthorectification of aerial photographs / satellite datasets			8
7	DEM generation using ortho images			4
8	Introduction to Stereoanalyst			2
	Total			**28**

Evaluation criteria

- Test1: 10% [End of module 1, 2 and 3] (Learning outcome 1)
- Test2: 10% [End of module 3, 4,5,6] (Learning outcome 2)
- Practical (Lab exercise and viva): 30% (Practical is conducted at the end of the semester and includes evaluation of the lab exercises student carry out throughout the semester: (All the learning outcomes)
- Test 3: 50% (Test 3 is conducted after completion of the course, at the end of the semester) (All the learning outcomes)

Learning outcomes

Upon completion of the course, student will be able to:

1. Extract data from aerial photography
2. Understand the process of reconstructing three-dimensional model for the real world

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials.

Course Reading Materials (* = compulsory readings)

Module 1 – 8 will be covered through following reading material.

1. *Moffitt F.H. (1980) Photogrammetry, 3rd Ed, Harper & Row, NY.
2. Campbell J.B. (2002) Introduction to Remote Sensing, 3rd ed., The Guilford Press.
3. *Paine D. P., Kiser J. D. (2012) Aerial Photography and Image Interpretation, John Wiley & Sons, Inc.
4. *Wolf P.R. (1983) Elements of Photgrammetry, McGraw-Hill, NY
5. Joseph, G. and Jeganathan, C. (2018) Fundamentals of Remote Sensing. By. Universities Press (India) Private Limited, Hyderabad, India. ISBN 978-93-86235-46-6.

Advanced reading.

1. George J. (2005) Fundamentals of Remote Sensing Universities Press India
2. Lillesand T.M., Kiefer R.W. and Chipman J.W. (2003) Remote Sensing and Image Interpretation, 5th ed., Wiley.
3. Floyd F.S. (2007) Remote Sensing: Principles and Interpretation New York, WH Freeman and Company.
4. Zorn H.C. (1980) Introductory Course in Photogrammetry, 6th Ed. ITC, Netherlands.

Journals

1. Asian Journal of Geoinformatics
2. International Journal of Remote Sensing
3. ISPRS Journal of Photogrammetry and Remote Sensing

Additional information (if any)

Magazines 1. Coordinates 2. Geospatial today 3. GIM International 4. GIS World 5. GIS development 6. GPS World
Student responsibilities Attendance, feedback, discipline, guest faculty etc.

Course Reviewer:

- Prof. J. K. Garg, Indraprastha University, Dwarka
- Dr. P.L.N. Raju, NESAC, Shillong

Course title: Wildlife Conservation and Management			
Course code: NRE 151	**No. of credits:** 3	**L-T-P:** 18-08-32	**Learning hours:** 42
Pre-requisite course code and title (if any): NRE 121 Ecology, NRE 123 Biodiversity assessment and Conservation			
Department: Department of Energy and Environment			
Course coordinator: Dr Sudipta Chatterjee		**Course instructor:** Dr Sudipta Chatterjee	
Contact details: s.chatterjee@terisas.ac.in			
Course type: Elective		**Course offered in:** Semester 3	

Course Description

This course teaches the essential elements, concepts and skills related to wildlife conservation and management. This includes implementing habitat management practices; identifying wildlife conflicts; and participation in personal and community leadership development activities and planning. The perspectives of science and management will be elucidated in the context of historical, current and future strategies designed to conserve the diversity of life. The course work will be guided by work on scientific papers and field experience.

Course objectives

The course will impart knowledge on the past and present status on concerns in wildlife in India, tools and techniques in wildlife studies and approaches to wildlife conservation in India and the world.

Course content

Module	Topic	L	T	P
1.	**Introduction and History of Wildlife Conservation** Perspectives and philosophical perspective; Cultural foundation; Protected Area Network (PAN) **Values and Ethics in Wildlife Conservation** Definitions and (Instrumental; Intrinsic; Ecocentrism; Religious traditions and conservation), Ethics in conservation.	2		
2.	**Wildlife–Habitat Ecology** Measuring wildlife habitat, availability, quality, animals signs; monitoring changes; corridors *Journal article to work on.*	2	2	
3.	**Wildlife Behavior** Introduction (Group living, selfishness and altruism); evolutionarily stable strategies; concept of optimality in decision making in animals **Practical:**Methods of behavioural observation	2		2
4.	**Population Estimation and Modelling** Estimating abundance and density; Modelling (stochastic and deterministic) of populations and occupancy. Bayesian models in abundance estimation (Spatial and Non Spatial).Population viability analysis **Practical:** RAMAS/Vortex.	3		2
5.	**Conservation Genetics and Wildlife Forensics** Re fresh: Genetic variation; pedigree management; molecular markers, genotyping; wildlife forensics - overview *Journal article to work on.*	2	2	
6.	**Management & Planning** ReFresh: Captive breeding and propagation, rehabilitation, gene banks, *ex-situ* and *in-situ* linkages. *Journal article to work on.*	2	2	
7.	**Human Wildlife Conflict (HWC)**	2	2	

	Introduction - Lethal (human, livestock, crop, disease); non-lethal; cost and schemes. *Journal article to work on.*			
8.	**Conservation Economics and policy** Values of wildlife; Market incentive; Ecotourism and conservation; PA (direct, indirect, opportunities); Refresh: conservation acts in India; Enforcement of legislation in India	3		
9.	**Excursion** **(Wildlife Institute of India, Ranthombore Tiger Reserve/ Dudhwa Tiger Reserve)** Wildlife Population parameters and census methods for various species(Line Transects and DISTANCE; Mark-recapture Data and MARK); Radio telemetry, GIS demonstration			28 (3 days)
	Total	**18**	**8**	**32**

Evaluation criteria

- 2 Minor tests: 20% each
- Presentation: 20%
- Major test: 40%

Learning outcomes

On completion of the course, the student will be able to analyze and assess threat to wildlife and will be equipped with the basic knowledge on wildlife in India which can be further enhanced to pursue a career in a wildlife conservation organization or higher research.

Pedagogical approach

The classroom lectures will cover the contents of the modules of the course. Major course modulus will have classroom discussions on publishes papers, reports and spread sheet exercises and R Programming. Subject to opportunities in the semester, students will participate in wildlife based events in the capital, undertake field visit and work on a wildlife based topic, interact with subject matter specialists, participate in quizzes and class discussions. The Assignment scheduled in the course will be an opportunity to the students to shape up a project idea through writing a proposal and make presentations

Materials

Required text

1. Caughley G. and Sinclair A.R.E. (Eds.) (1994) *Wildlife Ecology and Management*, Blackwell Science, Cambridge.
2. Hunter M.L., Gibbs J.B. and Sterling E.J. (2008) *Problem-Solving in Conservation Biology and Wildlife Management: Exercises for Class*, Field and Laboratory, Blackwell Publishing.
3. Williams B.K., Nichols J.D. and Conroy M.J. (2002) *Analysis and Management of Animal Populations*, Academic Press, San Diego, California, USA.
4. Woodroffe R., Thirgood S. and Rabinowitz A. (2005) *People and Wildlife, Conflict or Co-existence*? (Conservation Biology), Cambridge University.

Suggested readings

1. Chape S., Spalding M.D. and Jenkins M.D. (Eds.) (2008) *The World's Protected Areas: Status, Values and Prospects in the Twenty-first Century*, University of California Press, Berkeley.
2. Crow J.F. (1986) *Basic Concepts in Population, Quantitative and Evolutionary Genetics*, W.H. Freeman and Company, New York.
3. Hanski I.A. and Gilpin M.E. (editors) (1997) *Metapopulation Biology: Ecology, Genetics and Evolution,* Academic Press, San Diego, California, USA.
4. Nichols J.D. and Karanth K.U. (2002) *Statistical Concepts; Assessing Spatial Distribution*, in

Karanth K.U. and Nichols J.D. (editors) Monitoring Tigers and their Prey, Centre for Wildlife Studies, Bangalore, India.

5. Primack R.B. (2008) *A Primer of Conservation Biology*, 4th Edition, Sinauer Associates, Inc.
6. Rangarajan M. (2001) *India's Wildlife History*, Permanent Black, New Delhi, India.
7. Rodgers W.A. and Panwar H.S. (1988) *Planning Wildlife Protected Area Network in India*, 2 vols, Project FO: IND/82/003, FAO, Dehra Dun.

Case studies
Websites

Journals

1. Journal of Wildlife Management
2. Journal of Zoology

Additional information (if any)

Student responsibilities
Attendance, feedback, discipline, guest faculty etc

Course title: Integrated Watershed Management			
Course code: NRE 167	**No. of credits:** 3	**L-T-P:** 30-12-0	**Learning hours:** 42
Pre-requisite course code and title (if any): NRE 162 Hydrology			
Department: Energy and Environment			
Course coordinator: Dr Chander K. Singh		**Course instructor:** Dr Chander K. Singh	
Contact details: chander.singh@terisas.ac.in			
Course type: Elective		**Course offered in:** Semester 3	

Course Description

The course is conceptualised to provide competency in understanding the impact of landuse changes on various hydrological cycle parameters and soil erosion and choosing suitable soil and water conservation techniques to control it. It tries to touch upon divergent disciplines relevant to this complex topic. The course is designed as an elective to help capacity building of the candidates to undertake research work or professional assignment in the sub-fields of watershed management, which plays a key role in sustainable development.

Course objectives

1. To understand different watershed behaviour
2. To be able to interpret runoff data and quantify erosion by using various modelling methods
3. To understand land use classification and impact of land use changes on hydrological cycle parameters

Course content

Module	Topic	L	T	P
1.	Introduction, watershed behaviour, effects of land use and its change on hydrological cycle components, Land capability and suitability classification	4	2	
2.	Measurement of meteorological (temperature, wind speed, sunshine hours, atmospheric pressure, relative humidity) and hydrological (suspended sediment and bed load) parameters Modelling Runoff with SCS methodology, modifications suggested for Indian conditions, case study	4	4	
3.	Erosion process–Factors affecting erosion, Types of erosion Assessment of erosion, Modelling Erosion using USLE, RUSLE, introduction to few other models, Indian studies, case study	6	2	
4.	Control measures for soil erosion – vegetative and mechanical (including design), for agricultural and non-agricultural lands Wind erosion and its modelling, control measures	6	2	
5.	Crop water management and crop planning with special reference to different agro-ecological zones in India Water conservation practices for deserts	4	2	
6.	Watershed development in India, Common Guidelines, Allocation of funds Wetland management- types, hydrologic conditions and water budget, hydrological and ecological functions, the Ramsar convention	4	0	
7.	Drought and its management-causes and impacts, definition, management objectives and strategy-short term and long term measures	2	0	

	Total	30	12	

Evaluation criteria

- 2 minor tests: 25%
- 2 quiz tests: 15%
- Assignment/tutorial: 20%
- Test 3: 40%

Learning outcomes

- Suggest technical measures for soil erosion control both due to water and wind
- Assess the current status of the watershed at field, by taking up accurate investigation measures and conduct survey
- Suggest drought control measures, water conservation structures, including design

Pedagogical approach

The course will be delivered through class lectures, tutorials and assignment.

Materials

Required text

1. Sharda V.N., Sikka A.K. and Juyal G.P. (2006) *Participatory Integrated Watershed Management: A Field Manual*, Central Soil and Water Conservation Research and Training Institute, 218, Kaulagarh Road, Dehradun.
2. Tideman E.M. (1999) *Watershed Management–Guidelines for Indian Conditions*, Omega Scientific Publishers, New Delhi.

Suggested readings

1. *Common Guidelines for Watershed Development Projects* (2008) Government of India.
2. Dhruva N.V.V. (2002) *Soil and Water Conservation Research in India*, Indian Council of Agricultural Research, KrishiAnusandhanBhavan, Pusa, New Delhi- 110012.
3. Dhruva N.V.V., Sastry G. and Patnaik U.S. (1990) *Watershed Management*, Indian Council of Agricultural Research, New Delhi.
4. Frevert R.K., Schwab G.O., Edminster T.W. and Barnes K.K. (2009) *Soil and Water Conservation Engineering*, 4th Ed, John Wiley and Sons, New York.
5. Jain S.K. and Singh V.P. (2006) Water Resources Systems Planning and Management, Reed Elsevier India Pvt. Ltd., New Delhi.
6. James L.D. and Lee R.R. (1971) *Economics of Water Resources Planning*, McGraw Hill Book Company.
7. Jeffery R. and Vira B. (eds.) (2001) *Conflict and Cooperation in Participatory Natural Resources Management*, Palgrave, Hampshire.
8. Jones C., Palmer R.M., Motkaluk S. and Walters M. (2002) *Watershed Health Monitoring: Emerging Technologies*, Lewis Publishers, Boca Raton, Florida.
9. *Monitoring & Evaluation for Results* (2009) World Bank Institute Training Program: South Asia Regional Course, New Delhi, February, World Bank Institute Evaluation Group, World Bank Institute.
10. *More Water for Arid Lands: Promising Technologies and Research Opportunities* (2001) U.S.NationalAcademy of Sciences, Honolulu, Hawaii.
11. Mukherjee A. (2004a) *Participatory Learning and Action: Monitoring and Evaluation and Participatory Monitoring and Evaluation*, Concept Publishing Company, New Delhi.
12. Mukherjee A. (2004b) *Participatory Rural Appraisal: Methods and Applications in Rural Planning*, Concept Publishing Company, New Delhi.

13. Rajora R. (1998) *Integrated Watershed Management–Field Manual for Equitable, Productive and Sustainable Development*, Rawat Publications, Jaipur.
14. Rao K.V.S. (2003) *Watersheds: Comprehensive Development*, B.S. Publications, Hyderabad.
15. Samra J.S., Sharda V.N. and Sikka A.K. (2002) *Water Harvesting and Recycling: Indian Experiences*, Central Soil and Water Conservation Research and Training Institute, Dehradun.
16. Sharda V.N., Juyal G.P., Prakash C. and Joshi B.P. (2007) *Training Manual, Soil Conservation and Watershed Management Volume I-III*, Central Soil and Water Conservation Research and Training Institute, Dehradun.
17. Singh G., Venkataraman C., Sastry G. and Joshi B.P. (1990) *Manual of Soil and Water Conservation Practices*, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
18. Singh G.D. and Poonia T.C. (2003) *Fundamentals of Watershed Management Technology*, Yash Publishing House, Bikaner.
19. Singh R.V. (2003) *Watershed Planning and Management*, Yash Publishing House, Bikaner.
20. Suresh R. (2002) *Soil and Water Conservation Engineering*, Standard Publishers Distributors, New Delhi.
21. Suresh R. (2005) *Watershed Hydrology*, Standard Publishers Distributors, New Delhi.

Journals
1. Hydrology Journal, Indian Association of Hydrologists, Roorkee
2. Journal of Soil and Water Conservation, Central Soil and Water Conservation, Research and Training Institute, Dehradun
3. Photonirvachak, Journal of Indian Society of Remote Sensing, Dehradun

Additional information (if any)

Student responsibilities
Attendance, feedback, discipline, guest faculty etc



Course title: Applications of geoinformatics for land resources			
Course code: NRG 164	**No. of credits: 3**	**L-T-P: 16-8-36**	**Learning hours: 42**
Pre-requisite course code and title (if any):			
Department: Department of Natural Resources			
Course coordinator(s): Dr. Neeti		**Course instructor(s):** Dr. Neeti/ Dr. C.K. Singh	
Contact details:			
Course type: Core		**Course offered in: Semester 3**	

Course description

This course is designed for students to learn applications of geospatial technology for land resources. The course is designed to quantify different landscape elements using remote sensing. It also introduces mapping of agriculture, forest, soil and minerals using remote sensing and GIS.

Course objectives:

1. To gain broad understanding of the geospatial approaches for detecting and characterizing landscape pattern and the causes of landscape pattern
2. To study utility of geospatial technology for agriculture, forest, soil and minerals detection

Course content (max 15)

Module	Topic	L	T	P
1.	Introduction: Landscape, landscape characterization, patterns and changes, Concepts of landscape Elements and quantification analysis	4		
2.	Quantification of landscape using landscape metrics and remote sensing, Scale issues in landscape observation,	2		
3.	Applications of Geoinformatics (Case studies): land use/land cover mapping, vegetation mapping: Forest type, density and biomass assessment, Change detection, crop type, crop stress due to disaster, habitat suitability mapping	2	2	
4.	Introduction to soils, soil formation models/processes, soil profile, soil classification, spectral reflectance of soil, models of radiation scattered by soil, factors affecting soil spectra, soil mapping	4	4	
5.	Spectroscopy; emission and reflectance spectra, Spectroscopic processes, electronic and vibrational processes, spectral library of minerals; silicates, carbonates, sulphides, arsenates, etc and spectral library of rocks; igneous, sedimentary and metamorphic rocks, alteration minerals	4	2	
	LABS			
1.	Defining Landscape			2
2.	Quantifying patch mosaic: landscape metrics using FragStats			4
3.	Quantifying point and pattern in landscape			2

4.	**Group project:** This will be hands-on training for students. Students will do group project with group size of 2-3 on relevant topics taught in the course			28
	Total	16	8	36

Evaluation criteria:

- Assignments/Tutorials: 20% (All learning outcomes)
- Test1 [Module 1, 2, 3]: 20% (Learning outcome 1 and 2)
- Test2 [Module 4, 5]: 20% (Learning outcome 3 and 4)
- Concept Note for research project: 10%

  (a) Title: 5%
  (b) Introduction: 15%
  (c) Literature review: 20%
  (d) Aim and objectives, research questions: 25%
  (e) Data and method: 15%
  (f) Potential outcomes: 15%
  (g) References: 5%

- Final Presentation: 10%

  (a) Defining the problem (10%)
  (b) Objectives are framed to address the problem (10%)
  (c) Methodology addresses the issue (15%)
  (d) Results orient towards the problem (10%)
  (e) Appropriate findings (15%)
  (f) Presentation (formatting/style/clarity) (10%)
  (g) Viva (30%)

- Final Report: 20%

a) Abstract (clarity and comprehensiveness) (5%)
b) Introduction (scientific background and rationale of study is properly stated, statements are referenced properly) (15%)
c) Literature review (Structure and logic of argument, statements are properly referenced) (15%)
d) Objectives (Logic of argumentation, justification of hypothesis/research questions, Link to actual scientific knowledge) (15%)
e) Material and method (Choice of methodology and their appropriate application Structure, link to objectives, Referencing and use of methodology outlined in literature) (15%)
f) Results (Completeness and clarity, Structure, link to objectives, Tables and figures and their link to the text) (15%)

g) Discussion and Conclusion (Linkage with previous sections, clarity in findings from the study and based on literature, proper interpretation, understanding of limitation of study) (15%)
h) List of references (proper formatting) (5%)

Learning outcomes (Connect with the evaluation criteria mentioned above)

The student will be able to

1. Able to apply different landscape metrics to quantify landscape pattern
2. Use geospatial technology for vegetation mapping
3. Understand spectral properties of soil and mineral geological applications
4. Apply Advanced techniques for soil and mineral mapping
5. Ability to conceptualize and perform a research project

Pedagogical approach

Course Reading Materials (* = compulsory readings)

Module 1:

Gergel, Sarah E., and Monica G. Turner, eds. *Learning landscape ecology: a practical guide to concepts and techniques*. Springer, 2017.

Turner, M. G., Gardner, R. H., O'neill, R. V., Gardner, R. H., & O'Neill, R. V. (2001). *Landscape ecology in theory and practice* (Vol. 401). New York: Springer.

Module 2:

Gergel, Sarah E., and Monica G. Turner, eds. *Learning landscape ecology: a practical guide to concepts and techniques*. Springer, 2017.

Turner, M. G., Gardner, R. H., O'neill, R. V., Gardner, R. H., & O'Neill, R. V. (2001). *Landscape ecology in theory and practice* (Vol. 401). New York: Springer.

Module 3:

Gergel, Sarah E., and Monica G. Turner, eds. *Learning landscape ecology: a practical guide to concepts and techniques*. Springer, 2017.

Turner, M. G., Gardner, R. H., O'neill, R. V., Gardner, R. H., & O'Neill, R. V. (2001). *Landscape ecology in theory and practice* (Vol. 401). New York: Springer.

Module 4:

Wulder, M. A., & Franklin, S. E. (Eds.). (2012). *Remote sensing of forest environments: concepts and case studies*. Springer Science & Business Media.

Steven, M. D., & Clark, J. A. (Eds.). (2013). *Applications of remote sensing in agriculture*. Elsevier.

Module 5:

Diwedi, R.S. (2017). *Remote Sensing of Soils*. Springer

Module 6:

Prost, G. L. (2002). *Remote sensing for geologists. A guide to image interpretation*. CRC Press

Borengasser, M., Hungate, W.S. and Watkins, R., 2007. *Hyperspectral remote sensing: principles and applications*. CRC press.

Advanced Reading Material

Lu, D., Chen, Q., Wang, G., Liu, L., Li, G., & Moran, E. (2016). A survey of remote sensing-based aboveground biomass estimation methods in forest ecosystems. *International Journal of Digital Earth*, *9*(1), 63-105.
White, J. C., Coops, N. C., Wulder, M. A., Vastaranta, M., Hilker, T., & Tompalski, P. (2016). Remote sensing technologies for enhancing forest inventories: A review. *Canadian Journal of Remote Sensing*, *42*(5), 619-641.
Tang, L., & Shao, G. (2015). Drone remote sensing for forestry research and practices. *Journal of Forestry Research*, *26*(4), 791-797.
Healey, S. P., Cohen, W. B., Yang, Z., Brewer, C. K., Brooks, E. B., Gorelick, N., ... & Loveland, T. R. (2018). Mapping forest change using stacked generalization: An ensemble approach. *Remote Sensing of Environment*, *204*, 717-728.
Cohen, W. B., Yang, Z., Healey, S. P., Kennedy, R. E., & Gorelick, N. (2018). A LandTrendr multispectral ensemble for forest disturbance detection. *Remote Sensing of Environment*, *205*, 131-140.
Khanal, S., Fulton, J., & Shearer, S. (2017). An overview of current and potential applications of thermal remote sensing in precision agriculture. *Computers and Electronics in Agriculture*, *139*, 22-32.
Gago, J., Douthe, C., Coopman, R., Gallego, P., Ribas-Carbo, M., Flexas, J., ... & Medrano, H. (2015). UAVs challenge to assess water stress for sustainable agriculture. *Agricultural water management*, *153*, 9-19.
Mulder, V.L., De Bruin, S., Schaepman, M.E. and Mayr, T.R., 2011. The use of remote sensing in soil and terrain mapping—A review. *Geoderma*, *162*(1-2), pp.1-19.
Metternicht, G.I. and Zinck, J.A., 2003. Remote sensing of soil salinity: potentials and constraints. *Remote sensing of Environment*, *85*(1), pp.1-20.
Clark, R.N. and Roush, T.L., 1984. Reflectance spectroscopy: Quantitative analysis techniques for remote sensing applications. *Journal of Geophysical Research: Solid Earth*, *89*(B7), 6329-6340.
Van der Meer, F.D., Van der Werff, H.M., Van Ruitenbeek, F.J., Hecker, C.A., Bakker, W.H., Noomen, M.F., Van Der Meijde, M., Carranza, E.J.M., De Smeth, J.B. and Woldai, T., 2012. Multi-and hyperspectral geologic remote sensing: A review. *International Journal of Applied Earth Observation and Geoinformation*, *14*(1), pp.112-128.
Cracknell, M.J. and Reading, A.M., 2014. Geological mapping using remote sensing data: A comparison of five machine learning algorithms, their response to variations in the spatial distribution of training data and the use of explicit spatial information. *Computers & Geosciences*, *63*, pp.22-33.

Recommended journals for reference

Remote Sensing of Environment
Computer and Geosciences
Geoderma

Additional information (if any)

Student responsibilities

Course reviewers:

Dr. Benidhar Deshmukh, IGNOU, New Delhi



Dr. P. L. N Raju, NESAC

Course title: Applications of geoinformatics for water resources			
Course code: NRG 165	**No. of credits: 3**	**L-T-P: 28-00-28**	**Learning hours: 42**
Pre-requisite course code and title (if any):			
Department: Department of Natural Resources			
Course coordinator(s): Vinay S P Sinha		**Course instructor(s): Vinay S P Sinha**	
Contact details:			
Course type: Core		**Course offered in:** 3rd Semester	

Course description

Course start with basis overview of Remote Sensing and GIS application in Water Resources followed by basic concept of hydrological process and estimation of hydrological parameters. Geospatial technique to evaluate and management of watershed. Further soil, snow, glacier study link with water resources and enhanced the capability to estimate water budget of the watershed. A detail description on ground water with basic knowledge to evaluating the hydrogeomorphology and quality aspects of water. Finally, the water resources link with climate change and hydrological disaster

Course objectives: Enhance the capability and advanced knowledge of Geoinformatic tools and technique to understand, monitor, mapping and management of Water Resources in various aspects.

Course content

Module	Topic	L	T	P
1.	Overview of RS & GIS Application in Water Resources Management; Hydrological Modelling with Geospatial Inputs	2		
2.	Hydrological cycle, Estimation of precipitation, Hydrological Parameter Estimation using RS & GIS; Digital Elevation Model (DEM) hydro-processing,	2		
3.	Drainage network and drainage pattern, watershed definition and scope, morphometric parameter	2		
4.	Watershed Characterization; Watershed Prioritization and Conservation Planning			
5.	Aquatic System; Classification of Wetland and Wetland mapping using Remote Sensing	2		
6.	Water balance studies- interception, soil moisture, evaporation, run off and discharge	2		
7.	Snow/Glacier Mapping, Monitoring and Snow Melt Runoff Model;	2		
8.	Soil erosion and Sediment modelling, Reservoir Sedimentation Assessment using Remote Sensing	2		
9.	Darcy's Law, porosity, permeability, Transmissibility, specific yield, specific capacity, field capacity and depression storage; role of remote sensing in evaluation hydrological investigations	2		

10.	Type of aquifer, aquiclude, aquitard, aquifuge, ground water regimes, application of remote sensing for the hydro geomorphological interpretation and Ground Water Prospects Zonation	2		
11.	Source of Water Pollution, Water quality parameters, Water Quality modelling: Surface and Ground Water quality mapping and modelling	2		
12.	Application of remote sensing in Oceanography: Sea Surface Temperature, Total Suspended Solids, Fishing potential and Coastal wetland.	4		
13.	Monitoring of Hydro-meteorological Disasters and Damage Assessment; Flood Modelling and Early Warning Systems,	2		
Labs:				
1	Stream order, watershed delineation and editing			2
2	Exercise on Water balance modelling (one case study)			6
3	Exercise on Ground Water modelling (one case study)			6
14.	**Group project** The objective of this module is to give hands on experience on tools and techniques learnt throughout the course. Group project (Students will undertake a group project on relevant topics [module 3 to 13]. This module will consist of requisite data download, data processing, analysis and final presentation on any thematic areas [module 3 to 13] at the end of the semester)			14

Evaluation criteria:

- Test 1: 10% [Syllabus—module no.s 1, to 4
- Test 2: 10% [Syllabus—module no.s 5 to 8]
- Test 3: 40% [End of the module no.s 1 to 13]
- Test 4: 40% [Group project module no.s 3 to 13] - Synopsis 10%; Presentation 20%; Report 10%
  (Students will developed a project on application based on from module no.s 3 to 13

Learning outcomes

- Develop appropriate methods for studying and/or solving the problems related to hydrological cycle, estimation of hydrological parameter and water budget with the help of RS&GIS
- Able to provide geo-information science and earth observation technology to watershed management and prioritization
- Hands on training on geoinformatics tools and technique in the application of water resources

Pedagogical approach

Course Reading Materials (* = compulsory readings)

Jensen J. R, Remote Sensing of the Environment: An Earth Resource Perspective, Pearsons, 2009.

Lillesand T, Kiefer RW and Chipman J, Remote Sensing and Image Interpretation, Wiley &Sons. 2009.

Chang K., Introduction to Geographic Information Systems, McGraw-Hill, New York, 2006.

Lo, C.P. and Yeung, A.K.W., Concepts and Techniques of Geographic Information Systems, PHI Leaning Private Limited 2011.

JVS Murty, 2004, "Watershed management" New Age International Pvt Ltd, New Delhi

Ebgman, E.T., and R.J. Gurney. (1991) Remote sensing in hydrology. London, Chapman and Hall

Shamsi UM, GIS Applications for Water, Wastewater, and Stormwater Systems, Taylor and Francis, 2005

Lyon JG GIS for Water Resources and Watershed Management Chen Y, GIS and Remote Sensing in Hydrology, Water Resources and Environment, 2004

Bedient B. Philip and Huber C. Wayne (2002). Hydrlogy and floodplain analysis, Prentice Hall, Upper saddle river, New Jersey. USA. Bastiaanssen,

W.G.M. 1998. Remote sensing in water resources management: the state of the art. Colombo, Sri Lanka: IWMI

Karanth, K.A, 2008, Ground water assessment Development and management. Tata McGraw Hill

Recommended journals for reference

Journal of the American Water Resources Association
Climate change
Australian Journal of Water Resources
International Journal of Ecology and Environmental Sciences
International Journal of Disaster Risk Science
Aquatic Procedia
Hydrological Sciences journal
Journal of Hydrology
Geoscience Frontiers
Global Environmental Change
Modeling Earth Systems and Environment
Agricultural Water Management

International Journal of Water Resources and Environmental Engineering
Additional information
Student responsibilities

Course reviewers:
Dr M P Punia, Sr. Scientific Officer, Department of Remote Sensing, BIT (Mesra), Jaipur

Prof R B Singh, Head Department of Geography Delhi University

Course title: Applications of geoinformatics for atmosphere

Course code: NRG 166	**No. of credits: 3**	**L-T-P: 14-14-28**	**Learning hours: 42**

Pre-requisite course code and title (if any): Prior knowledge of remote sensing and image processing

Department: Dept of Natural Resources

Course coordinator(s): Dr Anu Rani Sharma	**Course instructor(s):** Dr Anu Rani Sharma

Contact details:

Course type: Core	**Course offered in:** Semester 3

Course description

The analysis of satellite measurements is critical in weather, climate studies, air quality etc. and transforming these observations into information is a current challenge in the developing world. This course deals with study of earth's atmosphere using data obtained from geostationary and polar orbiting satellites for meteorological and atmospheric science applications. This course will provide fundamental understanding about meteorological and atmospheric remote sensing as well as operational and future satellite missions. It will also deal with satellite image interpretation for identification of several weather phenomena, cloud types, aerosols etc. This course will further focus on various applications of satellite-derived parameters in meteorology, weather forecasting, air quality and climate monitoring.

Course objectives

1.To provide fundamental understanding about meteorological and atmospheric processes and its association with coupled human – environment system

2.To provide fundamental understanding about current and future satellite missions and weather forecasting

3.To utilize satellite-based observations to monitor the environment, meteorological processes/phenomena and air quality

Course content

Module	Topic	L	T	P
1.	**Fundamentals of Meteorological and atmospheric remote sensing** The objective of this module is to gain familiarity with fundamentals of meteorological and atmospheric process through remote sensing. Following topics will be introduced in the module. Principles of Geoinformatics in Meteorology and Atmospheric sciences, Operational and future satellite missions for aerosols, clouds and trace gases (Terra/Aqua MODIS, Calipso, Cloudsat, AURA OMI, INSAT series etc.), Atmospheric Radiative transfer	4		
2.	**Weather observation from space** The objective of this module is to gain familiarity with satellite image interpretation for identification of various weather and atmospheric phenomena. Following topics will be introduced in the module.	2	4	

	Satellite Image interpretation (Visible, IR and Water vapor), Identification of cloud type, water vapour, precipitation and atmospheric aerosols from satellite imagery			
3.	**Application of Satellite–derived parameters in Meteorology and atmospheric sciences** The objective of this module is to gain familiarity with applications of satellite derived parameters for various domains. Following topics will be introduced in the module. Atmospheric aerosols, trace gases and Air quality Tropical cyclones (satellite tracking of cyclones, Dvorak's technique, genesis and intensity), Cyclone warning system in India and dissemination Fog phenomena Atmosphere-Ocean interactions (El Nino, La Nina, ENSO, IOD (Indian Ocean Dipole) Indian summer monsoon–Onset, Active/Break cycles, retreat Weather Forecasting and data assimilation	8	10	

Lab

Module	Topic	**L**	**T**	**P**
1.	Introduction to SBDART and OPAC			2
2.	Satellite image interpretation for identifying cloud types, water vapor, atmospheric aerosols, phenomena etc.			4
3.	Introduction to Grid Analysis and Display System (GrADS)			8
4.	**Group project** The objective of this module is to give hands on experience on tools and techniques learnt throughout the course. Students will undertake a group project on relevant topics. This module will consist of requisite data download, data processing, analysis and final presentation at the end of the semester			14
	Total	**14**	**14**	**28**

Evaluation criteria

- Test 1: Written test (at the end of teaching of modules 1 and 2) - 20%
- Test 2: Written test (at the end of teaching of modules 3) - 20%
- Test 3: Written test [at the end of the semester, full syllabus] – 30%
- Final presentation of group project (at the end of the semester) - 30%

Final presentation of group project will be evaluated on following basis –

- Novelty of the work (10%)
- Oral presentation skills and logical flow of information (10%)

Viva (10%)

Learning outcomes

By the end of the course, students will:

- command a critical understanding of physical principles behind meteorological and atmospheric remote sensing [test 1 and 2]
- be able to interpret satellite images for various meteorological and atmospheric phenomena [test 2]
- be able to interpret information from various satellite derived parameters [test 3]
- enhance their knowledge in satellite remote sensing and ready to use this to achieve their professional career goals

Pedagogical approach

Lectures, lab exercises, tutorials, visits

Course Reading Materials

1. Ahrens C.D. (1999) Meteorology today, Brooks/Cole, 6th edition.
2. Cobb A.B. (2003) Weather Observation Satellites, Rosen Publishing Group.
3. Kelkar R.R. (2007) Satellite Meteorology, B S Publications, Hyderabad.
4. Kidder S.Q. and Vonder T.H. (1995) Satellite Meteorology–An Introduction, Haar Academic Press, New York
5. Wallace J.M and Hobbs P.V. (2006) Atmospheric Science; An introductory survey book, 2nd addition, Academic press, Elsevier

Advanced Reading Material

Advanced reading material will be provided to the students as and when required.

Recommended journals for reference

1. Advances in Meteorology
2. Atmospheric Environment
3. Climate Dynamics
4. Journal of Geophysical Research
5. Geophysical research letters

Additional information

Student responsibilities: Attendance, Feedback, discipline

Course Reviewers

Dr Shailesh Kumar Kharol

Air Quality Research Division | Direction recherche sur la qualité de l'air

Environment and Climate Change Canada / Environnement et Changement climatique Canada
4905 Dufferin Street | 4905, rue Dufferin, Toronto, Canada

Dr. P. L. N. Raju
NE-SAC, ISRO, Shilong, Meghalaya

Course title: Advances in remote sensing: Thermal, Hyperspectral, Microwave, LIDAR and UAV			
Course code: NRG 181	**No. of credits:** 4	**L-T-P:** 26-13-34	**Learning hours:** 73
Pre-requisite course code and title (if any): NRG 172 & NRG 178			
Department: Natural Resources			
Course coordinator: Dr Nithiyanandam		**Course instructor:** Dr Nithiyanandam	
Contact details: nithiyanandam.y@terisas.ac.in			
Course type: Core		**Course offered in:** Third semester	

Course Description:
This course will provide an opportunity to understand and work with advanced developments in Remote Sensing and covers a wide range of remote sensing data interpretation and processing techniques.

Course objectives:
To teach basics of Thermal, Hyperspectral, Microwave and UAV remote sensing, and to inculcate practical skill for processing advance remote sensing datasets for various applications including natural resources management.

Course content

Module	Topic	L	T	P
1.	Thermal remote sensing ▪ Introduction: Laws and definitions –Thermal emission characteristics – Physics behind thermal mapping (including thermal inertia)– Errors and assumption in thermal remote sensing – Modelling Thermal data ▪ Processing and Analysis: Radiometric Calibration of Satellite and Airborne Thermal data – TIR Image processing – Emissivity databases – visual and quantitative image interpretation of TIR data – Data fusion ▪ Applications of thermal imagery – UHI and coal mine fire mapping.	6	3	
2.	Hyperspectral remote sensing ▪ Introduction: Imaging spectroscopy–History and development of Hyperspectral remote sensing – working principles of imaging spectrometers – hyperspectral sensors ▪ Processing and Analysis: Data preparation and Transformation– Atmospheric correction–End member detection and extraction– spectral unmixing–target and anomaly detection ▪ c. Applications of hyperspectral imagery – Mineral and vegetation mapping.	6	3	
3.	Microwave remote sensing ▪ Introduction: Active and passive microwave systems – basic principle of Radar/SAR (Geometric and statistical properties and imaging geometry) –Radar Relief displacement (Foreshortening, Layover, Shadow & Speckle) ▪ Processing and interpretation: Filters– Radar interferometry and polarimetry ▪ c. Applications of microwave remote sensing – ocean topography and flood mapping.	8	4	
4.	LIDAR ▪ Introduction: Principles and Geometry– sensor and platforms ▪ Processing and interpretation: Data processing – Quality control– information extraction. ▪ c. Applications of LIDAR – land surface topography and 3D mapping.	4	2	
5.	Unmanned Aerial Vehicle (UAV): Overview of the technology, data visualization, and interpretation.	2	1	
	Total	**26**	**13**	**0**
Exp. No.	**Labs**			
1.	Land surface emissivity estimation and compare outputs of two estimation techniques			4
2.	Estimate land surface temperature and analyse its spatial variation with respect to different land cover types			4

3.	Pre-processing hyperspectral datasets (Data preparation, Spectral analysis, atmospheric correction)			2
4.	Spectral analysis comparing hyperspectral and multi-spectral datasets			2
5.	Target detection using the hyperspectral data			2
6.	Dimension reduction analysis with hyperspectral data			2
7.	SAR imagery pre-processing			4
8.	Radar Bathymetry			4
9.	Lidar data visualisation, quality checking and basic processing in latosols			4
10.	Surface and terrain model creation using Lidar data (			4
11.	UAV data visualization			2
	Total	**26**	**13**	**34**

Evaluation criteria

Test I: 15 %	(Module 1& 2) (learning outcome 1 & 2)
Test II: 15%	(Module 3&4) (learning outcome1 & 2)
Practical: 30%	(Module 1:5) (learning outcome 3)
Test III: 40%	(Module 1:5) (learning outcome 1 & 2)

Learning outcomes:

Upon completion of this course, a fully engaged student shall be able to:

1. Comprehend the basics of thermal, hyperspectral, microwave, LIDAR and UAV remote sensing.
2. Process and interpret thermal, hyper spectral, microwave, LIDAR datasets.
3. Utilize skills obtained for different applications of thermal, hyper spectral, microwave, LIDAR remote sensing.

Pedagogical approach: Interdisciplinary learning, discovery learning, peer teaching, practical and case studies.

Materials: Books

Module 1:

- Kuenzer, C., & Dech, S. (2013). Thermal Infrared Remote Sensing, ISBN 978-94-007-6639-6.
- Quattrochi, D., & Luvall, J. (2004), Thermal Remote Sensing in Land Surface Processing, CRP Press, ISBN: 978-0-415-30224-1.

Module 2:

- Marcus Borengasser, William S. Hungate, Russell Watkins (2007) Hyperspectral Remote Sensing: Principles and Applications, CRC Press.
- Ruiliang Pu (2017), Hyperspectral Remote Sensing: Fundamentals and Practices, CRC press.

Module 3:

- H. Woodhouse (2005). An introduction to microwave remote sensing. Taylor and Francis, London.
- J.S. Lee, E.Pottier (2008), Polarimetric Radar Imaging: From Basics to Applications, CRC Press
- Oliver and Quegan (1998). Understanding synthetic aperture radar images. Artech House.
- Van Zyl, J., & Kim, Y (2011), Synthetic Aperture Radar Polarimetry, John Wiley & Sons, Inc,
- Van Zyl, J., & Kim, Y (2011), Synthetic Aperture Radar Polarimetry, John Wiley & Sons, Inc,

Module 4:

- Qihao Weng (2011), Advances in Environmental Remote Sensing: Sensors, Algorithms, and Applications, CRC Press.
- Qihao, Weng (2012), An Introduction to Contemporary Remote Sensing, McGraw-Hill Professional, ISBN: 978-0-071-74011-1.

Module 5:

- Gianluca C, Andras S, Gergely S (2017), Small Flying Drones, Applications for Geographic observation, Springer, ISBN:978-3-319-66576-4

Journals references

- ISPRS Journal of Photogrammetry and Remote Sensing
- Journal of Indian Society of Remote Sensing
- Remote Sensing of Environment

Magazines

- Coordinates
- Geospatial world

- GIM International **Others** Other online materials including case studies will be shared time to time.
Additional information (if any)
Student responsibilities: The students are expected to read supplementary materials provided along with the course to get holistic knowledge about the subject. Further expected to complete practical exercises and assignments on time.

Course Reviewers:

1. Professor Qiao Weng, Director, Center for Urban and Environmental Change; Professor, Department of Earth & Environmental Systems, Indiana State University, Terre Haute, IN 47809, USA.
2. Professor Muralikrishna V Iyyanki, Dr Raja Ramanna Distinguished fellow at DRDO, Hyderabad, India.
3. Dr. Nusret Demir, Space Sciences and Technologies Division, Akdeniz University, Turkey.



Course title: Minor Project			
Course code: NRG 107	**No. of credits:** 02	**L-T-P:** 0-0-42	**Learning hours:** 42
Pre-requisite course code and title (if any):			
Department: Natural Resources			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered:** In the third semester	
Course Description: The minor project for MSc Geoinformatics students is projected to acquire practical knowledge in Geoinformatics. The students are directed to undertake a project in an industry/institution related to Geoinformatics for 6-8 weeks			
Course objectives: The objective of the minor project is to provide an opportunity for students to undertake short research training outside the classroom to solve real-world issues. That mainly involves the application of geoinformatics as a part of its solution, through a short project with an external institution/organization or TERI SAS.			
Evaluation criteria [time of evaluation] The marks obtained by students in the minor project would be graded as per absolute grading scale given by the university (*Annexure 1*). The distribution of marks for the minor project work as follows: a. Timeline adherence – 10% [the marks are distributed among joining report, progress reports, feedback form and Dissertation submission] b. Supervisor feedback – 10% [A feedback e-form would be sent to the supervisor of the host organization at the end of the course] c. Dissertation – 30 %[Dissertation submitted in the format prescribed in the guideline will be evaluated by the examiner/s. The Dissertation submitted by the student will undergo a similarity check, and a penalty for plagiarism would be imposed as per the university policy (*Annexure 2*)] d. Oral presentation / viva voce – 50% [An evaluation panel consist of internal faculty members and External/s (whenever necessary) would evaluate the oral presentation at the end of the course].			
Learning outcomes: A fully engaged student shall be able toget exposure to undertakea short research project. Also, able to communicate and demonstrate the learning through structured thesis and oral presentation.			
Pedagogical approach: Student's conduct research under the mentorship of the research supervisor/s in an organization on a topic mutually agreeable to them. The minor project coordinator oversees the process and mentor students whenever required. The guideline issued by the programme before the implementation of the minor project shall detail the mode of execution, reporting and evaluation. The outcome of the project is evaluated through an oral presentation and the dissertation.			
Additional information: For detailed process including timelines for submissions, format for various reports, and other items related to the thesis student should refer the minor project guideline uploaded in the student portal.			
Student responsibilities: The students are expected to be in constant touch with the minor project coordinator and to follow minor project guideline strictly.			
Course reviewers: Dr Shefali Agarwal, Group Head, Geospatial Technology & Outreach Programme Group, IIRS (ISRO). Ms Seema Joshi, GM & Head – Strategic Solutions & Technology, Esri India			

Prepared by Dr Nithiyanandam, Assistant Professor, DNR.

Annexure 1: Minor project grading scale

Table1. The absolute grading scale for the minor project

Mark obtained	Grade
>90	A+
>80≤90	A
>70≤80	B+
>60≤70	B
>50≤60	C+
>45≤50	C
>40≤45	D
≤40	F

The students scoring overall marks less than or equal to 40% (≤ 40%) in the evaluation would be considered unsuccessful and would be graded F (fail).

Annexure 2: Plagiarism in the Dissertation

TERI SAS strongly encourages its students to submit the original dissertation work without plagiarism. TERI SAS has zero-tolerance for plagiarism. The similarity detected in the Dissertation submitted by the student would be investigated by the MPEC members to verify the level of plagiarism by looking at similarity identified at various sections of the thesis. The committee would determine the final percentage of plagiarism. The penalty for plagiarism shall be imposed as per table 2 in line with the UGC notification dated 23rd July 2018 on "Promotion of academic integrity and prevention of plagiarism in higher education institutions, REGD. NO. D. L.-33004/99". The students are responsible for resolving the similarity in consultation with the supervisor, and for ensuring the document deemed fit for final submission upon written consent of the supervisors to the minor project coordinator along with the list of amendments.

Table 2. Different levels of plagiarism and its corresponding penalty (in line with UGC guidelines) for minor project dissertation.

Levels of Plagiarism	Percentage of similarity	Penalty
Level 3	> 60%	Student's registration to the program stands cancelled
Level 2	> 40% ≤ 60%	The student repeats the minor project next year
Level 1	> 10% ≤ 40%	The student needs to revise and resubmit the thesis within a stipulated period decided by the MPEC not exceeding six months
Level 0	≤ 10%	Minor similarities, no penalty



Course title: Geocomputation			
Course code: NRG 167	**No. of credits:** 3	**L-T-P:** 22-8-24	**Learning hours:** 42
Pre-requisite course code and title (if any): NRG172, NRG163, NRE111			
Department: Department of Natural Resources			
Course coordinator: Dr Neeti	**Course instructor:** Dr Neeti/Dr. Deepty		
Contact details:			
Course type: Elective	**Course offered in:** Semester 3		

Course Description

The volume and complexity of available spatial data are many times difficult to analyze using traditional analytical modeling methods. Therefore, there is an increasing need to exploit the power of computational environments to analyze geographic phenomena with a minimum of simplifying assumptions. This course provides introduction to the use of computational intelligence methods for exploring, analyzing, modeling and simulating geographic phenomena.Techniques discussed include spatial optimization, pattern recognition, machine learning techniques and simulating complex spatiotemporal systems. Four major areas of geocomputation are discussed in this course.

Course objectives

1. To understand advanced techniques useful for pattern recognition in remotely sensed data.
2. To develop knowledge of tools, techniques, and methods used in spatial simulation
3. To develop skills on applications of spatial optimization techniques for problem solving
4. To understand spatio-temporal models for gridded image time series

Course content

Module	Topic	L	T	P
1.	Machine learning algorithms for classification and regression: Artificial Neural Network, Decision tree classification, SVM, Random Forests	4	2	
2.	Spatial Optimization: Location modelling: Facility location, Route location and location choice modelling	4	2	
3.	Spatial simulation: cellular automata models, agent base models (Netllogo)	8		
4.	Time Series Analysis: classification, components, concept of stationarity, decomposition of time series, trend detection and slope estimation, ARIMA	4	2	
5.	Applications of Data Analytics in Geoinformatics	2	2	
	Labs			
1.	Classification and regression using ANN			2
2.	Classification and regression using SVM			2
3.	Classification and regression using Decision Tree and RF			2
4.	Mapping spatial entities (e.g., traffic, land use/landcover)			4
5.	Analyzing spatial patterns and behavior			2
6.	Simulating Spatial Changes			6
7.	Decomposition of time series			2
8.	Detection of trend and estimation of slope using parametric and non-parametric approach			2

9.	Fitting ARIMA model			2
	Total	**22**	**8**	**24**

Evaluation criteria

- Test1: Written Test: 20% [Module 1,4,5] (learning outcome 1,4,5)
- Test2: Written Test: 20% [Module 2, 3] (learning outcome 2,3)
- Lab Assignments/Tutorials: 20% (All the learning outcomes)
- Test3: Written Test 40% (All the learning outcomes)
  (Test 3 include entire syllabus)

Learning outcomes

Students will be able to

1. Able to apply machine learning algorithm on a dataset and interpret the result
2. Explain how complex spatial models can address solving and understand environmental and social and management challenges
3. Describe the range of tools and techniques that fall within the collection of spatial analytical models
4. Critically analyse a time series data and provide important findings based on them
5. Apply the techniques taught in the class on geospatial dataset

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials

Course Reading Materials

Module 1: Lantz, B. (2013). *Machine learning with R.* Packt Publishing Ltd. (Chapter 5,6,7, 11)

Module 2: Chan, Y., 2005. *Location, transport and land-use: modelling spatial-temporal information.* Springer Science & Business Media.

Module 3: Longley, P. and Batty, M., 2003. *Advanced spatial analysis: the CASA book of GIS.* ESRI, Inc..

Module 4: Makridakis, S., Wheelwright, S. C., & Hyndman, R. J. (2008). *Forecasting methods and applications.* John wiley & sons.

Module 5 Karimi, H. A. (2014). Big Data: techniques and technologies in geoinformatics. CRC Press.

Advanced Reading Material

1. Weng, Q. (Ed.). (2018). *Remote Sensing Time Series Image Processing*. CRC Press.
2. Bishop-Taylor, R., Tulbure, M. G., & Broich, M. (2018). Evaluating static and dynamic landscape connectivity modelling using a 25-year remote sensing time series. *Landscape Ecology*, 33(4), 625-640
3. Maxwell, A. E., Warner, T. A., & Fang, F. (2018). Implementation of machine-learning classification in remote sensing: An applied review. *International journal of remote sensing*, 39(9), 2784-2817.

Additional information (if any)

Magazines

1. Coordinates 2. GIM International 3. GIS World
Student responsibilities Attendance, feedback, discipline etc

Course reviewers:

Prof. S. Ratick, Graduate School of Geography, Clark University, USA

Mr. G. Fiske, Senior Geospatial Analyst, Woods Hole Research Center, USA

Course title: Advances in GIS and Current Trends			
Course code: NRG 179	**No. of credits:** 4	**L-T-P:** 22-10-48	**Learning hours:** 56
Pre-requisite course code and title (if any):			
Department: Department of Natural Resources			
Course coordinator: Dr.Anu Rani Sharma		**Course instructor:** Mr Piyush Dubey	
Contact details:			
Course type: Core		**Course offered in:** Semester 3	

Course Description

This course is designed to introduce Web GIS, programming concepts for constructing high quality web mapping applications, participatory GIS, mobile GIS and fundamental concepts behind Internet of Things. The course will be delivered using both COTS and FOSS platform and related programming tools to customize web-mapping applications and to develop distributed GIS based web services.

Course objectives

1. Introduces new ways of data collections, dissemination and applications of GIS technology
2. Provide state-of-art technical skills to build Web GIS applications and the knowledge needed to choose from various Web GIS development options
3. Introduces fundamental concepts of Internet of Things and its applications in GIS

Course content

Module	Topic	L	T	P
1.	Introduction to Web mapping, Web publishing technology: CSS and HTML	2		
2.	WebGIS: Concept of WebGIS, Server Architecture, Web server, Application server, Database server, GIS server	2	2	
3.	Web server: IIS server, apache tomcat / GIS server: ArcGIS server, Geoserver / Database server: Oracle, postgreSQL	2		
4.	Database Management in Oracle and PostgreSQL, sde architecture in Oracle and PostgreSQL	2		
5.	Introduction to GIS web services: WMS, WFS, WMTS, Mapservices, Feature Services. Publishing Spatial data as one of the above specified web services	2	2	
6.	Web Mapping: Introduction, Geospatial web services, Geospatial mashups	2		
7.	Participatory GIS and Mobile GIS	2	2	
8.	Distributed GIS System	2		
9.	Internet GIS : Web mapping application using open source api to consume GIS web services in web application.	4	2	
10.	Internet of Things: Introduction, Designing principles for connected devices, Internet Principles, Embedded devices and codes (sensors, actuators, platform: Arduino, Raspberri Pi), Applications in GIS	2	2	
	LAB			
1.	Creating a webmap using Google map and ArcGIS online			4
2.	Write a page using HTML and CSS			4

3.	Creating web application using spatial data			4
4.	Writing query in PostgreSQL and creating a customized map			8
5.	Creating a geodatabase using ArcSDE			4
6.	Creating web maps using different web services: leaflet, geoserver			8
7.	Development of distributed GI services application			4
8.	Development of mobile app			6
9.	Creating a web based map using open source API			6
	Total	**22**	**10**	**48**

Evaluation criteria

- Test 1: 15% [Modules 1, 2 and 3] (Learning outcome1)
- Test 2: 15% [Module 4,5 and 6] (Learning outcome 1,2 and 3)
- Assignment/tutorial: 20% [every week] (All the learning outcomes over semester)
- Lab Exam: 20% [from all modules at the end of semester] (All the learning outcomes)
- Test 3: 30% [All the modules] (All the learning outcomes)

Learning outcomes

After completion of this course students should be able to

1. Assess benefits and challenges of development of web based application in GIS
2. Differentiate between webGIS, mashup, mobile GIS
3. Critically examine the internal workings of "communities" and "mapping."
4. Able to develop web based application in GIS

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials

Course Reading Materials

1. Peng, Z. R., & Tsou, M. H. (2003). *Internet GIS: distributed geographic information services for the internet and wireless networks*. John Wiley & Sons.(Module 1-6)
2. Sheehan, M. (2015). *Developing Mobile Web ArcGIS Applications*. Packt Publishing Ltd. (Module 7)
3. Weiner, D., & Harris, T. M. (2008). Participatory geographic information systems. *The handbook of geographic information science*, 466-480. (module 7)
4. McEwen, A., & Cassimally, H. (2013). *Designing the internet of things*. John Wiley & Sons (Module 10)

Advanced Reading Material

1. McCord, P., Tonini, F., & Liu, J. (2018). The Telecoupling GeoApp: A Web-GIS application to systematically analyze telecouplings and sustainable development. *Applied Geography*, 96, 16-28.
2. Al-Sahly, A., Hassan, M. M., Al-Rubaian, M., & Al-Qurishi, M. (2018, April). Using GIS for Measuring Mobile Tower Radiation on Human. In 2018 *1st International Conference on Computer Applications & Information Security (ICCAIS)* (pp. 1-6). IEEE.
3. Radil, S. M., & Anderson, M. B. (2018). Rethinking PGIS: Participatory or (post) political

GIS?. *Progress in Human Geography*, 0309132517750774.

4. Cao, H., & Wachowicz, M. (2019). The design of an IoT-GIS platform for performing automated analytical tasks. *Computers, Environment and Urban Systems*, 74, 23-40.

Recommended journals for reference

5. Journal of Digital Earth,
6. Computers, Environment and Urban System
7. Computer and Geosciences

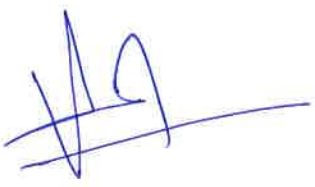
Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course reviewers: s

1. Prof. C. Jeganathan, BIT Mesra, Ranchi.
2. Mr. Greg Fiske, Senior Geospatial Analyst, WHRC, USA



Annexure 1.1.3.1.A Technical and a Skill-oriented programme 22 courses

1.1.3 Average percentage of courses having focus on employability/ entrepreneurship/ skill development (10)

SN	Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of introduction	% of employability/ entrepreneurship/ skill development
1	Principles of Cartography	NRG 171	MSc Geoinformatics	Map preparation tools, techniques and concepts	2008	100%
2	Principles of GIS & GNSS	NRG 175	MSc Geoinformatics	Fundamentals of GIS, GPS, data models, data sources, databases, cartography, introduction to Global Positioning Systems (GPS) and geospatial metadata	2008	100%
3	Principles of Remote Sensing	NRG 173	MSc Geoinformatics	Basic concepts and the operational skills necessary to acquire remote sensing data and extract geo-information from them	2008	100%
4	Environmental Statistics	NRE 111	MSc Geoinformatics	Applications of statistics in environmental management, life sciences & decision making	2012	100%
5	Project Management	NRG 103	MSc Geoinformatics	Prepare students for working in various projects right from conceptualization stage to delivery of spatial product.	2008	100%
6	Fundamentals of computers and programming	NRG 101	MSc Geoinformatics	Fundamentals of computer science, RDBMS and programming for GIS customization.	2008	100%
7	Technical Writing	NRE 101	MSc Geoinformatics	The student should be able to organize information for a report, a scientific paper and a proposal	2012	100%

8	Photogrammetry	NRG 170	MSc Geoinformatics	This course introduces photogrammetry as a data acquisition tool, and provides a general overview of its theory and working principles.	2008	100%
9	Digital Image Processing and Information Extraction	NRG 172	MSc Geoinformatics	This course will introduce fundamental technologies for digital image: compression, analysis, and processing	2008	100%
10	Spatial data Modelling and GIS Applications	NRG 174	MSc Geoinformatics	The course covers fundamental aspects of spatial data modeling specifically on the aspect of three-dimensional (3D) modeling, structuring, raster and vector analysis	2008	100%
11	Multivariate Data Analysis	NRE 112	MSc Geoinformatics	Introduce the language of multivariate data analysis. Understand the characteristics of multivariate quantitative research, including strengths and weaknesses.	2012	100%
12	Research Methodology and thesis writing	NRE 173	MSc Geoinformatics	Introducing the student to the fundamental concepts and terminology of research as they relate to the field of research	2012	100%
13	Advances in Remote Sensing	NRG 177	MSc Geoinformatics	Latest developments in the Remote Sensing; covers wide range of remote sensing data interpretation and their processing techniques.	2008	100%
14	Advances in GIS and current trends	NRG 179	MSc Geoinformatics	New ways of data collections, dissemination and applications of GIS technology.	2008	100%

15	Applied Mathematics	NRE 113	MSc Geoinformatics	Foundation course to meet the requirement of mathematical knowledge in various subsequent courses	2014	100%
16	Programming in geoinformatics	NRG108	MSc Geoinformatics	The course introduces programming required for both GIS and remote sensing analysis to the students	2018	100%
17	Environmental modelling	NRE 171	MSc Geoinformatics	To provide introduction to the fundamental modelling concepts and their applications in simulating the pollutant fate and transport problems in the natural environmental systems.	2012	100%
18	Application of Geoinformatics for Land Resources	TBD	MSc Geoinformatics	Will be updated after final content updation in AC meeting	2018	100%
19	Application of Geoinformatics for Water resources	TBD	MSc Geoinformatics	Will be updated after AC meeting	2018	100%
20	Application of Geoinformatics for Atmosphere	TBD	MSc Geoinformatics	Will be updated after AC meeting	2018	100%
21	Geocomputation	TBD	MSc Geoinformatics	Will be updated after AC meeting	2018	100%
22	Major Project	NRG 104	MSc Geoinformatics	Provides industrial/research training to students.	2008	100%



Read on 22/1/18

Annexure 1.1.3.1.B Collaboration with Kalindi College, New Delhi and University of Sri Jayewardenapura, Srilanka

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE TERI SCHOOL OF ADVANCED STUDIES
New Delhi, India

AND

FACULTY OF GRADUATE STUDIES,
UNIVERSITY OF SRI JAYEWARDENAPURA,
Nugegoda,, Sri Lanka

1. By this Memorandum the TERI School of Advanced Studies, India, and Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP), wishing to establish collaborative relations, agree to cooperate with each other. The areas of cooperation may include any program at either institution that could help foster and develop the relationship. The terms of cooperation for each activity under the *Memorandum of Understanding* shall be mutually discussed and agreed upon in the future, should the need arise, and shall be subject to appropriate and separate *Agreements*. Cooperation shall be carried out through activities such as;

    a. Exchange of faculty and/or staff.
    b. Joint research activities and publications.
    c. Collaboration in activities such as seminars, workshops and conferences.
    d. Special short-term academic programs, with prior approval from each institution's respective authorities.
    e. Short and medium-term research visits for graduate students (Master's and Doctoral) and postdoctoral fellows, with prior approval from each institution's respective authorities.
    f. Joint supervision for doctoral candidates and / or collaborative degrees.
    g. Exchange information pertaining to developments in teaching, learning and research

For the activities described above to take place, a *Grant* or an *Agreement* must be formally in place.

2. The *Memorandum of Understanding* imposes no financial obligation on either institution; co-operative activities that require funding should not be initiated before the necessary resources have been secured.

3. This MoU outlines the framework of a working relationship between the parties. Except as expressly noted, it is not intended to constitute a contract, but is built on goodwill and is binding in honour only.

4. Each institution shall designate a liaison officer to develop and coordinate the specific activities.

5. Each institution name or logo will be used only with express written consent from the senior executive of the other institution or his/her designate.

6. The Intellectual Property policies in place at each institution shall apply to the activities initiated and implemented by the respective researchers.

7. Participants under this *Memorandum of Understanding* will be selected on the basis of merit without regard to race, national or ethnic origin, colour, religion, age, sex, marital status, physical handicap, or sexual orientation. TERI School of Advanced Studies and Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP) will each accept the participants selected by the other Party if mutually acceptable academic and/or professional qualifications and standards are met. All participants will be treated in the same non-discriminatory manner in carrying out the provisions of this *Memorandum of Understanding*, subject to the provisions of the policies and requirements of each of the institutions.

8. This *Memorandum of Understanding* shall remain in force for a period of five (5) years from the date of the last signature and may be renewed on mutual agreement. Either institution may terminate their involvement with six months advance written notice to the other institution.

9. The activities under the MoU shall be undertaken in accordance with established statutes, regulations, policies, procedures and laws of the TERI School of Advanced Studies in India and Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP) in Sri Lanka.

Name:	Prof. Sampath Amarathunga	**Name:**	Capt.Pradeep Kr.Padhy (Retd.)
Title:	Vice-Chancellor	**Title:**	Registrar
Institution:	Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP)	**Institution:**	TERI School of Advanced Studies
Signature:		**Signature:**	
Date:	6th June 2018	**Date:**	21 Aug 2018

school of advanced studies
(a Deemed University)
(Set up under Section 3 of the UGC Act, 1956)
Accredited by NAAC with A++ Grade

TERI School of Advanced Studies
10, Institutional Area
Vasant Kunj
New Delhi – 110 070

Tel. 7180 0222
Fax 2612 2874
India +91 • Delhi (0) 11

MEMORANDUM OF UNDERSTANDING

This is a Memorandum of Understanding between TERI School of Advanced Studies (TERI SAS), New Delhi and Kalindi College, Delhi University, New Delhi for initiating scientific studies on microbial diversity in Forest Landscape Restoration initiatives at TERI SAS.

Kalindi college will provide the basic infrastructure and available equipment for the project. TERI SAS will provide the chemicals and other consumables alongwith labour charges if any. TERI SAS will also provide certification to the students of Kalindi College for the work undertaken by them in the project.

Following shall be the activities carried out by the two institutions:

A. Kalindi College :
   1. To isolate the microbes from the three types of soil samples
      a. Reclaimed and un restored land
      b. Reclaimed sites with afforestation and
      c. Overburdens
   2. To identify and characterise the bacteria isolated from the aforementioned types of soil
   3. To create a database and assess the changing diversity if any correlated with changing soil profile

B. TERI SAS :
   1. To do a spore count of arbuscular mycorrhizal fungi (AMF) from the soil of the site.
   2. To apply the enumerated AMF to the reclaimed site.
   3. To assess effect of AMF on the inoculated plants.

In addition to the aforementioned activities, both the institutions will work towards the pursuit of higher education through faculty and students participation in scientific research.

This MOU shall be valid until March 31st 2018 and will be extended with mutual consent of both the institutions.

Dated 27 December 2017

Capt.Pradeep Kr.Padhy (Retd.)
Registrar
TERI School of Advanced Studies
Vasant Kunj, New Delhi

On behalf of TERI School of Advanced Studies

06.1.18

(Anula Maurya)
Principal
Kalindi College
East Patel Nagar, New Delhi

On behalf of Kalindi College

Capt. Pradeep K Padhy (Retd.)
Registrar
TERI School of Advanced Studies
10, Institutional Area, Vasant Kunj
New Delhi-110070

Annexure 1.3.1 Environment and Sustainability, Human Values and Professional Ethics

Course Code	Course title	Integrations of cross cutting issues into the curriculum			Justification
		Gender	Environment and Sustainability	Human values and professional ethics	
NRE 101	Technical Writing		Yes	Yes	1
NRE 173	Research methodology			Yes	2
NRG 107	Minor project	Yes	Yes	Yes	3
NRG 104	Major project	Yes	Yes	Yes	3

1. In technical writing one model is to review papers under that component most the student trend to research ethics and human value

2. Design of the research under Research methodology course students are trained towards human value, professional ethics, and environmental sustainability

3. Minor and major projects, most of the students work gender based study, environmental sustainability and human value. Department also expect social and professional ethics in their dissertations/thesis report

Annexure 1.3.4 List of courses associated with field projects / internships

1.3.4 Percentage of students undertaking field projects / internships (Current Year data) (5)			
Programme name	**Programme Code**	**Year**	**No. of students undertaking field projects / internships**
MSc(Geo)	02004	2015	6
MSc(Geo)	02004	2016	12
MSc(Geo)	02004	2017	10
MSc(Geo)	02004	2018	18
MSc(Geo)	02004	2019	19

Sample of Batch 2019 - 2021

SN	Reg No.	Name	Organistaion Name	Project Title
1	1900128 MSG	Akshar Tyagi	Regional Remote Sensing Centre, North	Drought monitoring in Maharashtra using multi-sensor Earth Observation data
2	1900129 MSG	Anandita Gupta	Andhra Pradesh Space Applications Centre (APSAC)	Geospatial Technology for quantitative analysis of urban sprawl and future modeling- A Case Study
3	1900130 MSG	Ankit Majumdar	Sociometrik infer Private Limited	Agricultural Risk Assesment
4	1900141 MSG	Debashree Bhattacharjee	North Eastern Space Applications Center(NESAC)	Agricultural Drought Monitoring Using Geospatial Technology
5	1900146 MSG	Debasmita Lahiri	Wildlife Institute of India	Site selection using decision support tool.
6	1900131 MSG	Hardik Negandhi	Esri India Technologies Private Limited	Development Of Web-Based Geospatial Learning Resources Using Gis Platforms
7	1900149 MSG	Harshit Bhasin	Indian Institute of Technology(IIT, Roorkee)	Satellite remote sensing based Automatic framework to delineate debris-covered glaciers of the Indian Himalayas
8	1900144 MSG	Mehnaz Jabeen	Forest Survey	Forest Fire Risk Mapping Using Remote Sensing and GIS Technology
9	1900133 MSG	Mohammad Tayyab	Centre for Policy Research	Digitization of Scanned Legal Docs for MILL, Implementation of new interactive maps on the MILL website

10	1900134 MSG	Nishant Thaploo	Risk Management Solutions (RMS)	Flood Modelling and Exposure Analysis
11	1900135 MSG	Nitin Singh Ghugtyal	TERI SAS	Using ML algorithm to predict Air quality
12	1900148 MSG	Ojo Patrick Duke	International Institute of Tropical Agriculture(IITA, CGIAR)	Application of Machine Learning and UAV Data in Crop Type Identification A Case Study of IITA Campus, Ibadan
13	1900145 MSG	Piyush Kumar	Indian Institute of Remote Sensing, Dehradun, India	Investigation of water content on lunar south pole using chandrayaan-2 fully polarimetric data
14	1900136 MSG	Priyal Bhatia	Andhra Pradesh Space Application Centre (APSAC)	A Comparative Analysis of Urban Green Spaces in Andhra Pradesh
15	1900137 MSG	Protikar Sen	ESRI India	Use of GIS in business management
16	1900147 MSG	Riya Ghosh	TERI	Gram Swaraj
17	1900251 MSG	Sayantani Majumder	TERI-SAS The Energy and Resource Institute School of Advanced Studies	Identification of Transport Infrastructure Development and Management strategies
18	1900139 MSG	Sravani Ponugoti	NCESS	Groundwater change assesment over India
19	1900140 MSG	Sreeja Das	North Eastern Space Application Centre	Crop damage assessment due to bank line erosion in flood prone districts of Assam

Note: Department collects all information during internship period for every batch

Annexure 1.4.1.A Feedback taken from the stakeholders

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
1	Balaji Narasimhan	Associate Professor	IIT Madras	nbalaji@iitm.ac.in	4.42E+09	Academia	GIS/Remote Sensing Analyst, Scientist, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm development & other R&D	Ability to do programming and develop tools	Familiarity and knowledge to work with open source tools	Ability to develop code and develop tools	Ability to apply a set of tools for solving a problem	
5	D Nagesh Kumar	Professor	Dept of Civil Engg., IISc, Bangalore-12	nagesh@civil.iisc.ernet.in	080 2293 2666	Academia	JRF/SRF	Skill set 3: Geoinformatics: Algorithm development & other R&D	Engineering background	Data mining and Data Compression techniques	Integration and analysis of multiple map sources in GIS	Good understand of algorithms to handle large datasets	Best wishes
7	Anshuman Bhardwaj	Scientist	LTU, Sweden	anshuman.terai@gmail.com	-9.8E+07	Academia	GIS/Remote Sensing Analyst, Scientist, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm development & other R&D	Research aptitude	To be very frank, it is high time now and the acadmic sector in India offering cources in geoinformatics has to realise that private sector within India has very little to offer to the prospective professionals in terms of both, career growth and monetary benefits. Geoinformatics is basically an application based field and most suited for research and development within academic and scientific sectors. Students who invest a lot of money and time in doing MSc in this field should be mentally	Research Aptitude, a sound basic knowledge of remote sensing, photogrammetry, and digital image interpretation concepts, Good GIS familiarity	I do not recommend this course	

SN	
Name:	
Designation:	
Address:	
Email id:	
Phone Number:	
Please identify category of your institution	
1. At which you level you would like to hire	
2. Which skill set clearly defines the requirement for your organization/Institute?	
3. What additional skill sets you may expect from Geoinformatics professional for your	
4. What do you foresee as the upcoming trend and required skill set among professionals?	prepared for research as this is the only sector that after a little patience and hard work can make them great professionals in their respective fields of specialisation after MSc. I am probably the only one from all the MSc geoinformatics batches which passed out from TERI who has completed his PhD and is now working in world's renowned research group in Sweden. I always knew that temporary earning in private sector was never going to be career defining for me and it would have never given me the job satisfaction that I expected while completing a "hard-earned" MSc from TERI. Today I am earning at least 4 times more than the highest paid geoinformatics pass-outs in the private sectors; apart from enjoying my work profile and status. So in short, teachers teaching the cources in geoinformatics have to be very frank with the students about their career prospects instead of keeping it gloomy. They have to motivate them towards research.
5. What kind of skill sets would you expect from MSc Geoinformatics?	
6. What kind of skill sets would you expect from MTech Geoinformatics:	
7. Any other suggestions:	

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
										My strong recommendation (and is based on my personal opinion) is that one should pursue PhD right after completing MSc. Mtech course is simply a waste of time and energy as again, one has to do PhD to seek a growth in this field. I do not understand a need for MTech course. TU should first make some major overhauls in the MSc course to make it more robust instead of introducing another Mtech course on an already weaker foundation.			
10	Bakul Budhiraja	Ph.D. Civil Engineering (Geoinformatics)	Shiv Nadar University, NH91, Tehsil Dadri, Uttar Pradesh 201314	bakul.budhiraja@snu.edu.in	9582757529	Academia	Research Scholar	Skill set 1: Geoinformatics and its applications	Focus more on R,python,matlab and more intensive mathematics courses - complex theory	For research - environmental modelling and architecture - integration of various fields	Coding,Sound understanding of mathematics, Spatial statistics,open to other fields as in projects are in colabration	Same as above	Increase no of credits, along with statistics, maths courses must be floated, compulsory courses on R,matlab and python. Make them more literature intensive.
12	Bijan Debnath	PhD Research Scholar	C-44 Baramunda H.B.C., Bhubaneswar, India	bijan.debnath@outlook.com	9.42E+09	Academia	GIS Manager, GIS/Remote Sensing Analyst, Scientist	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm developme	Management of man power for better project results.	Ability to deal with people, by understanding their requirements; designing applications and making the usage easy to achieve the end results.	Dynamic Knowledge of understanding and interpreting different theme maps	Knowledege of GIS models along with programming and also to develop if require for various GIS	Geoinformatics Experts should also have interdisciplinary skill to understand the requirements of clients from various fields/subjects (e.g. socio-economic, climate-change, forestry application, disaster

SN	Name	Designation	Address	Email id	Phone Number	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
								nt & other R&D				based applications	mitigation and agriculture).
13	P K Joshi	Professor	Jawaharlal Nehru University, New Delhi	pkjoshi@mail.jnu.ac.in	011-27704323	Academia	Scientist, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm development & other R&D	Having good knowledge of statistics and programming with thematic discipline.	Data Analytics and Data Mining (including statistical and econometric analysis)	Correct and good knowledge of RS/GIS/GPS and Geography. Strengths in thematic discipline. Interest in programming and statistics.	Details in programming and statistics. Strong background OGC.	Strong hands-on in academic and operations projects. Interests and exposure to OGC.
16	Jeganathan	Professor	Department of Remote Sensing, BIT, Mesra	jeganathanc@bitmesra.ac.in	0651-275444	Academia	JRF/SRF, Assistant Professor	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D	Good communication skills and knowledge about latest global developments	Whole globe is moving from experiment to explanation. Natural resources management, Climate Change adaptation, Decision making and Disaster Prevention will be the key fields.	Able to understand the basic and advanced concepts of using RSGIS tools AND Implementation methods.	We expect M.Tech. students to have an independent research execution capabailities and sound analytical and logical skills.	Most importantly students should be bold enough to carry out new and advanced researches in the field of geoinformatics.
17	KRISHNA MOHAN BUDDHIRAJU	PROFESSOR AND HEAD	CSRE, IIT BOMBAY, POWAI, MUMBAI - 400076	bkmohan@csre.iitb.ac.in	-10191	Academia	JRF/SRF	Skill set 3: Geoinformatics: Algorithm development & other R&D	Knowledge of mathematics, programming, modeling	Data analysis skills, ability to program/implement any model by oneself, ability to handle relevant mathematics, statistics, hypothesis testing, etc.	Knowledge of GIS, remote sensing, GPS, basic surveying, field data collection skills etc.	Types of remote sensing, image processing, raster and vector GIS algorithms, GPS based position estimation and	Should not be tied to a software package but core principles should be covered properly, after which experience with any good software may be okay.

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
												navigation, applications to forestry/agriculture/urban/rural problems, field data collection and accuracy estimation, independent project handling	
18	Dr. Sanjay Shitole	Associate Prof in Information Technology	UMIT, SNDT Women's University, Mumbai	sanjay.shitole@umit.sndt.ac.in	9.89E+09	Academia	GIS/Remote Sensing Analyst	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D	Good programming skill	Machine learning, Internet of things	Should understand mathematical modelling	Analytical skill	Learner should be trained to acquire multidisciplinary skill set
20	HIMANSHU GOVIL	ASSISTANT PROFESSOR	NIT RAIPUR	HGOVIL.GEO@NITRR.AC.IN	9.93E+09	Academia	Scientist	Skill set 1: Geoinformatics and its applications	SHOULD BE GOOD IN THE PROCESSING OF THE RECENT DATA	HYPERSPECTRAL, SAR DATA PROCESSING AND ITS APPLICATION	SHOULD BE GOOD IN THEORETICAL AND PRACTICAL	TECHNICAL ASPECTS SHOULD BE SOUND	PRACTICAL SHOULD BE MORE IN THE CLASS
26	Anshul	GIS Specialist	CWC, New Library	anshul.kashyap@stu	9.82E+09	Academia	GIS/Remote	Skill set 2: Geoinformatics and IT	to have adequate knowledge	Auto - Cad knowledge and immense computer language knowledge	Should not only know ArcGIS but	Should have more technical	

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
			Buildin g	dents.t eriuniv esity.ac .in			Sensing Analyst	enabled Services, Skill set 3: Geoinforma tics: Algorithm developme nt & other R&D	about Computer Language		various other open softwares	knowledge of all the software being used	
32	Bhartend u Pandey	Doctoral Student	380 Edwar ds St New Haven CT	bharten du.pan dey@y ale.edu	475-355-4646	Academi a	GIS/Rem ote Sensing Analyst, Technicia n/Assista nt, Scientist	Skill set 1: Geoinforma tics and its applications , Skill set 2: Geoinforma tics and IT enabled Services, Skill set 3: Geoinforma tics: Algorithm developme nt & other R&D	Machine learning; data visualizatio n; web/mobile application developme nt	Big data analytics (Data science)	Computational/Data Science (Visualization, Processing, Machine Learning); Geo-spatial data management; Web/Mobile GIS; Algorithm Development; Satellite and Aerial Remote Sensing	Software Development	
35	Rama Chandra	Assistant Professor	IIIT Hydera bad	rcprasa d@iiit. ac.in	9.25E+09	Academi a	Faculty	Skill set 3: Geoinforma tics: Algorithm developme nt & other R&D, Application s too	use of IT, Modeling skills	Understand subject, synchronize it with practical applications	capable of coding and modeling real scenarios	Though sound Tech in degree, need to have good theoretical and practical implementati onl	What ever is the degree, students are scoring high in exams, and it is just scoring, no indepth knowledge about the course studied, nor its practical application. They do good project in PG, but dont know basics of their project. Their moto is to get job and it is valid, but without understanding the subject running behind the opportunities is of no use. Make

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
													students to realize the relation between what they are studying and its real application, not for just degree sake
36	prasad	assistant professor	shiv nadar university	prasad.Pathak@snu.edu.in	8.13E+09	Academia	GIS/Remote Sensing Analyst, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm development & other R&D	Updated with latest open source software knowledge	Mobile based applications	application based research	programming, stats n maths, engineering based GIS	
37	prasad	assistant professor	shiv nadar university	prasad.Pathak@snu.edu.in	8.13E+09	Academia	GIS/Remote Sensing Analyst, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm development & other R&D	Updated with latest open source software knowledge	Mobile based applications	application based research	programming, stats n maths, engineering based GIS	
38	Harini Nagendra	Professor Azim Premji University	Pixel Park, PES University Campus, Hosur Road, Electronic City, Bangal	harini.nagendra@apu.edu.in	9.18E+11	Academia	GIS/Remote Sensing Analyst	Skill set 1: Geoinformatics and its applications	open source GIS teaching capabilities	Working with open source datasets, software, and applications such as Google Earth Engine and R	Same as above	Same as above	No

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
			;ore 560100										
41	Dr V Madha Suresh	Professor and Head	Centre for Natural Hazards and Disaster Studies, University of Madras, Chepauk, Chennai: 600005	cnhdms@gmail.com / vmsuresh@unom.ac.in	Mobile 09444205566/ 9042991961 Land Line: 044-25399664 Office	Academia	Teaching Geoinformatics and Examiner in JSS college, Mysore, Bharathidasan University, Trichirapalli etc.	Skill set 1: Geoinformatics and its applications	Hand Training, Internship and Project Work	Customization and Development of software thereof.	Both concept and training are very important.	Hand on experience skill in GIS, RS and GPS.	Online training is welcome for those are employed and regular programme also equally important for the freshers.
42	Sivagnanam.N	Professor /retired	13, Yogi Gardens, Pallippattu, Chennai 600113	sivagnanam@gmaul.com	9.19E+11	Academia	Scientist, JRF/SRF	Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D, Development and application of Open Source Tools	Project design and Management /apply PMI strategies	2D and 3D visualizations and various dimensional applications	Knowledge in Scientific Methodology, Experimentation, Language /Script handling with it implementation	Advanced knowledge in GeoStatistical, Go GeoSpatial and GeoSocial methdologies and applications	40% Theory, 30% Hand-on 15% project design and 15% industry /state knowledge
44	Iyyanki Venkata	Professor	Hyderabad	iyyanki@gmail.com	9.85E+09	Academia	GIS/Remote	Skill set 1: Geoinformatics and its	Nil	Web based applications	Geospatial Data analysis	Geospatial data analysis, modeling,	Should have current knowledge skills

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
	Muralikrishna						Sensing Analyst	applications, Skill set 2: Geoinformatics and IT enabled Services				project planning, project management, Semantic web	
45	Benidhar Deshmukh	Associate Professor of Geology	IGNOU, New Delhi	benidhar@gmail.com	011-2957-1677	Academia	JRF/SRF	Skill set 1: Geoinformatics and its applications	Background in Geosciences/Earth Sciences	mobile handset based geospatial data creation, visualisation and interaction	RS/GIS application professional	RS/GIS analyst/engineer with good s/w customisation capabilities	
46	Akanksha Balha	PhD Student	Ghaziabad, Uttar Pradesh	akanksha.balha@gmail.com	- 8.4E+09	Academia	Professors highly specialized in Remote Sensing and GIS (Theory as well as Practical)	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D	He/ she should be good at application part while having good knowledge about the techniques, softwares, methods etc.	Flexibility in working with different softwares, datasets etc because it is primarily the practical knowledge that is important in Geoinformatics.	MSc Geoinfo should be able to impart practical application knowledge of the geospatial tools into their respective subject areas. They should also have theoretical knowledge of the geospatial techniques to understand the phenomenon well. Practical application part should be emphasised more. Computers course in 1st sem and Advanced GIS course (esp WebGIS) in 3rd sem are necessarily and important subjects for the course but what happens is, because students come from different graduation	Besides point mentioned in (5), Mtech Geoinfo should focus on programming & web applications as a mandatory thing, whereas it can be an optional thing for MSc Geoinfo (depending upon one's choice). As name itself suggests, Mtech should try to focus more on technological part of the course.	I would like to emphasise on placements for MSc Geoinfo students. As every year TU produces good number of MSc Geoinfo students & sends them for internships as well, I believe regular & active contacts with relevant institutions & companies should be made so that the entire batch of students can get placed before the new sessions starts. Good job placements will definitely attract more genius minds to the University.

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
											backgrounds (sometimes even BA Geography), it becomes hard for them to understand the subject. Instead of enjoying and understanding the subject, they just cram to get pass. Therefore an open and honest discussion between students & teachers should or some other efforts should be made to improve these two subjects.		
47	Ajeet Singh Nain	Professor & Head	Department of Agrometeorology, GBPUA&T, Pantnagar-263145	nain_ajeet@hotmail.com	05944-235021	Academia	Scientist, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services	Should be good in large scale applications	Cloud GIS, Decision Support Systems	Should know all popular proprietary and open source softwares related to GIS and Remote Sensing. Person should handled the applications problem himself.	In addition to above given, the students should know how to modify/write addon module as per applicational needs.	---
49	Y S Rao	Professor	CSRE IIT Bombay	ysrao@iitb.ac.in	9.77E+09	Academia	JRF/SRF	Skill set 3: Geoinformatics: Algorithm development & other R&D	Microwave remote sensing, SAR, land subsidence, landslides, earthquake mapping	GIS and image processing industry is growing. Software development requirement is also growing.	In addition to theory, more practical orientated training is required in handling software, GIS, image processing, etc.	After M.Tech. we generally recruit for Ph.D. At Ph.D. level, they have to have their own thinking and completely Ph.D. work	Out of 22 M.Tech. students we have, a few are placed in GIS and Image processing area. Others are placed in software field which are not related to their degree.

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
												on their own. So, Independent thinking is required.	
50	Rishikesh Bharti	Assistant Professor	Department of Civil Engineering, Indian Institute of Technology Guwahati, Assam	rbharti@iitg.ernet.in	3.61E+09	Academia	JRF/SRF	Skill set 1: Geoinformatics and its applications	Algorithm development	Aa a team, individual should share the ideas and work.	Basic knowledge of Remote Sensing and GIS	Knowledge of advance remote sensing techniques and GIS for different application	Students must have lab and field exposure
3	R PRERNA	PROJECT SCIENTIST B	NATIONAL CENTRE FOR ANTARCTIC AND OCEAN RESEARCH, GOA	prerna.geoinfo@gmail.com	1E+10	Government institutes/ organization other than academia	Technician/Assistant, Scientist, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm development & other R&D	additional background information on marine and cryospheric GIS applications	greater role of GIS servers and applications	basic processing of remotely sensed data and understanding of GIS tools (software specific i.e working knowledge)	greater knowledge in coding and algorithm development	far greater exposure of students in practical is required as opposed to theoretical classes. students must receive classes for all subjects stated in the syllabus and not just a few lectures from visiting faculty as was the case during my batch (2010-2012)
4	Sneha	Research Scientist	N 34, Top Floor, Sriniwas Puri, New Delhi-110065	shirohy.sneha@gmail.com	8.06E+09	Government institutes/ organization other than academia	Scientist	Skill set 3: Geoinformatics: Algorithm development & other R&D	Numerical Modeling and Software Development with applied statistics	Research orientation in specialized domains with expertise in Open and proprietary software for statistics and modeling	Good Research Writing and overall idea of implementation and usage of the subject in the their interest domain	Engineering Remote Sensing & Geospatial Technology, Updated with the usage of current equipment	It would be great if the students get exposure of more industries in the field with some exposure of abroad universities internships too.

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
												and gadgets with the effective implementation over some application based project.	
8	Rumia Basu	Researcher	Triveni puram Ganga 1 Flat no 404 booty ranchi	rumia.basu@gmail.com	7.89E+09	Government institutes/ organization other than academia	GIS/Remote Sensing Analyst	Skill set 1: Geoinformatics and its applications	To be able to be able to develop one's own ideas in this ector and carry out innovative research	Programming	Complete knowledge about the theory and practical aspects of Remote sensing and GIS together with programming skills in any one language such as python,R etc.	More technical aspects like programming	
11	Swati	Project Engineer	Delhi	swatigis23@gmail.com	9.81E+09	Government institutes/ organization other than academia	Scientist	Skill set 1: Geoinformatics and its applications, Skill set 3: Geoinformatics: Algorithm development & other R&D	should have innovative approach and solutions for resolving the challenges	Web based services, Mobile based app, ICT development, all aspects associated with the public welfare and social development	Innvovative approach , research interest,	should be technical enough to provide more innovative solutions to the problems	exposure to organizations, industries should be given so as to know them the practical and real world challenges
14	Shanthala Devi B S	E A Director	CWC, Bhubaneswar	shanthaladevi100@gmail.com	8.09E+09	Government institutes/ organization other than academia	GIS Engineer, GIS Manager, GIS/Remote Sensing Analyst, Technician/Assistant, Scientist, JRF/SRF	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm	Geoinformatics and Ecological Modelling	Geoinformatics in Hydrodynamics	Geoinformatics in Basic Science Application	Geoinformatics and Software Development	Geoinformatics subject should be made popular and percentage of job opportunities to be increased.

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
								developme nt & other R&D					
15	C S Murthy	Head, Crop Monitori ng & Assessme nt Division	NRSC Balana gar Hydera bad	murthy _cs@n rsc.gov .in, csmurt hy09@ gmail.c om	9.99E+ 09	Governm ent institutes/ organizat ion other than academia	GIS/Rem ote Sensing Analyst, Scientist, JRF/SRF	Skill set 1: Geoinforma tics and its applications , Skill set 2: Geoinforma tics and IT enabled Services	Analytics, spatial modelling	Multi-parameter data analysis, parametric and non-parametric approaches	Spatial data analysis, basic statistical techniques	Spatial data analysis, statistical techniques	
21	Biswadip Gharai	Head, AC & PS Division, NRSC	AC & PS Divisio n, ACSG-ECSA, NRSC, Balana gar, Hydera bad 500037 , Telang ana	g.bisw adip@ gmail.c om	040 238844 67	Governm ent institutes/ organizat ion other than academia	GIS/Rem ote Sensing Analyst	Skill set 3: Geoinforma tics: Algorithm developme nt & other R&D	Inefficienci es on computer language including matlab programmi ng.	Application of RS & GIS on atmospheric sciences, specially on air quality monitoring/climate change study. Strong mathematical knowledge/numerical analysis and handling of big matrix of data sets including satellite & in-situ data.	Knowledge on atmospheric science/climate change & handling associated problems.	Strong mathematical knowledge/ computer language including matlab	To develop analytical power on handling any atmospheric science problem, it is required to have strong numerical/mathematical analysis subject and its application within the course, which may help students to participate in development of algorithm development for retrieval of geophysical parameters from satellite data.
23	Shailja Bahugun a	Research Scientist	NRSC/ ISRO, Hydera bad	shailja. bahugu na@g mail.co m	9.71E+ 09	Governm ent institutes/ organizat ion other than academia	Scientist, JRF/SRF	Skill set 1: Geoinforma tics and its applications , Skill set 2: Geoinforma tics and IT enabled Services	IT enabled GIS databases, app developme nt	A Geoinformatics professional must know digital image processing, photogrammetry and GIS operations. In addition to this the knowledge of programming especially python (as it is used for developing tools and customized operations in ArcGIS, the widely used proprietary software) can give an edge. However govt. institutions are	Students should be able to process all types of digital data (raster, vector). They must try to gain experience to use all kind of remote sensing products optical & microwave (radar) through various projects and studies they undertake during 2 years.	In addition to the skill set described for MSc students, Mtech students can work on using various models(hydro logy, land information/ climate etc) integrated with spatial	University should encourage students to take up projects that require field work and handling of field instruments in addition to the lab work on softwares.

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
										nowadays focusing on the use of open source technology for GIS data visualization and analysis. A professional with an experience of handling open source software (both for backend database operations as well as GIS data rendering on user interface) is preferred as most of the government projects are introduced to the public in the form of portals providing spatial services that make use of programming, database operations and GIS analysis. Those having programming skill must try for app development that utilise GIS information such as lat/long, geotagged photographs, road network etc as the ap development is very much in demand.	Apart from purely working on Remote sensing applications, students can also work on linking GIS database with other non-spatial databases. Creation of GIS data services, their storage and rendering through programming (as GIS database management) is an interesting aspect of Geoinformatics domain. Those interested in programming can also look into android app development that is utilising spatial information such as lat/long, geotagged photos etc.	information. They can also work on algorithm development for object oriented classification of remote sensing data processing etc.	
25	Anuj Singh	GIS Executive	New Delhi-110007	anuj.geoinfo@gmail.com	- 9.9E+09	Government institutes/ organization other than academia	GIS Engineer, GIS/Remote Sensing Analyst	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm developme	Strong analytical skills as well as development (customization) skills.	GIS development especially customization and small tools development	Practical Knowledge of open source GIS (Server, database, Web GIS, customization), Geodatabase, SQL, GIS Customization, Geostatistic, mobile GIS etc.	GIS development using different platform like Java, python, C# .NET, R etc;	1.(***) The most important suggestion, TERI University lacks competent faculties for Geoinformatic; 2.(**)If TERI can not afford ESRI ArcGIS Server then please provide open source GIS Server training to students; 3.(*) Campus placements for Geoinformatic students; 4. Just basic hands on

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
								nt & other R&D"					practices in lab are not sufficient for competing the current GIS market, try to make difference from others by providing our students more practical knowledge rather just theoretical. No one in the market wants to spend time and money in training someone and then have productivity from them. At last but not the least, I have given my true review on just lacking part of the course. I hope University will take it seriously and produce better GIS professionals than us. I would really make me happy, looking at best products in the industry from my own university.
9	Swati Rawat	Research Associate	CIPT, 910-911, Pragati tower, Rajendra Place, Delhi-110008	swatirawat149@gmail.com	9.99E+09	NGO	GIS Engineer, GIS/Remote Sensing Analyst, Scientist	Skill set 1: Geoinformatics and its applications	Experience in Statistical analysis and policy advocacy, and surveys	good knowledge on latest remote sensing technologies such as Hyperspectral and SAR, programming skills	specific application based analysis like in hydrology, geology, agriculture, climate change, atmospheric science etc	algorithm development for different geospatial datasets, devlopment of tools for processing images using R or Python, etc	
30	Suchita Mitra	GIS Specialist, UDRI	Mumbai	mitrasuchita15	8.02E+09	Non Government	GIS Engineer	Skill set 2: Geoinformatics and IT	Knowledge of coding, some basic	GIS Professional with knowledge of programming	The course was fine as it was (2011-13). But more focus	Knowledge of RS , GIS as well as	The course structure of TERI prepares students for research, which is

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
				@gmail.com		Research Institute		enabled Services	programming knowledge of Python, Javascript, SQL.		should be given on coding skills and open source softwaress	knowledge of R, MATLAB, Python,Javascipt, SQL. Exposure to projects that are more market oriented rather than research oriented.	very good and definitely creates a solid foundation. But, the market demand is very different from what is taught and seeks different aspects especially from a fresher. Research organisations does not pay as do the corporate firms and hence programming skills should be incorporated as a major subject like the Statistics curriculum, rather than the applied maths, communication skill and research methodology courses which has no practical implications of what was taught in class and has always been a time pass course for all the batches.
24	Kanwal Nayan Singh	Research Associate	Darbari Seth Block, IHC complex, Delhi	kanwalnayan@gmail.com	9.2E+11	Not for Profit	Researcher	Skill set 3: Geoinformatics: Algorithm development & other R&D	With B.Tech background in some professional course like forestry, Geology, Geography, Water resources, Air pollution or	More technical skills on computers, forestry, geology, agriculture and modeling.	Atleast they have programming skills in some programming languages with the knowledge on climate change, natural resources, water resources and government policies related to climate change and renewable energy etc.	It would be good if they have more technical skills on WebGIS and spatial modeling with the knowledge of policy issues and good computer knowledge.	Re-Design the Geo-informatics course in such a way that they learn come of the upcoming programming languages in each of the semester, TERI uni should teach them Climate change, other environmental issues like agriculture and forestry and policy issues related to renewable, climate change and water.

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
									Agriculture				
2	Kasturi Deb	GIS Executive	1916/10	Kasturideb23@gmail.com	1E+10	Private Industry	GIS Engineer, GIS/Remote Sensing Analyst	Skill set 2: Geoinformatics and IT enabled Services	Application development, knowledge in Python, Java	Strong IT skills	Good domain knowledge in remote sensing and GIS, data management, application development	Same as above	No
6	Senjuti sen	Project coordinator	B404 green home society, marol pipeline, andheri east mumbai	Senjutisen.kol@gmail.com	9E+09	Private Industry	GIS Manager	Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D	Project management, v.well versed with languages like python, java, big data, gis tool development.well versed with excel	Developers are more in demand than gis analyst	One should be very well versed with upcoming technologies in the field. HADOOP can be an added advantage. Project management skills are must in a corporate world.	Hyperspectral remote sensing, algorithm developments, image processing.	For optional paper computer languages should be kept like courses for python , Linux, java, .net, apart from the introductory course in first semester. Placement cell should place students as per their choice as analyst or developers.
19	Umamah eshwaran Rajasekar	Director, TARU Leading Edge	M6, Aurobindo Marg, Hauz Kaus, New Delhi	Mrajasekar@taru.org	9.72E+09	Private Industry	GIS Engineer, GIS Manager, GIS/Remote Sensing Analyst	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D	Analytical problem solving ability	Constant change and ability to capture and process big data	Professionals should be software independent	Innovative approaches to problem solving	
22	samta	Manager product	Pitney Bowes,	samta.sharma	9.87E+09	Private Industry	GIS Engineer	Skill set 1: Geoinformatics and its	Raster, Programming	data analysis, Imaging	NA	Na	NA

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
		developm ent	LI - GIS	@pb.c om				applications , Skill set 2: Geoinforma tics and IT enabled Services, Skill set 3: Geoinforma tics: Algorithm developme nt & other R&D	language, Databases				
27	Subhodip Mukherje e	GIS Specialist	Delhi	subhod ipmukh erjee02 05@g mail.co m	7.84E+ 09	Private Industry	GIS/Rem ote Sensing Analyst	Skill set 2: Geoinforma tics and IT enabled Services	A thorough knowledge of not only Geoinforma tics but also having a basic understandi ng of other related fields.	The ability to code. To develop applications catering to the specific need of the client.	A basic knowledge of coding along with the usual Geoifo stuff.	Since there is the word Tech associated, He/she will be perceived to know more of the nitty gritty mathematical details of what he does.	
28	Poorva Harbola	Modeler, Spatial Modeling	RMS, Elixir Busine ss Park, Sector 127, Noida	poorva. h@gm ail.com	8.59E+ 09	Private Industry	GIS Engineer, GIS/Rem ote Sensing Analyst	Skill set 1: Geoinforma tics and its applications , Skill set 2: Geoinforma tics and IT enabled Services	Working knowledge of statistics and programmi ng	Automation of repetitive processes	Complex GIS analysis and basic automation and basic programming and statistics	Complex GIS analysis, programming (python), automation of complex repetitive GIS processes, good knowledge of statistics	
29	Jagriti Dabas	Managin g Partner	New Delhi	Jagriti. dabas @gmai l.com	9.82E+ 09	Private Industry	GIS/Rem ote Sensing Analyst, Technicia	Geoinforma tics includes all of the above	Repetitive question	Not appropriate question	Practical and conceptual knowledge	Same as above	Present faculty for geoinformatics is incapable of delivering what is required. No proper lab services, no

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
							n/Assistant	mentioned options. Again irrelevant question					concept teaching, no motivation, unfair marking. I would highly recccomend that some better faculty is invited to TERI University to teach students of geoinformatics course. Third semester studies are almost nil as the subjects which are there in third semester are quite difficult and faculty is not able to teach that. Students are nil in practicals in third sem because of no help or guidance from university. This course is being run just for the sake of it. I would personally not hire anyone, because i know the present standard of teaching and exposure that is given out.
31	Zafar Ali Amanullah	Project Analyst - Geospatial	Global Scan Technologies LLC, EDI Campus, 13th Street, Behind Al Bustan Center, Al Qusais,	zafarali.a@gmail.com	+971 50 1596675	Private Industry	GIS Engineer, GIS Manager, GIS/Remote Sensing Analyst, Scientist	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm developme	1. GIS Applications • Initialization of Major GIS, Remote Sensing, CAD and 3D Packages. • Able Provide GIS	Mentioned in Point 4	Mentioned in Point 4	Mentioned in Point 4	Passionate in Geospatial, Trendy, Confident, Accountable for Planning, Scheduling, Productivity & Progress monitoring, Reporting, Forecasting, Change Management, and Project Administration. Be part of Contract formulation, Monitoring the contractor's progress and performance to ensure goods or services

SN														
	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your consultancy	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
			Dubai, United Arab Emirates					nt & other R&D	• Innovative, subjective and scientific approaches on GST's Geospatial Services. 2. GIS and IT integration. • Master of GIS candidate should have strong knowledge in trendy languages and major Database packages. • Sound Knowledge in Web based GIS applications from major commercial GIS packages like ArcGIS for Desktop 10.x and ArcGIS for Server 10.x and open				confirm to the contract requirements. In addition, support research guidance to academics, this make bound between industry and academic. Strong interpersonal skills, highly adept at diplomatically facilitating discussions and negotiations with stakeholders. Recognized production and project management skills, consistently met the needs of complex, large-scale projects.

	SN
	Name:
	Designation:
	Address:
	Email id:
	Phone Number:
	Please identify category of your institution
	1. At which you level you would like to hire
	2. Which skill set clearly defines the requirement for your organization/Institute?
source packages 3. Trendy - Products knowledge and applications • Master of GIS candidate should have strong knowledge in existing and trendy Hardware and it's software packages. • Strong knowledge handling surveying instruments such as all all sorts of LiDAR scanners, Hyperspectral scanners, GPR, Total Statioh, DGPS, Hydrographic Systems(Echo Sounder, Tide Gauges	3. What additional skill sets you may expect from Geoinformatics professional for your
	4. What do you foresee as the upcoming trend and required skill set among professionals?
	5. What kind of skill sets would you expect from MSc Geoinformatics?
	6. What kind of skill sets would you expect from MTech Geoinformatics:
	7. Any other suggestions:

SN													
Name:													
Designation:													
Address:													
Email id:													
Phone Number:													
Please identify category of your institution													
1. At which you level you would like to hire													
2. Which skill set clearly defines the requirement for your organization/Institute?													
3. What additional skill sets you may expect from Geoinformatics professional for your	Valeport, Current Profilers Teledyne etc) to experience in Topographic Surveying, Hydrographic Surveying, Metocean Surveying, Construction Surveying, Aeronautical Surveying, Geodetic Control, Route Surveying Spatial Data Collection and Geoinformatics Surveying, Magnetic surveying, Soil Investigation and Lidar scanning • Provide technical support to												
4. What do you foresee as the upcoming trend and required skill set among professionals?													
5. What kind of skill sets would you expect from MSc Geoinformatics?													
6. What kind of skill sets would you expect from MTech Geoinformatics:													
7. Any other suggestions:													

	SN
	Name:
	Designation:
	Address:
	Email id:
	Phone Number:
	Please identify category of your institution
	1. At which you level you would like to hire
	2. Which skill set clearly defines the requirement for your organization/Institute?
the clients for Mobile and Static Lidar • After sale supports to the clients. • Strong knowledge in major Remote Sensing UAV's and its Application s. 4. GIS Business Developme nt Candidate ability to handle • Liaise with companies on project and product basis. • Sales and supports on company selling all type of Geospatial hardware and software. • Estimation.	3. What additional skill sets you may expect from Geoinformatics professional for your
	4. What do you foresee as the upcoming trend and required skill set among professionals?
	5. What kind of skill sets would you expect from MSc Geoinformatics?
	6. What kind of skill sets would you expect from MTech Geoinformatics:
	7. Any other suggestions:

SN													
Name:													
Designation:													
Address:													
Email id:													
Phone Number:													
Please identify category of your institution													
1. At which you level you would like to hire													
2. Which skill set clearly defines the requirement for your organization/Institute?													
3. What additional skill sets you may expect from Geoinformatics professional for your	Quote and execution. • Field observation for project estimation • Onsite Surveying Verification • Review and analyse the tender documents • Responses to clients and suppliers/partners • Follow up, presentation for tender meetings and demonstration • Explore client requirements and support • Explore, Research and Prepare PoC & RFP • Calculate project estimations. • Update and maintain												
4. What do you foresee as the upcoming trend and required skill set among professionals?													
5. What kind of skill sets would you expect from MSc Geoinformatics?													
6. What kind of skill sets would you expect from MTech Geoinformatics:													
7. Any other suggestions:													

SN												
Name:												
Designation:												
Address:												
Email id:												
Phone Number:												
Please identify category of your institution												
1. At which you level you would like to hire												
2. Which skill set clearly defines the requirement for your organization/Institute?												
3. What additional skill sets you may expect from Geoinformatics professional for your	project status. • Technical Sales Support • Present on GST products and services. • Monitor and coordinates quality control efforts and provides direction on quality control efforts within area of responsibility. • Conduct Technical Workshops and Conference s. • Actively participate in exhibition and conference to demonstrat e											
4. What do you forsee as the upcoming trend and required skill set among professionals?												
5. What kind of skill sets would you expect from MSc Geoinformatics?												
6. What kind of skill sets would you expect from MTech Geoinformatics:												
7. Any other suggestions:												

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
33	sushmita	senior analyst	badarpur	sushmita.biswal5@gmail.com	9.81E+09	Private Industry	GIS Engineer	Skill set 2: Geoinformatics and IT enabled Services, Programming	scripting language(R, python), databases, development(c,C#)	data mining, data analysis, location analytics	IT enabled, knowledge of spatial data, free wares and scripting	IT enabled, knowledge of spatial data, free wares and scripting	Please keep only one course preferably Mtech since the corporate demands of technical degree. also msc will lose seat if mtech is introduced.
34	Shiv	NA	Bengaluru	shiv@mapbox.com	9.01E+09	Private Industry	Data Analyst	Skill set 1: Geoinformatics and its applications	Communication, Industry knowledge, Writing, Passion, Empathy	Communication, Analysis	NA	NA	We look for individuals who are strong communicators, and put in the effort to understand industry and current trends.
39	Dr. Manoj Kumar Kukreja	Software Product Lead	Mumbai	manoj_sac@yahoo.co.in	9.72E+09	Private Industry	GIS Manager, GIS/Remote Sensing Analyst, Technician/Assistant	Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D	Should be IT enabled and sound knowledge of SLDC	Complete Geospatial knowledge along with Geospatial development skills	Sound knowlegde and hands-on / good exposure in Geospatial applications	Geospatial development skills	Institutional trainining
40	Madhura Phaterpekar	Product Engineer	618 Esther Way Redlands CA 92373	Madhura.Phaterpekar@gmail.com	9.1E+09	Private Industry	GIS Engineer, GIS Manager, GIS/Remote Sensing Analyst, Technician/Assistant	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm developme	Programming	Web Development, GiS project development	Ability to join an ongoing GIs project and hit the ground running with little to no help	Ability to join a GiS project and get some training before getting started	

SN	Name:	Designation:	Address:	Email id:	Phone Number:	Please identify category of your institution	1. At which you level you would like to hire	2. Which skill set clearly defines the requirement for your organization/Institute?	3. What additional skill sets you may expect from Geoinformatics professional for your	4. What do you foresee as the upcoming trend and required skill set among professionals?	5. What kind of skill sets would you expect from MSc Geoinformatics?	6. What kind of skill sets would you expect from MTech Geoinformatics:	7. Any other suggestions:
								nt & other R&D					
43	Shailesh deshpande	Scientist	TRDDC, 54 bhadapsar industrial estate, pune 13	shailesh.deshpande@tcs.com	9.01E+09	Private Industry	GIS/Remote Sensing Analyst, Scientist, JRF/SRF	Skill set 2: Geoinformatics and IT enabled Services, Skill set 3: Geoinformatics: Algorithm development & other R&D	programing, database, algorithms and structures, image processing, ML	as above, ML and AI is important, UAV applications	comletion of task as per the plan	work without or a little supervision, innovation, self learning	none
48	Rajesh C Mathur	Advisor	Esri India Technologies, Tapasya, Sector 126, Noida, UP	rajesh.mathur@esriindia.com	9.11E+11	Private Industry	GIS Engineer, GIS Manager, GIS/Remote Sensing Analyst, Solution Architect, DBA,	Skill set 1: Geoinformatics and its applications, Skill set 2: Geoinformatics and IT enabled Services, Cloud, Mobile, Analytics, Data Base Management	Systems Design, Application Development and integration, Testing, ,	Contemporary IT developments like Web/Cloud, IoT, Mobile, Big Data, Various data acquisition techniques like UAVs, LiDAR, GPS...	Same as above	As above	Please make sure that every student does at least one semester equivalent internship in the industry
50													

Annexure 1.4.1.B Action taken on feedback report

Action taken report for MSc Geoinformatics programme structure and Semester I courses

The revised programme structure for MSc Geoinformatics and four revised and one new Semester I courses were put for approval of Academic Coulncil (June 12, 2018)

The table below is the proposed programme structure for MSc Geoinformatics:

Year/ Semester	Courses	Type	Credits
1st year			
1st Semester	Total credits (5+0/1/2 Core Courses + 1 Core Audit)		15
	Principles of Cartography	Core	3
	Principles of Remote Sensing	Core	3
	Principles of GIS and GNSS	Core	4
	Environmental Statistics	Core	3
	Fundamentals of Computers and Programming	Core	2
	Applied Mathematics	Core* (Audit)	-
	Fundamentals of Physics	Core** (Audit)	-
	Technical Writing	Core (Audit)	-
2nd Semester	Total credits		19
	Photogrammetry	Core	3
	Digital Image Processing and Information Extraction	Core	4
	Spatial Data Modelling and its Applications	Core	4
	Multivariate Data Analysis	Core	3
	Programming in Geoinformatics	Core	3
	Law and Policy for Maps and Remote Sensing	Core	2
	Project Management	Core (Audit)	-
	Research Methodology and Thesis Writing	Core (Audit)	-
2nd year			
3rd Semester	Total Credits		21
	Advances in Remote Sensing	Core	4
	Advances in GIS and current trend	Core	4
	Geoinformatics Applications for Land Resources	Core	3
	Geoinformatics Applications for Water Resources	Core	3
	Geoinformatics Applications for Atmosphere	Core	3
	Minor Project	Core***	2
	Geocomputation	Elective	3
4th Semester	Total Credits		15
	Major Project		15

* Required for students who did not study mathematics at 10+2 level

** Required for students who did not study Physics at 10+2 level

*** Minor project will be carried out during summer between Semester II and Semester III

There was no specific suggestion received on proposed MSc Geoinformatics programme structure.

As per the suggestion of Dean Academic, learning outcomes and evaluation criteria for all the five courses were revisited and revised. The action taken report for the five courses that were put for approval with Academic Council are given below.

1. Principles of Remote Sensing (NRG 173)

How the proposed evaluation criteria

1. meets the USP of our University - continuous evaluation system that has been adopted since its inception;

   The evaluation is mostly based on written tests, however the test 3 would have practical and viva components. Each test covers the complete syllabus taught at that point of time.

2. is mapped with the Learning Outcomes; and
   The outcomes are mostly in terms of skill set developed which would be finally evaluated in written and more importantly in the practical exam.

3. is fair, transparent and unbiased.

   The students are required to go through the answer sheets after evaluation and thus its open ended and unbiased as the answer sheets are open to all the students and best performed candidate copy is circulated among the class students to evaluate themselves and the marks obtained

2. **Principles of GIS and GNSS (NRG 175)**

The course evaluation designed with 1:1:4:4 ratio though out the semester having four steps of continuous assessment includes theoretical concepts and practical demonstration. The first evaluation take care of creating and understanding of database in spatial platform for analysis and modeling of various applications; second evaluation is proposed for conducting the GNSS based survey and mapping under variety of planning and management applications.

Finally, two more evaluation (Practical and Test 3) covers entire course based on theory and practical demonstration to make students capable of understanding the use of spatial tools & techniques for analysis and modeling of the spatial data over various natural and human resource mapping, monitoring and management.

Evaluation criteria are based on written and practical demonstration, which reflect the results of evaluation either though written concepts of theory, practical books or demonstration outcomes in the software. These results are transparent to each student, they can cross validate to each other. The theoretical answer sheets are submitted in the form of blinded manuscript using

unique code to preserve fair and unbiased evaluation. After the evaluation answer sheet are open for discussion among the students.

3. Fundamentals of Computers and Programming

Action taken/response to the proposed evaluation criteria

- Continuous evaluation: *Continuous evaluation is done through test1, test2 and test 3. In each of tests, students are evaluated upto the topics that was covered until the date. Since test 3 is at the end of the semester, so it envolves entire syllabus. Thus, three tests and lab exams show continuous progress of students through out the semester.*
- Mapping evaluation criteria with learning outcome: *The evaluation criteria and learning outcomes are aligned. The learning outcomes reflect skillsets of students achieve after successfully passing the course*
- is fair, transparent and unbiased*: Students are shown the graded answer sheets after each test which allows them to find out the errors for which marks has been cut. The answers are also discussed in the class.*

4. **Fundamentals of Physics**

[1] Comments given in the academic council for the course: Nil

[2] Action taken/response to the proposed evaluation criteria

- Continuous evaluation: *Yes, ensured through test 1,2 and 3 and other assessments (tutorials/assignments/quizzes), those accounts topics covered till respective test dates. The Test 3 will evaluate the student's understanding of the entire course.*
- Mapping evaluation criteria with learning outcome*: It is mapped with learning outcome.*
- Credibility: *The nature of the questions allows to carry out fair evaluation, further students can introspect the evaluated answer sheet and left to seek clarification on the marks awarded before uploading it into the portal.*

5. Principles of Cartography (NRG 171)

How the proposed evaluation criteria

1. Meets the USP of our University - continuous evaluation system that has been adopted since its inception;

A continuous evaluation of the course is carried out by conducting regular tests, assignments and quizzes. Additionally, lab outputs are evaluated regularly, and test 3 is conducted after completion of the course.

2. is mapped with the Learning Outcomes; and
   Learning outcomes of the course are based upon the skillsets, student gain during the semester.

3. is fair, transparent and unbiased.
   The proposed evaluation criteria is unbiased and fair as students are shown their answer sheets after evaluation. Additionally, students are also allowed to cross check it with other student's answer sheet and report to concerned faculty in case of any confusion.

Minutes of Internal Academic Council Meeting

The Internal Academic council meeting for MSc Geoinformatics programme review was held on May 31, 2018.

The meeting was attended by:

Dr. Rajiv Seth,

Dr. Prateek Sharma,

Dr. Sudipta Chatterjee,

Dr. Sapna Narula,

Dr. Nandan Nawn,

Dr. Anandita Singh,

Dr. Chaitanya Madhurantakam,

Dr. Kamna Sachdeva,

Dr. Anu Rani Sharma,

Dr. Naqui Anwer,

Dr. Vinay Sinha,

Dr. Neeti,

Dr. Chander Kumar Singh,

Dr. Soumendu Sarkar,

Dr. Ritika Mahajan

Regrets:

Prof Suresh Jain

Prof Manipadma Datta

Dr. Neeti apprised the internal committee members of the Academic Council, the process of revision of MSc Geoinformatics programme presented the proposed programme structure. Comments received from the members were addressed as under:

IAC Member	Comments	Remarks/Action taken
Dr. Rajiv Seth	Documentation of what we have (have not) been able to implement based on stakeholder's feedback.	Most of the feedbacks have been covered through new courses in MSc Geoinformatics. We are not directly handling IoT concept as it involves knowledge of Electronics. However, this topic can be revisited after few years. Data mining part is covered under Geocomputation

Dr. Prateek Sharma	Objectives and Learning outcomes of Applied Mathematics, Technical Writing are not there in the syllabus	The concerned courses are offered as part of ESRM. Course Coordinator has been informed regarding the concern for necessary action
	None of the test in any course can have more than 40% weightage	We have revised the evaluation criteria for the courses that have more than 40% weightage for a test
Dr. Anandita Singh	Heavy weight on Test 3 in all courses.	Test 1 and Test 2 and lab assignments/tutorials are used for continuous evaluation. Test 3 is used for overall assessment
	Specific comments on Environmental Statistics, Technical Writing and Applied Mathematics	Received updated syllabus from DEE for Environmental Statistics Technical Writing and Applied Mathematics are ESRM courses and Course Coordinator has been informed
Dr. Nandan Nawn	Concept of Economics missing though it is part of the overall aim of programme	The Geoinformatics programme aims to teach application of geospatial technology in solving Earth's pressing challenging in different domains.
Dr. Shaleen Singhal	1. Core course: Geoinformatics for environmental management 2. Independent study course: Geoinformatics application for energy and environmental management 3. Analytical course: exposure to aspect of night time light data	1 & 2: Introduction of three application courses cover all these aspects 3. Covered under different courses
Dr. Arun Kansal	Big Data Analytics and application of AI	Geocomputation course (E) in Semester III covers fundamentals Of Big Analytics. AI could not be covered right now. However, it may be considered in future
Dr. Ramakrishnan Sitaraman	Applied Mathematics and Fundamentals of Physics need to be credit course	These two courses are bridge courses required by students who have not studied Maths/Physics in their 10+2 level and therefore it has been kept as audit.

The revised MSc Geoinformatics programme shall now be placed for approval to the Academic Council on 12 June 2016.

The minutes of the meeting was prepared by Dr Neeti.

MSc Geoinformatics Programme Review
Academic Council Meeting
June 12, 2018



2

Need for Review

University Grants Commission (UGC)

- Recommended that curricula of all academic departments in Universities should be reviewed and revised at least once in every three years.

National Policy on Education

- Updating existing courses to match the current state-of-the-art in each discipline
- Common programmes to be adopted are:

a) Semester pattern of study
b) Continuous internal assessment
c) Credit/grading system
d) Student feedback
e) Self-appraisal by teachers

National Assessment and Accreditation Council (NAAC)

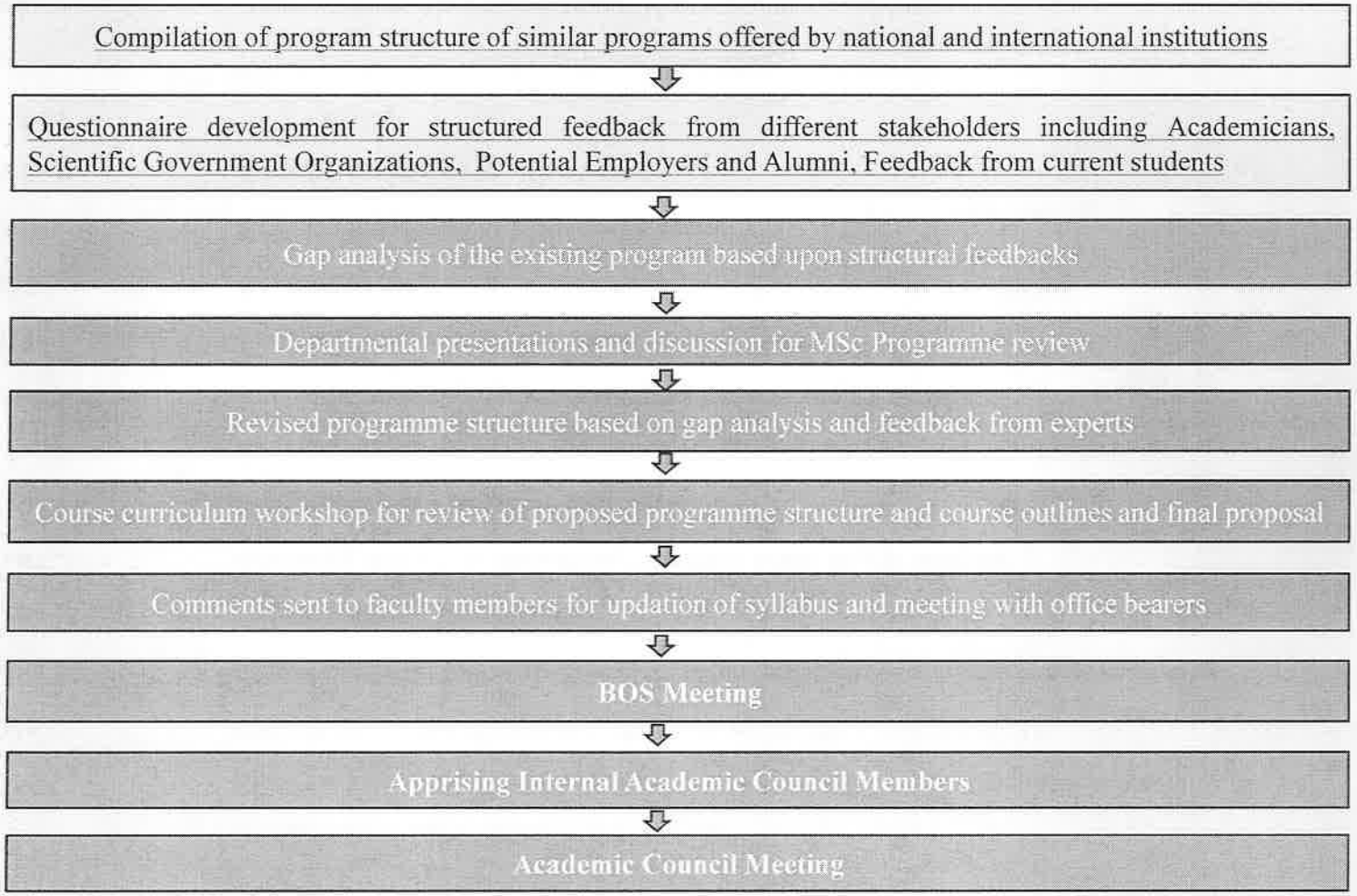
- The institution revises the curriculum at regular intervals and analyses the impact.
- Structured feedback from stakeholders and students is obtained for enriching the curriculum
- The institution draws on the feedback from experienced faculty.

Chronological Sequence

3

May 2016	Assignment of MSc Geoinformatics review
May 2016	Steps for MSc Geoinformatics review chalked out and circulated to the department
June 2016	Compilation of list of courses in different universities offering MSc Geoinformatics in India and abroad
July – Aug 2016	Questionnaire for gap analysis sent to different stakeholders and responses received
Oct 2016	Department level presentation
Nov – Dec 2016	Revisiting objectives and learning outcomes based on gap analysis
Jan – Feb 2017	Design of revised programme structure
June – Jul 2017	Revision of existing courses as per current state of art by course coordinators
Sep – Oct 2017	Review of revised programme structure by three subject experts
Dec 2017	Feedback from current students on existing courses
Dec 2017	Revision of programme structure and curriculum development workshop
Jan 2018	Revision in syllabus of individual courses
Feb 2018	Presentation infront of office bearers
March 2018	BOS Meeting
May 2018	Apprising Internal Academic Council Members
June 2018	Approval from Academic Council Meeting

Review Process for MSc Programme

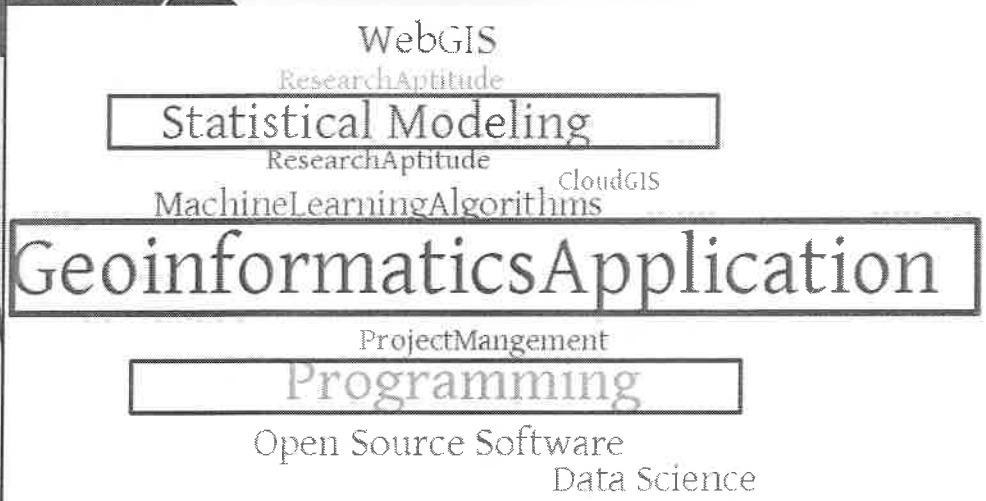


Basis for Proposed Changes in the Programme Structure

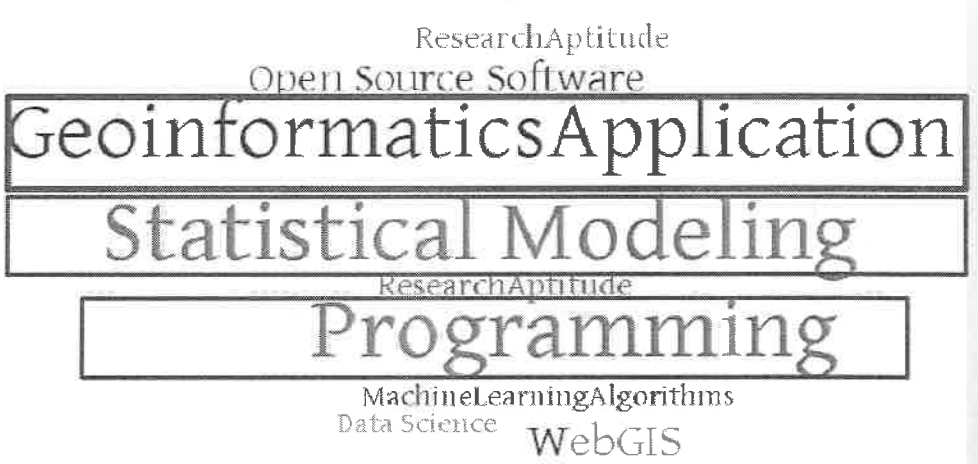
- Comparison with MSc Geoinformatics programme Structures offered at other national and international universities
- Structured feedback from different stakeholders: Academicians, Potential Employers from Private and Government Sector, alumni, current students
- Gaps Identified by National task force on Geospatial Education (MHRD)
- Experts Comments

Outcome of Need Based Analysis

Academia



Govt Sector



Private Sector



Major Gaps in Geospatial Industry (Source: MHRD, 2013)

7

Geospatial Technology	Leadership	Managerial Skill	Technical Skills	Consulting and Systems Analysis	Research/ Modelling
Geographic Science	Low	Low	Low	Low	Low
Survey/Mapping	Low	Average	Very Good (Limited)	Average	Low
Geospatial database development	Low	Very Good	Very Good	Average	Average
GIS Applications & S/W development	Low	Average	Average	Average	Low
Solution architecture / deployment	Average	Average	Good	Average	Low

Market Demand vs Shortcoming of the Programme at TERI SAS

8

Separate course on Geoinformatics Application
In depth Programming
Statistical Modeling
Open Source Software
Machine Learning Algorithm
Data Science
WebGIS
CloudGIS
Research Aptitude
Project Management

9

Review of programme structure by experts

Experts

1. Prof. J. K. Garg, Indraprastha University
2. Prof. C. Jeganathan, BIT Mesra
3. Prof. P. K. Joshi, JNU
4. Dr. S. S. Ray, MNCFC
5. Dr. B. Deshmukh, IGNOU
6. Dr. Shalini Singh, CDAC
7. Dr. Parul Srivastava, IORA International
8. Mr. Abhishek Sindal ESRI India
9. Dr. P L N Raju, Director, NESAC, ISRO

10

Overall Comments

1. Greater emphasis on remote sensing and GIS applications.

1. Latest trend such as big data analytics, multi-temporal, data mining, cloud computing, Programming should be part of USP.

2. Break up of credits in theory and lab. 4 credit course =3+1.

3. Equal credit load across different semesters

4. Emphasis on open source software

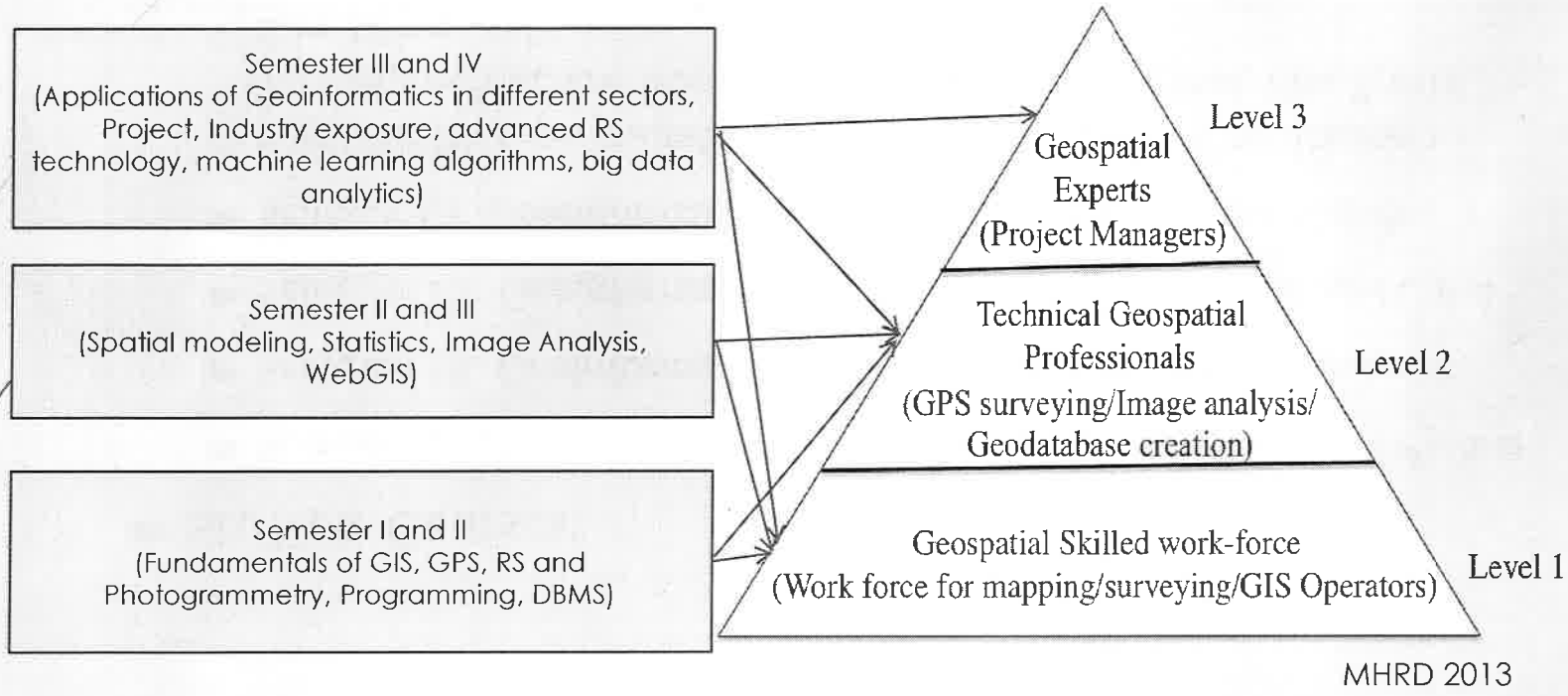
5. Overlap between the courses should be addressed

Major upscaling in revised MSc Geoinformatics

- **Six New Courses**:
  - Semester II: Programming in Geoinformatics (Core) : Focus on Python
  - Semester IIL Geoinformatics Application for Land Resources (core)
  - Semester III: Geoinformatics Application for Water Resources (Core)
  - Senester III: Geoinformatics Application for Atmosphere (Core)
  - Semester III: Geocomputation (Elective): Advanced Classification Techniques/Machine learning algorithms, Big data analytics, Spatial Simulation

Skillset generated matches country's expectation

12



MHRD 2013

Proposed Programme Structure (70 Credits)

13

Semester I (15 Credits) (Core)	Semester II (19 credits) (Core)	Semester III (19 Credits) (Core/Elective)
Principles of Cartography (3)	Photogrammetry (3)	Advances in Remote Sensing (4) (core)
Principles of Remote sensing (3)	Multivariate Data Analysis (3)	Advances in GIS and current trend (4) (Core)
Principles of GIS and GNSS (4)	Spatial Data Modelling and its applications (4)	Application of Geoinformatics for Land Resources (3) (Core)
Environmental Statistics (3)	Digital Image Processing and information extraction (4)	Application of Geoinformatics for Water Resources (3) (Core)
Fundamentals of Computers and Programming (2)	Programming in Geoinformatics (3)	Application of Geoinformatics for Atmosphere (3) (Core)
Applied Mathematics* (3) (Audit)	Law and Policy for GIS and Remote sensing (2)	Geocomputation (3) (Elective)
Technical Writing (2) (Audit)	Project Management (3) (Audit)	Electives from Other Department
Fundamentals of Physics** (2) (Audit)	Research methodology and thesis writing (2) (Audit)	

Summer Minor Project (2 Credits)

Semester IV Major Project (15 Credits)

* Required for students who did not study Mathematics at 10+2 level
** Required for students who did not study Physics at 10+2 level

Semester I Courses (new/updated)

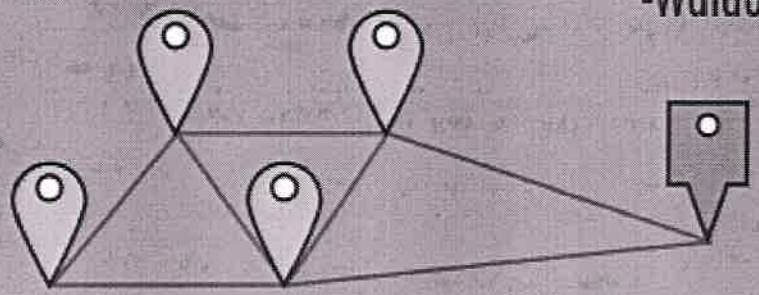
Semester I
Principles of Cartography (3) (Core)
Principles of Remote sensing (3) (Core)
Principles of GIS and GNSS (4) (Core)
Fundamentals of Computers and Programming (2) (Core)
Fundamentals of Physics (2) (Audit)

15

- Thank You

Everything is related to everything else, but near things are more related than distant things.

-Waldo Tobler



Need Survey for Masters Programme in Geoinformatics at TSAS

Annexure 1.4.1.C Feedback collected, analysed and action

We would like to understand the current need of master level programs in Geoinformatics. TERI University offers MSc program in Geoinformatics which is under review to meet the current market need. At the same time we are planning to offer an MTech program in the field of Geoinformatics. In this regard, we would like to have your response to the following questions. Thank you so much for your time and input.

- Department of Natural Resources, TERI University.

* Required

- o Govt Organization
- o Academia
- o Private Sector
- o Alumni

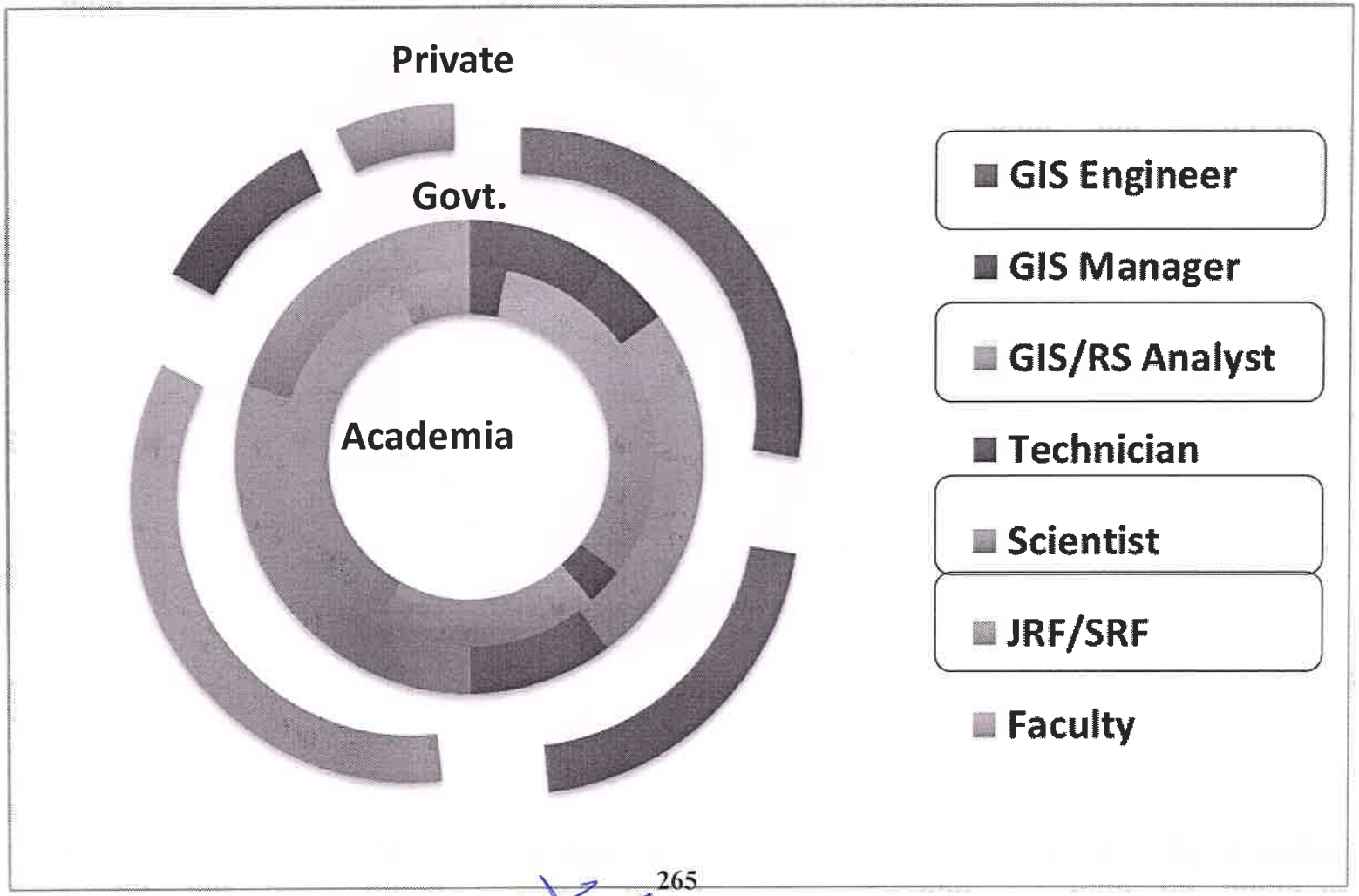
1. At what level do you hire?
2. Which skillset defines the requirement of your organization?
3. Additional skill set which you may like to have in Geoinformatics professional for your organization?
4. What do you foresee as the upcoming trend and required skill set among Geoinformatics professionals?
5. What kind of skill sets would you expect from MSc Geoinformatics?

Responses

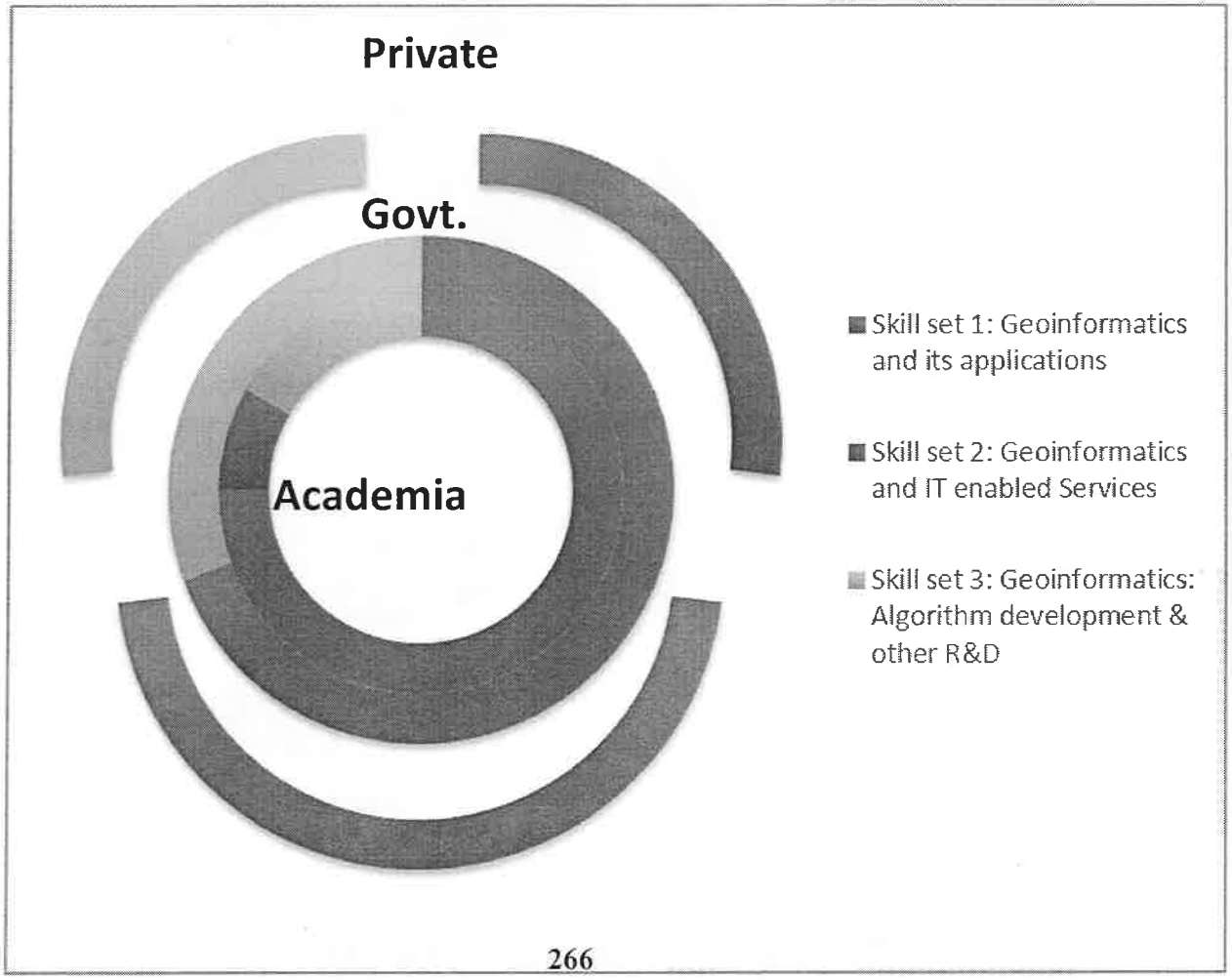
S. No.	Stakeholders	Questionnaire Sent	Responses Received	Main stakeholders (responses received)
1	Government*	38	10	NRSC, RRSC, CWC, NCAOR, SAC, ISRO
2	Private Sector*	70	17	ESRI-India, ESRI-USA, Rolta, Mapbox, UDRI, RMSI, CIPT
3	Academia*	44	24	IIT, IISc, JNU, IGNOU, Govind Ballav Pant University, University of Madras, Ajim PremJi University, NIT, SNU, IIIT
	Total	152	51	

* Includes Alumni

What level are you hiring?

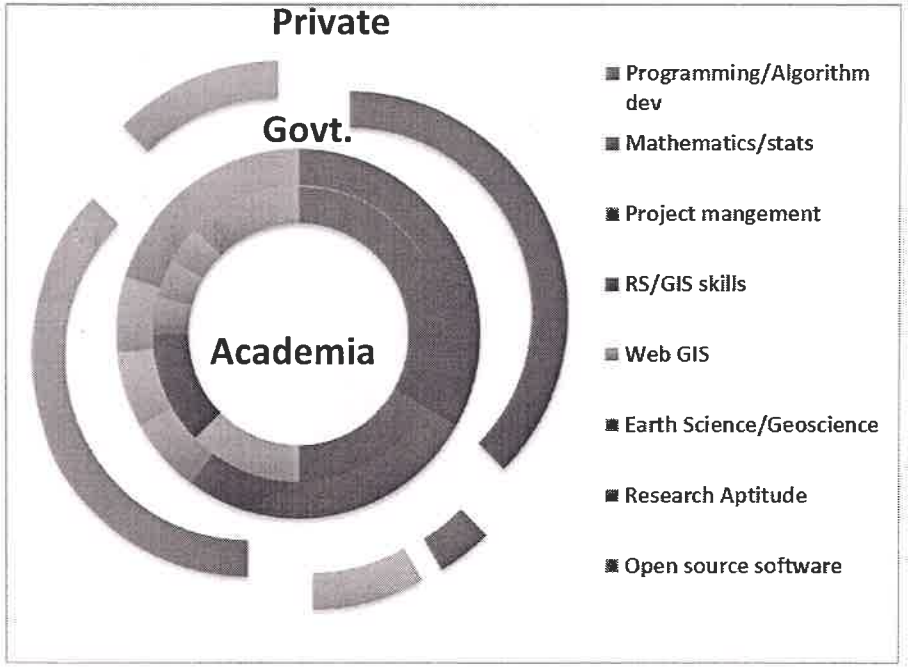


Which skill set clearly defines the requirement for your organization/Institute?

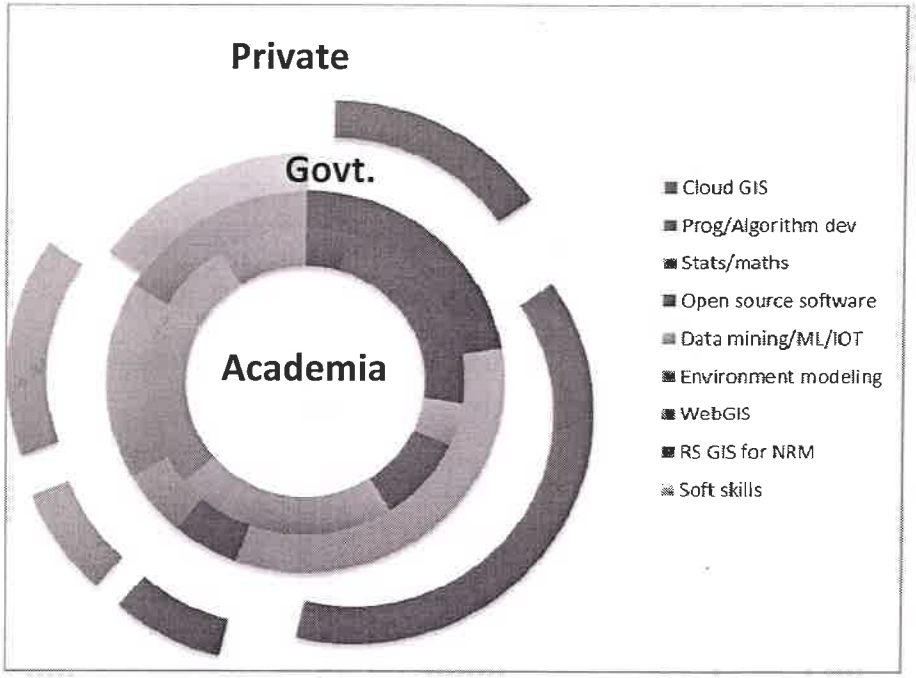


266

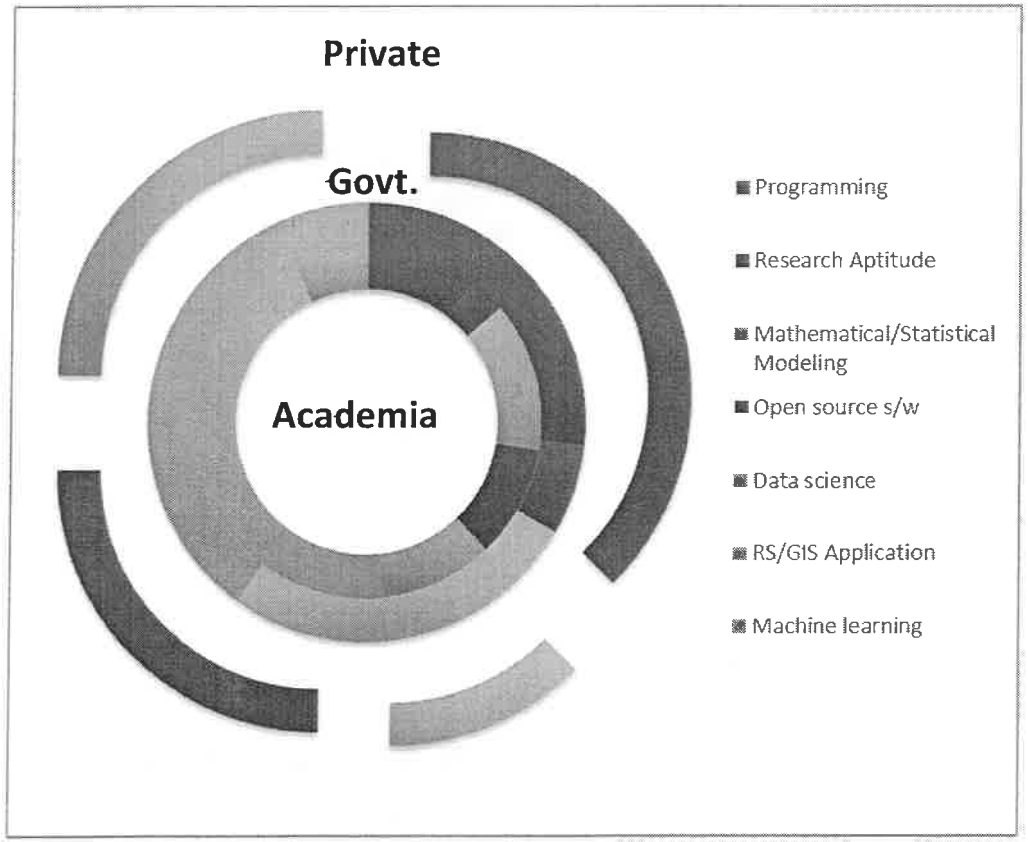
Additional skill sets you may expect from Geoinformatics professional for your organization



What do you foresee as the upcoming trend and required skill set among Geoinformatics professionals?



What kind of skill sets would you expect from MSc Geoinformatics



Feedback from current students

Current Programme Structure

- Need for latest programming language such as Python
- Programming courses need to be split over semesters
- Lot of topics covered under Maths are not used subsequently for other courses
- Courses need to be distributed equally across different semesters
- More elective courses

Annexure 2.1.1 Demand ratio of MSc Geoinformatics students

Year 2020		
No of Seats	No of applications	Final No. of Student in a batch
25	90	22
Year 2019		
No of enrolled students	No of applications	Final No. of Student in a batch
25	72	19
Year 2018		
No of Seats	No of applications	Final No. of Student in a batch
25	59	18
Year 2017		
No of Seats	No of applications	Final No. of Student in a batch
25	50	10
Year 2016		
No of Seats	No of applications	Final No. of Student in a batch
20	58	12
Year 2015		
No of Seats	No of applications	Final No. of Student in a batch
20	50	6



Annexure 2.3.3.1 **The list of Mentor & Mente**

Faculty mentors to students (2019 – 20)

S. No	**Faculty mentor**	MSc Geoinformatics (Ist Semester)
1.	Prof J K Garg	Hardik Negandhi Protikar sen Debasmita Lahiri
2.	Dr Sudipta Chatterjee	Duke Ojo Patrick Ria Ghosh Shubhendra Pratap Singh
3.	Dr Vinay Sinha	Ankit Majumdar Mohammad Tayyab Debashree Bhattacharjee
4.	Dr Neeti	Nishant Thaploo Sreeja Das Sayantani Majumder Piyush Kumar
5.	Dr Anu Rani Sharma	Akshar Tyagi Harshit Bhasin Jayita Kundu Sravani Ponugoti
6.	Dr Nithiyanandam Y	Nitin Singh Ghugtyal Anandita Gupta Priyal Bhatia Mehnaz Jabeen

Faculty mentors to students (2020 – 21)

S. No	**Faculty mentor**	MSc Geoinformatics (I[st] Semester)
1.	Dr Sudipta Chatterjee	Aneesh Kumar Satish Charu Bisht Jahanvi Rajora Jyoti Kunal Kumar
2.	Dr Vinay Sinha	Anshu Ekta Jatin Nandal Kriti Marjara Mohd Afzal Khan
3.	Dr Neeti	Umar Naz Navneet Jain Prakriti Gupta Saptaparna Saha Sarthak Madan
4.	Dr Anu Rani Sharma	Shivam Srivastava Jyoti Sandeep Ps Vandana S Sudeeksha Shanker Vani Kaushik
5.	Dr Nithiyanandam Y	Shivangee Paul Soumya Shambi Tanvi Sharma Rajesh Kumar Mangala Katyayni

Annexure 2.4.3.1.A Teaching experience of full-time teachers and their Name

Teaching experience of full time teachers in number of years (current year data)				
Name of faculty	Qualification	Designation	Years of experience (as provided to NAAC) in 2018	Total Experience
Dr Vinay Shankar Prasad Sinha	Ph. D	Associate Professor and HoD	14	17
Dr Neeti	Ph. D	Assistant Professor	3.5	9.5
Dr Nithiyanandam Yogeswaran	Ph. D	Assistant Professor	6.5	6.5
Dr Anu Rani Sharma	Ph. D	Assistant Professor	7	12
Dr Sudipta Chatterjee	Ph.D	Associate Professor	5	22

Annexure 2.4.3.1.B List of teachers including their PAN, designation, department and experience details

Name of the Full-time teacher	PAN	Designation	No. of Sanctioned posts	Year of appointment	Name of the Department	Total years of Experience	Is the teacher still serving the institution/If not last year of the service of Faculty to the institution
PRESENT							
Dr Anu Rani Sharma	BSJPS7091H	Assistant Professor	5	August 2012	Natural Resources	12	Serving
Dr Sudipta Chatterjee	ADEPC6989R	Associate Professor	5	February 2014	Natural Resources	24	Serving
Dr Nithiyanandam Yogeshwaran	ALKPN6322K	Assistant Professor	5	December 2014	Natural Resources	8.5	Serving
Dr Vinay Shankar Prasad Sinha	AYUPS2678E	Associate Professor	5	April 2015	Natural Resources	16	Serving
Dr. Neeti	ACRPN5226G	Assistant Professor	5	October 2015	Natural Resources	4	Serving
Resigned during assessment period							
Dr Vinay Kumar Tyagi	ANAPT8674Q	Assistant Professor	10	January 2015	Natural Resources	2	Till April 2016
Dr Suresh Jain	AFYPJ4411R	Professor	10	June 2007	Natural Resources	15	2017 Transferred to DEE & Resigned 2018
Transferred to other department (who were in DNR)							
Dr Prateek Sharma	ARMPS0876M	Professor	10	August 2007	Natural Resources	19	Serving Transferred to DEE

Dr Kamna Sachdeva	CDJPS7963N	Associate Professor	10	October 2008	Natural Resources	9	Serving Transferred to DEE
Dr Chubamenla Jamir	AUMPJ4356J	Assistant Professor	10	July 2012	Natural Resources	6	Serving Transferred to DEE
Dr Arun Kansal	AFBPK0183L	Professor	10	January 2008	Natural Resources	21	Serving Transferred to DEE
Dr Chander Kumar Singh	DOZPS4307N	Assistant Professor	10	September 2011	Natural Resources	6	Serving Transferred to DEE

Annexure 2.4.4.1 List of awards

National Environmental Science Academy

206, RAJ TOWER-1, ALAKNANDA COMMUNITY CENTRE
NEW DELHI - 110019 (INDIA)



Board of Awards

of

National Environmental Science Academy, India

does hereby proclaim that

Dr. Vinay S.P. Sinha

has been conferred with

Scientist of the Year Award - 2017

for his outstanding contributions in the field of

Natural Resources, Water Resources and Remote Sensing

based on his high accomplishments to date

and

the noble example he has set for his peers

and entire academic community.

Sanctioned by
Board of Awards of
National Environmental Science Academy
India

Chairman-cum-General Secretary

President, National Environmental Science Academy

Dated : 24th December 2017

REGD. OFFICE: SHIVPURI, BEHIND A.N. COLLEGE, PATNA-800023, BIHAR

National Environmental Science Academy

206, RAJ TOWER-1, ALAKNANDA COMMUNITY CENTRE
NEW DELHI - 110019 (INDIA)

SCIENTIST OF THE YEAR AWARD - 2017



Dr. Vinay S P Sinha is Associate Professor Department of Natural Resources at TERI University, India. He received his Ph.D in Urban regional Planning from Banasthali University, Rajasthan. He did his M.Tech in Remote Sensing and Post graduation in Geography. He has over 13 years of research/consultancy/teaching experience in the areas of Geo informatics, Urban and Regional planning, Natural Resource Assessment and Management and Groundwater Resource Modeling. Dr Sinha has extensively traveled most of the states in India and is well versed with geology, geomorphology and physiography including socio-economic configuration. He visited United Kingdom to deliver lectures on Sustainable cities and Sustainable water resource management. Among various contributions to planning and execution lead to policy formulation, the key contributions of his research are "Water Vision Plan - 2030 of Arunachal Pradesh State" for the Ministry of Water Resources, Govt. of Arunachal. He has regularly published papers in peer-reviewed journals and also presented in different forums including seminar/conferences/workshops.

At TERI University he is teaching courses related to geoinformatics, supervising masters (MSc/MTech) and doctoral research and strengthening application of RS&GIS in other disciplines. He is also adjunct professional to TERI and is advising activities related to applications of RS/GIS/GPS and allied technologies.

Considering all his achievements and contribution in the field of **NATURAL RESOURCES, WATER RESOURCES AND REMOTE SENSING** the **BOARD OF AWARDS** of the Academy has recommended his name for the **SCIENTIST OF THE YEAR AWARD 2017**, as such academy confers upon him the same day i.e on 24th December, 2017.

(Prof. Javed Ahmad)
President

(Prof. Ajay Kumar Gupta)
General Secretary



SUSTAINABLE DEVELOPMENT GOALS

Network India

THIS CERTIFICATE

is presented to

TERI SCHOOL OF ADVANCED STUDIES

Category: Business School
for being adjudged the

WINNER

3rd Innovative Practices Awards for
Sustainable Development Goals (SDGs)
at
GCNI 14th National Convention
31st May, 2019 Mumbai

Dr. Bhaskar Chatterjee
Chairman of the Jury

Kamal Singh
Executive Director
Global Compact Network India

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Annexure 2.5.1.1 Number of days from the date of last semester-end/ year- end examination

Average number of days from the date of last semester-end/ year- end examination till the declaration of results during the last five years					
Programme Name	Programme Code	Semester/ year	Last date of the last semester-end/ year- end examination	Date of declaration of results of semester-end/ year- end examination	Difference between dates
M Sc (Geo)	02004	2012	17-05-2014	26-06-2014	40
M Sc (Geo)	02004	2013	16-05-2015	15-07-2015	60
M Sc (Geo)	02004	2014	14-05-2016	14-07-2016	61
M Sc (Geo)	02004	2015	13-05-2017	05-08-2017	84

Annexure 2.5.4 **Positive impact of reforms on the examination procedures and processes**

EXCERPT FROM COMPENDIUM – PART 2

CHAPTER VI - EXAMINATION

A. Guidelines For Conduct Of Major Examinations

Every Head of Department/Programme Coordinator is required to give the date sheet of examination of all courses in their department/program to the exam section. This is required to be submitted at least ten days before the start of examinations as per the academic schedule of the University.

Every Head of Department/Programme Coordinator is required to give the list of invigilators for all the examinations of their program to the examination branch. This is to be submitted along with the examination date sheet. Any change in the name of invigilator is to be brought to the notice of examination branch at least two days before the examination date of that course.

The Head of Department/Programme Coordinator/faculty are required to send their question paper to the examination branch at least 5 days before their scheduled exam so that these may be checked for errors by the examination cell, photocopied and kept in sealed envelopes which would be handed over to the concerned faculty member 15 minutes before the commencement of their respective exam. The course coordinator is requested to mention clearly

a. Whether it is an open-book or closed book exam;

b. Which teaching notes and materials a candidate can carry;

c. Any other relevant instruction she/he intends to share.

The invigilator of the examination would collect all the answer sheets and attendance sheet after the completion of the exam. The faculty is required to evaluate the answer sheets and submit grades to the HoD within the timeframe specified in the academic calendar. The faculty/course coordinator will then submit the answer sheets to the examination branch, after showing them to the concerned students, for records. In case the answer sheets are to be examined by external faculty, the course coordinator is responsible for making necessary arrangements to get these evaluated by the external faculty members and show these answer sheets to students. After the specified date, these answer sheets are to be submitted back to examination branch.

Once the answer sheets etc. are shown to the students, the final marks are to be uploaded on the TERI University portal for consideration and approval of MPEC/Dean (Academic) as per the academic calendar of the University.

B. Eligibility & Responsibility of Invigilator for Examination:

Under normal circumstances course faculty/course coordinator is expected to act as the invigilator for her/his examination. In specific cases where the course faculty/course coordinator is not available, the Head of Department/Programme Coordinator is required to depute another faculty from her/his department to perform the duty of invigilation.

The invigilator may be assisted by a research scholar or teaching assistant but the responsibility of smooth conduct of the examination would remain with the invigilator.

The Invigilator is responsible for the conduct of the examination. If s/he notices any occurrence of use of any unfair means, s/he is authorized to take strict action and report the event to Controller of Examination/Deputy Controller of Examination immediately. The Controller of Examination in such event is to initiate suitable action against the erring student. In instances of serious breach of academic honor code, CoE would forward the complaint to the Dean(Academic) for appropriate action as per TERI University rules.

Internet access is not allowed during examination time.

For internal and external audit.

Prepared by: Seema Sangita
Submitted to: Anu Rani Sharma
Date: 21st February, 2019

Metric 2.5.4 – Positive impact of reforms on the examination procedures and processes including IT integration and continuous internal assessment on the examination management system –

Describe the examination reforms with reference to the following within 500 – 1000 words

- **Examination procedures**
- **Processes integrating IT**
- **Continuous internal assessment system**

Examination Procedure

The following is a summary of the Examination Procedure that is followed at TSAS:

Schedule

The semester schedule for each academic year is published in the academic calendar prior to the start of an academic year. With respect to examinations, this calendar specifies the time line for the conduct of minor and major exams and the declaration of results.

Examination Guidelines

The examination procedures are documented in detail in Chapter VI of the Compendium of Policies, Rules and Guidelines for TERI University, Part – II, May 2017.

Every Head of Department/Program Coordinator is required to give the date sheet of examination and the list of invigilators of all courses in their department/program to the exam section. This is required to be submitted at least ten days before the start of examinations as per the academic schedule of the University.

The Course Coordinators are required to send their question paper to the examination branch at least 5 days before their scheduled exam so that these may be checked for errors by the examination cell, photocopied and kept in sealed envelopes which would be handed over to the invigilator 15 minutes before the commencement of their respective exam.

Other instructions for faculty, invigilators and students are articulated in the Compendium/Students Handbook and a reminder is circulated over email prior to the major exams.

The Invigilator is responsible for the conduct of the examination. If s/he notices any occurrence of use of any unfair means, s/he is authorized to take immediate action and report the event to Controller of Examination/Deputy Controller of Examination immediately. The Controller of Examination in such event is to initiate suitable action against the erring student. In instances of serious breach of academic honor code, CoE would forward the complaint to the Dean(Academic) for appropriate action as per TERI University rules.



The invigilator of the examination would collect all the answer sheets and attendance sheet after the completion of the exam. The faculty is required to evaluate the answer sheets and submit grades to the HoD within the timeframe specified in the academic calendar. The faculty/course coordinator will then submit the answer sheets to the examination branch, after showing them to the concerned students, for records. In case the answer sheets are to be examined by external faculty, the course coordinator is responsible for making necessary arrangements to get these evaluated by the external faculty members and show these answer sheets to students. After the specified date, these answer sheets are to be submitted back to examination branch.

Flying squad of at least two faculty members is set up for each exam. The flying squad undertakes surprise checks in each examination room. In case they observe use of any unfair practices in the exam, they may report the event to the Controller of Examination to initiate suitable action against the erring student.

Declaration of results

Once the answer sheets or other form of output of evaluation are shown to the students, the final marks are to be uploaded on the TERI University portal for consideration and approval of MPEC/Dean (Academic) as per the academic calendar of the University.

Once the results are approved by the Dean (Academic) through the University portal and submitted to the examination branch, the examination branch will check for inconsistencies etc. and publish the result on the student's portal as per the academic calendar.

There is a clear policy and procedure for student appeal regarding the final course and project grade and is elaborated in the Compendium/Student Handbook.

All these procedures have been documented in the Compendium/Student Handbook and communicated to the faculty and students. This has ensured that the examinations are conducted smoothly and any unfair practices or misconduct during examinations by students are appropriately handled.

(Proof: Chapter VI of the Compendium of Policies, Rules and Guidelines for TERI University, Part – II, May 2017)

Processes integrating IT

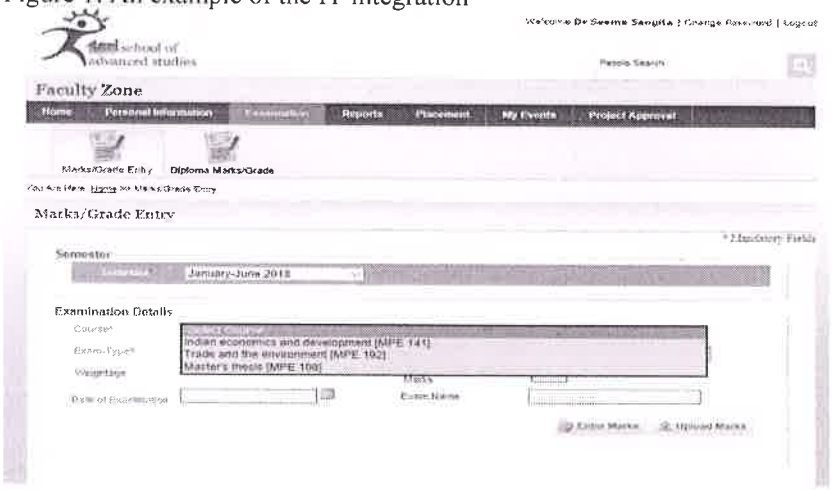
The examination evaluation and grade moderation process is integrated with the faculty and student portal

1. Faculty members can access the grade page of each of their courses. The grade pages are designed to accommodate the weighting system as defined in the syllabi and approved by the academic council.
2. Faculty enters the final marks in their own faculty portal page. The system then generates grades which may be retained or modified by the Faculty Members.
3. The chairperson of MPEC can access these grades on his/her portal and may approve or modify them in consultation with the MPEC.
4. The portal of the Dean, Academic would now reflect the submission of the marks by the MPEC. He may approve them or seek clarifications. In case of the latter, the MPEC uses the portal to present its response.
5. After the approval of the MPEC, due processes are carried out by the Examination cell the final grades are displayed on the students' portal.

6. Also, the attendance is recorded on the portal and students with attendance of less than 75% are automatically debarred from the exam.
7. The University Management System (UMS) calculates the SGPA and CGPA and generates the hard copy of the grade card for each student.

   This procedure is designed to avoid any errors in the final grades of the students. The use of the portal and UMS system increased the efficiency of this procedure and enables the faculty and administration to declare the results of the examinations as per the schedule.

Figure 1: An example of the IT integration



Proof: A demonstration of the portal system is the proof for this section.

Continuous internal assessment system

Grading is based on a continuous evaluation consisting of the following strategies of assessment:

- Tests
- Open book Exams
- Assignments
- Lab based assignments
- Quizzes
- Term papers
- Class interactions/presentations
- Field interactions/assignments

The exact form of assessment for each course and their weightage as a part of the total course grade is approved by the academic council and is indicated in the course outline. Also, students are informed about the procedure in the beginning of the semester.

Specific timeframes have been set aside in the academic calendar for minor and major tests. However, additional tests and other forms of continuous assessment take place throughout the semester.

As a result of this format of continuous internal assessment system, student learning process involves development of critical thinking skills, analytical abilities, experiencing the real world, written and verbal communication skills, rather than a mere rote learning.

Further, the continuous evaluation plan for each course is listed in the syllabus (on the website for effective communication with students) and is IT integrated with the portal.

Proof:

a. A compilation of syllabi (the section evaluation section) will be the documentation for this. All the syllabi are accessible from the website
b. Grades section of faculty profiles in the portal establishes the use and effective implementation of the continuous evaluation system

Annexure 2.6.1 Programme/ Course Specific Outcomes

Courses outcomes:

NRE 165: Introduction to Sustainable Development

1. The students will have a "generalist" development practitioner"s perspective towards environmental management.
2. The students will have fairly good understanding of the current debates around concepts of sustainable development and practices.

NRE 101: Technical Writing

Not mentioned

NRE 111: Environmental statistics

After completing this course the students will be able to
1. develop an intuitive statistical sense
2. analyse, model and quantify uncertainty
3. extract information and draw scientific inference from large amount of data collected to solve environmental problems
4. take informed decisions under uncertainty

NRG 176: Principles of GIS and GNSS

Upon completion of this course, student will be able to:
1. Create and understand database in spatial platform for analysis and modeling for various applications [test -1]
2. Conduct the GNSS based survey and mapping under variety of planning and management applications [test-2]
3. Capable to understand the use of spatial tools & techniques for analysis and modeling of the spatial data over various natural and human resource mapping, monitoring and management [Practical and test-3]

NRG 178: Principles of Remote Sensing

Upon completion of this course, student will be able to
1. Apply different type of remote sensing systems for various applications [Test1, Test2, Test3]
2. Operational skills necessary to acquire remote sensing data and learn to extract information from them.[Practical]
3. Develop skill set to deal with different types and forms of satellite data [Test1, Test2, Test3]

NRG 106: Fundamentals of computers and programming

1. Describe how data are represented, manipulated, and stored in a computer [Test1, Lab Assignments]
2. Design programme using flowchart [Test1, Lab Assignments]
3. Able to write and execute C programme using different logical operators[Test2, Lab Assignments]
4. Able to create database table and perform logical queries with different conditions [Lab Assignments, Test3]

NRG 102: Fundamentals of physics

Upon completion of this course, a student will be able to:
1. Understand basic concepts and principles in different branch of physics like energy, thermodynamics, waves, and optics. [Test1, Test2, Tutorials/assignments/Quizzes]
2. Realise the physics behind remote sensing thought in other courses. [Test3]

NRG 171: Principles of cartography

Upon completion of the course, student will be able to:

1. Design and Geovisualize maps and communicate in perspective [Test1, test2, Tutorials and Assignments, Practical]
2. Critically analyze a map to understand its scientific, social and political utility [Test1, Test2, Tutorials and Assignments, Practical, Test3]

NRE 113: Applied mathematics

Not mentioned

Semester 2

NRG 172: Digital Image Processing and Information Extraction

1. Gain knowledge and practical experience in digital image processing
2. Learn practical skills and analytical background for building digital image and its application

NRG 108: Programming in Geoinformatics

At the end of the course, students will be able to:
- Automate geoprocessing tasks using Python
- Understand, write, debug and execute python programme
- Write and execute basic image analysis using GEE

NRG 163: Spatial Data Modeling and Applications

1. Equip with analysis, description and modeling of geospatial data.
2. The practical applications of software tools, underlying theory, and the correct application of these tools to analyze and model data

NRG 162: Law and Policy for Maps and Remote Sensing

By the end of the course, the students are expected to:

1. Be familiar with the laws, policies and institutions in the field of maps and remote sensing both at the national and international level.
2. Understand the significance of regulations on remote sensing and mapping in the conservation of natural resources, land use & planning, agriculture, forests and overall environmental monitoring & assessment.
3. Acquire the ability to critically evaluate the role of law and policy in conservation and management of environment.

NRG 103: Project Management

Not mentioned

NRG 170: Photogrammetry

Upon completion of the course, student will be able to:

1. Extract data from aerial photography
2. Understand the process of reconstructing three-dimensional model for the real world

NRE 112: Multivariate Data Analysis

1. distinguish between dependence and interdependence methods in multivariate data analysis
2. identify the most appropriate statistical techniques for a multivariate dataset

3. carry out and apply commonly used multivariate data analysis techniques, and interpret results
4. use statistical software packages for the analysis of multivariate data

Semester 3

NRG 179: Advances in GIS and Current Trends

1. Provide latest state of art in GIS technology.
2. Software, hardware and application suits

NRG 177: Advances in Remote Sensing

Latest developments in the Remote Sensing datasets

NRE 112: Multivariate Data Analysis

1. distinguish between dependence and interdependence methods in multivariate data analysis
2. identify the most appropriate statistical techniques for a multivariate dataset
3. carry out and apply commonly used multivariate data analysis techniques, and interpret results
4. use statistical software packages for the analysis of multivariate data

NRG 105: Independent Study

Not mentioned

NRE 151: Wildlife Conservation and Management

Not mentioned

NRE 145: Integrated impact assessment

1. After attending the course the students shall have acquired knowledge to conduct integrated impact assessment, so that they are able to identify sustainable modes of environmental operation.
2. Students would be able to understand the key elements of EIA and its processes by which they can apply to relevant projects.
3. Able to understand various tools and techniques used in identification and analysis of impacts suggest appropriate mitigation measures and prepare environmental management plans.

NRE 171: Environmental Modeling

1. develop models based on the mass-balance approach
2. predict the impact of the of external waste loading on different environmental matrices
3. predict and generate future conditions under various loading scenarios or management/intervention action alternatives

NRE 133: Environmental Management System

After attending the course the students would be:

1. acquainted with the environmental management system and its benefits

2. able to identify and review audit-related documentation, prepare checklists and audit process
3. able to apply toolssuch life cycle assessment, environmental audits, evaluation of environmental performance for environmental decision-making
4. to evaluate the effectiveness of systematic EMS monitoring processes.

NRE 163: Groundwater Hydrology and Management

1. Interpretation of groundwater field data, identify pollutants, saline water intrusion
2. Ability to conduct surface and sub-surface investigations of groundwater using latest technology and methods available
3. Would be equipped to decide on conjunctive water use, including ability to identify competing water demands, allot ground water usage according to yield of existing aquifer.

NRE 136: Glacier hydrology

1. An understanding on interdisciplinary aspects of high altitude research.
2. An understanding about the tools and techniques to conduct research on glaciers
3. An exposure to glacier environment

NRE 167: Integrated Watershed Management

1. Suggest technical measures for soil erosion control both due to water and wind
2. Assess the current status of the watershed at field, by taking up accurate investigation measures and conduct survey
3. Suggest drought control measures, water conservation structures, including design

Annexure 3.1.3 **Teachers international fellowship /awarded**

WOODS HOLE RESEARCH CENTER

Richard A. Houghton, *Acting President and Executive Director*

August 22, 2014

Neeti Neeti
nneeti@bu.edu

Dear Neeti,

On behalf of the entire Woods Hole Research Center, it is with great pleasure that I invite you to join the staff as a Postdoctoral Researcher, reporting to Dr. Josef Kellndorfer.

This is a one-year, full-time, fixed term position with an annualized salary of $58,000.00, with the possibility of extending a second year, based upon funding. In addition to your salary, this offer of employment also includes our full benefit package, as explained to you during your interview. The Center will also reimburse you for moving expenses incurred in relocating, up to $2,500. This offer is contingent upon obtaining a valid work permit. We will pay for, and assist you in obtaining your H1-B transfer.

Your starting date will be on October 1, 2014, and can be further coordinated with Dr. Kellndorfer. As stated in the *WHRC Employee Handbook*, your supervisor will review your work performance upon the successful completion of the introductory period (your first six months of employment).

If you have any questions about compensation, status, or other employment issues, please call or email Lisa O'Connell at 508-444-1518 or loconnell@whrc.org.

By signing and returning this letter you signify that you accept the offer, and we will begin the process of preparing for your arrival, assisting you in any way that we can.

Sincerely,

R. A. Houghton

Richard A. Houghton

Self attested
Neeti
(NEETI NEETI)

Neeti Neeti Date

cc: Melanie Powers
Josef Kellndorfer
Joyce McAuliffe

Dr. Surender Singh
Joint Secretary

UNIVERSITY GRANTS COMMISSION
(Ministry of Human Resource Development)
NET Bureau, University of Delhi, South Campus,
Benito Juarez Marg, New Delhi-110021
Ph.: 011-24115419, Telefax: 011-24112278
email: ssingh.ugc@nic.in

JRF AWARD LETTER

18 APR 2016

No. F.15-9(JUNE 2015)/2015(NET)

UGC-Ref. No.: 2957/(NET-JUNE 2015)

NANDITA SINGH
D/O BIJOY KUMAR SINGH
Flat No. 6/4, Block-B, Narayani Vihar.,
Uttarayan, Via Premier Nursing Home, Asansol, Burdwan, WEST BENGAL - 713304,



Roll No.: 30000900 Subject: Geography

Dear Candidate,

You had applied in the UGC-NET held on 28th JUNE, 2015 for Junior Research Fellowship in the General category. I am pleased to inform you that you have qualified by securing marks at par with qualifying cut-off for General category. The tenure of the fellowship is five years and it commences from the date of declaration of NET result, i.e., 29th Sep., 2015 (or) from the date of Registration under M.Phil/Ph.D. (or) from the date of joining in M.Phil./Ph.D. programme, whichever is later. The summary of the financial assistance offered under the scheme is mentioned in **Annexure I** (all Annexures mentioned in this letter are available on www.ugc.ac.in/netjrf).

The Awardee is required to get admission and registration for **regular** and **full time M.Phil/Ph.D.** course in a University/Institution/College recognized by the UGC at the first available opportunity **but not later than two years** from the date of issue of this award letter. The University/Institution/College is requested to process for the award of JRF based on this letter, in accordance with the procedure available on www.ugc.ac.in/netjrf.

It may be noted that the fellowship amount shall be disbursed through Canara Bank to the bank account of the Awardee, (any bank) directly. The list of designated branches of Canara Bank is available on the UGC portal www.ugc.ac.in. The Awardee is required to approach the designated branch along with a copy of the **Award letter, Joining Report, Annexure II** and an **undertaking Annexure II (a)**. The Awardee is also required to submit the following documents to the designated branch of the Canara Bank at the stipulated period/interval:

1. At the end of every three months a '**Continuation Certificate**' in the prescribed proforma **Annexure III**. This will make the Awardee eligible to draw the fellowship for the next three months.
2. Half yearly **Progress Report** in the prescribed proforma **Annexure IV** along with the '**Continuation Certificate**'.
3. Details of the expenditure incurred out of the contingency grant to be submitted annually in the prescribed proforma **Annexure V**.
4. The claim towards HRA is subject to the submission of **HRA certificate** in the prescribed proforma **Annexure VI**.
5. After the completion of two years of award of fellowship an '**Upgradation Certificate**' needs to be submitted in the prescribed proforma **Annexure VII** along with **Progress Report and Continuation Certificate**.

It may also be noted that UGC has proposed to link "**AADHAAR**" with student's bank account number so that there can be direct cash transfer and effective disbursal of fellowship into the bank account of the student. In this regard Secretary, UGC has already requested the universities to help the students in Aadhaar Enrolment vide his D.O. letter No. F.14-34/2011 (CPP-II) dated 11.01.2013.

It may please be noted that the award is liable to be cancelled and it will also attract legal action against the Awardee in the following cases:

i) If the Awardee is found to be ineligible to receive the award at any point of time during the entire duration of the fellowship. ii) Misconduct of Awardee. iii) Unsatisfactory progress of research work of the Awardee. iv) In case, any other fellowship is drawn from other source(s). v) Concealment of facts or on any other ground of misconduct.

In order to provide easy accessibility, all the details of the scheme, its requirements, all the prescribed proformae for submission of the documents along with the details of the designated branches of Canara Bank are available on the UGC portal www.ugc.ac.in/netjrf

The e-Certificate of eligibility for Assistant Professor has already been uploaded on **www.ugcnetonline.in**. The category and eligibility of the candidate is to be ensured by the institution/appointing authority.

With best wishes,

Surender Singh

(Surender Singh)

Annexure XIII Number of Research Scholars/ Post Graduate students getting financial assistance

Details of JRF/SRF/Post Doc/RAs (2015 - 20)

SN	Name	Designation	Reporting to	Department	Salary (Rs.)	Period	
						From	To
1	Mohit Kesarwani	Research Fellow	Dr Neeti	DNR	31,000/- +30% HRA	6.12.2019	6.12.2020
2	Vimalathithan S	Consultant/Project Associate	Dr Nithiyanandam	DNR	32,500/-	1.3.2016 1.9.2017	31.08.2016 1.3.2018
3	Chandrashekhar Azad Vishwakarma	RA-II	Dr Vinay Sinha	DNR	49,000/- +24% HRA	14.08.2019	Till date
4	Komal Gupta	Project Associate	Dr Vinay Sinha	DNR	30,000/-	1.06.2017	1.06.2018
5	Sutapa Bhattacharjee	Junior Research Fellow	Dr Vinay Sinha	DNR	30,000/-	11.9.2017	11.03.2018 (Resigned on 15.12.2017
6	Pradeep Vashisht*	Junior Research Fellow	Dr Vinay Sinha	DNR	30,000/-	21.12.2018	31.12.2019
7	Pratibha Prakash	Junior Research Fellow	Dr Chubamenla J	DNR	32,500/-	22.02.2018	30.05.2018
8	Garima Singh	Research Assistant	Dr Vinay Sinha	DNR	20,000/-	02.09.2019	25.09.2019
9	Ushashi Podder	Junior Research Fellow	Dr Nithiyanandam	DNR	30,000/-	07.08.2019	7.04.2020
10	Shubhangi	Junior Research Fellow	Dr C K Singh	DNR	32,500/-	15.11.2016	31.05.2017
11	Prashant	Project Associate	Dr Vinay Sinha	DNR	25,000/-	24.07.2017	31.03.2018
12	Ayushi Vijhani*	Junior Research Fellow	Dr Vinay Sinha	DNR	30,000/-	1.06.2017	20.3.2018
13	Sumantra Basu	Junior Research Fellow	Dr Vinay Sinha	DNR	30,000/-	5.3.2018	28.09.2018
14	Charu Bhanot*	Senior Research Fellow	Dr Sudipta Chatterjee	DNR	36.400	1.4.2017	31..3.2018
15	Priyanka*	Senior Research Fellow	Dr Sudipta Chatterjee	DNR	23,400/-	1.7.2015	30.06.2016
16	Sahaj Kaur*	Senior Research Fellow	Dr Sudipta Chatterjee	DNR	23,400/-	1.4.2017	31.3.2018
17	Amit Pandey*	Senior Research Fellow	Dr Sudipta Chatterjee	DNR	36,400/-	1.12.2016	30.11.2017
18	P S Madhav Chandra	Senior Research Fellow	Dr Sudipta Chatterjee	DNR	36,400/-	17.07.2017	31.03.2018
19	Anupriya Desore*	Senior Research Fellow	Dr Sapna Narula	DNR	23,400/-	1.7.2015	30.06.2016

* are doctoral scholars and paid project assistantship as per the project guidelines.

school of
nced studies
eemed)
Section 3 of the UGC Act, 1956)

TERI School of Advanced Studies
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E-mail registrar@terisas.ac.in
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Web www.terisas.ac.in

Capt. Pradeep K Padhy (Retd.)
Registrar

TS/321/APT/P

29 November 2019

Mr Mohit Kesarwani
631/286, Ajay Nagar
Kamta
Lucknow
Tel. +91 8470914645

Dear Mr Kesarwani,

TERI School of Advanced Studies would like to associate you with us as a Research Fellow in the project titled "Area estimation of Kharif Bajra and Maize for Uttar Pradesh State" for a period of one year with effect from your date of joining. During this period, you will be paid a salary of Rs 31,000/- + HRA @ Rs. 30% /- per month, on submission of bill for the month.

Please note that your working hours shall be as per the University norms and you will be entitled to two days of leave per month of continuous work.

Your current association can be terminated by either side giving three months' notice or salary in lieu thereof.

If you agree to this association, kindly sign and return a copy of this letter indicating your acceptance.

With best wishes,

Sincerely,

Capt. Pradeep K Padhy (Retd.)
Registrar

MKesa
I accept this offer letter and will join by 6th Dec, 2019

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Web www.teriuniversity.ac.in

Gp. Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

29 February 2016

Mr Vimalathitthan S
Room No # 117
First Floor, Mahasagar Bhavan
CGO Complex
Lodhi Road - 110 003

Dear Mr Vimalathitthan,

TERI University would like to associate you with us as a Consultant (Part-time) in the project titled "Model building and developing algorithms for climate studies" with effect from 1 March 2016 for a period of four months. During this period, you will be paid an amount of Rs. 10,000/- pm, on submission of bill for the month.

Your current association can be terminated by either side by giving 15 days' notice or salary in lieu thereof.

If you agree to this association, kindly sign and return a copy of this letter indicating your acceptance.

With best wishes,

Sincerely,

Gp. Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

D. vimalathitthan
01/04/16

teri school of advanced studies
(Deemed to be University)
(established under Section 3 of the UGC Act, 1956)
Accredited by NAAC

TERI School of Advanced Studies
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Web www.terisas.ac.in

Capt. Pradeep K Padhy (Retd.)
Registrar

TS/321/APT/P

18 November 2019

To whomsoever it may concern

This is to certify that Dr. Chandrashekhar Azad Vishwakarma is working as Research Associate-II under the project "Water resources management through spring and catchment rejuvenation in Uttarakhand for improving water security" at TERI School of Advanced Studies since 14 August 2019 till date.

His monthly emolument is Rs. 38,000 + 24% HRA per month.

Capt. Pradeep K Padhy (Retd.)
Registrar

Capt. Pradeep K Padhy (Retd.)
Registrar
TERI School of Advanced Studies
10, Institutional Area, Vasant Kunj
New Delhi-110 070

Received
21.11.2019

teri university

TERI University
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Vasant Kunj
New Delhi – 110 070

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Web www.teriuniversity.ac.in

Capt. Pradeep K Padhy (Retd.)
Registrar

29 May 2017

Ms Komal Gupta
C/o Mr Anand Shrivastava
89/90A, Sector 5
Multitex Engineers Limited
Noida – 201 301

Dear Ms Gupta,

TERI University would like to associate you with us as a Project Associate in the project titled "Preparation of State Specific Action Plan for Water Sector – Arunachal Pradesh" with effect from 1 June 2017 for a period of one year. This period will be extendable based on your performance. During this period, you will be paid a consolidated salary of Rs 30,000/- per month, on submission of bill for the month.

Please note that your working hours shall be as per the University norms and you will be entitled to two days of leave per month of continuous work.

Your current association can be terminated by either side giving one month notice or salary in lieu thereof.

If you agree to this association, kindly sign and return a copy of this letter indicating your acceptance.

With best wishes,

Sincerely,

Capt. Pradeep K Padhy (Retd.)
Registrar

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Web www.teriuniversity.ac.in

Gp Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

4 September 2017

Ms Sutapa Bhattacharjee
C/o Mr. Pradyut Bhattacharjee
S.K. Baruah Road, Bye Lane - 1(W), H/No. - 26, Rukmini Nagar
Dispur, Guwahati, Dist. - Kamrup Metropolitan, Assam
P.O. Sachivalaya Pin - 781006
Email. Sutapabhattacharjee22@gmail.com
Tel. 91-9613147509

Dear Ms Bhattacharjee

TERI University would like to associate you with us as a Junior Research Fellow in the project titled "Enhancing water quality in Uttarakhand using geospatial technology" for a period of six month with effect from 11 September 2017. This period will be extendable based on your performance. During this period, you will be paid a consolidated salary of Rs 30,000/- per month, on submission of bill for the month.

Please note that your working hours are from Monday to Saturday (0830 – 1630 hours) and you will be entitled to two days of leave per month of continuous work.

Your current association can be terminated by either side giving one month notice or salary in lieu thereof.

If we do not receive an acceptance within 7 days of the date of this letter, it will be construed that you are not interested in this offer.

With best wishes.

Sincerely,

Gp Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

I have joined office at TERI University on 11/09/2017

Sutapa Bhattacharjee

teri school of advanced studies
(a University)
(Under Section 3 of the UGC Act, 1956)
by NAAC

TERI School of Advanced Studies
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Web www.terisas.ac.in

Capt. Pradeep K Padhy (Retd.)
Registrar

TS/321/APT/P

21 December 2018

Mr Pradeep Vashisht
House No. 298
Prahlad Pur (Bangar)
Delhi – 110 042
Tel. 9650040819

Dear Mr Vashisht,

TERI School of Advanced Studies would like to associate you with us as a Junior Research Fellow in the project titled "Enhancing water quality in Uttarakhand using Geospatial Technology" from the date of your joining until 31 December 2019. During this period, you will be paid a fellowship of Rs. 30,000/- pm.

Your current association can be terminated by either side giving one-month notice or salary in lieu thereof.

If you agree to this association, kindly sign and return a copy of this letter indicating your acceptance.

If we do not receive an acceptance within 15 days of the date of this letter, it will be construed that you are not interested in this offer.

With best wishes,

Sincerely,

Capt. Pradeep K Padhy (Retd.)
Registrar

Accepted and will be joining from 21st December 2018.

Pradeep

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New Delhi – 110 070

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Web www.terisas.ac.in

Gp Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

21 February 2018

Ms Pratibha Prakash
C-206, S G Impression
Sector 48, Vasundhara
Ghaziabad – 201 012
Tel. 9654835231

Dear Ms Prakash,

TERI School of Advanced Studies would like to associate you with us as a Junior Research Fellow in the project titled "Nutritional and livelihood security of subsistence farmer in the hilly and mountain areas of the Hindu Kush Himalayan region" for a period of two and a half month from the date of your joining. During this period, you will be paid a consolidated salary of Rs 32,500/- per month, on submission of bill for the month.

Please note that your working hours shall be as per the University norms and you will be entitled to two days of leave per month of continuous work.

Your current association can be terminated by either side giving 15 days' notice or salary in lieu thereof.

If we do not receive an acceptance within 7 days of the date of this letter, it will be construed that you are not interested in this offer.

With best wishes,

Sincerely,

Gp Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

Received
Pratibha
22/2/2018

TERI school of advanced studies

TERI School of Advanced Studies
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Capt. Pradeep K Padhy (Retd.)
Registrar

TS/321/APT/P

29 August 2019

Ms Garima Singh
Baheri Kalan. Gauri Karan
Kanpur Dehat – 209 115
Uttar Pradesh
Tel. 9027481783

Dear Ms Singh.

TERI School of Advanced Studies would like to associate you with us as a Research Assistant in the project titled "Development of flood warning system for Guwahati and Jorhat town" for a period of three months with effect 2 September 2019. During this period. you will be paid a fellowship of Rs 20.000/- per month. on submission of bill for the month.

Please note that your working hours are from Monday to Saturday (0900 – 1700 hours) and you will be entitled to two days of leave per month of continuous work.

Your current association can be terminated by either side giving 15 days' notice or salary in lieu thereof.

If you agree to this association. kindly sign and return a copy of this letter indicating your acceptance.

With best wishes.

Sincerely.

Capt. Pradeep K Padhy (Retd.)
Registrar

Received
Garima Singh

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(Deemed to be University)
(Established under Section 3 of the UGC Act, 1956)
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Capt. Pradeep K Padhy (Retd.)
Registrar

TS/321/APT/P

7 February 2020

Ms Ushashi Podder
P-48, Dakshin Behala Road
Kolkatta – 700 061
Tel. 9834779483

Dear Ms Podder,

TERI School of Advanced Studies would like to associate you with us as a Junior Research Fellow in the project titled "Dark ship detection using precision algorithm leveraging logical analysis of varied inputs" for a period of two months with effect from 7 February 2020. During this period, you will be paid a fellowship of Rs 30,000/- per month.

Please note that your working hours shall be as per the University norms and you will be entitled to two days of leave per month of continuous work.

Your current association can be terminated by either side giving one month notice or fellowship in lieu thereof.

If you agree to this association, kindly sign and return a copy of this letter indicating your acceptance.

With best wishes.

Sincerely,

Received
Ushashi Podder

Capt. Pradeep K Padhy (Retd.)
Registrar

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Gp Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

21 July 2017

Mr Prashant
B-24, Rama Park
Dwarka Mor
New Delhi – 110 059
Tel. 8860787847

Dear Mr Prashant,

TERI University would like to associate you with us as a Project Associate in the project titled "Preparation of State Specific Action Plan for Water Sector – Arunachal Pradesh" with effect from 24 July 2017 till 31 March 2018. During this period, you will be paid a consolidated salary of Rs 25,000/- per month, on submission of bill for the month.

Please note that your working hours shall be as per the University norms and you will be entitled to two days of leave per month of continuous work.

Your current association can be terminated by either side giving one month notice or salary in lieu thereof.

If you agree to this association, kindly sign and return a copy of this letter indicating your acceptance.

With best wishes,

Sincerely,

Gp Capt. Rajiv Seth (Retd.), Ph.D
Pro Vice Chancellor

Annexure 3.2.1 **Grant award letters for research projects sponsored by non-government**



White Paper Development Proposal

Landscape approach for Land-Water-Community Security

Collaborators/ Authors

Dr Smriti Das, Associate Professor, Department of Policy Studies

Dr Neeti, Assistant Professor, Department of Natural Resources

Ms. Ranjana Ray Chaudhuri, Lecturer, Department of Regional Water Studies

Ms. Fawzia Tarannum, Lecturer, Department of Regional Water Studies

TERI University, Plot No. 10 Institutional Area, Vasant Kunj, New Delhi - 110 070, India
Tel. +91 11 71800222 (25 lines), Fax +91 11 26122874

Solidaridad Network Asia Limited
Room 1318-20 Hollywood Plaza, 610 Nathan Road
Mong Kok, Kowloon, Hong Kong

Partner Agreement dated 01st February, 2017 ("*Effective Date*")

1.	Principal: ***Solidaridad Network Asia Limited***, hereafter referred to as "***SNAL***", legally represented for this purpose by ***Dr Shatadru Chattopadhayay***, Managing Director.
2.	Partner: ***TERI University***, hereafter referred to as the "***Partner***' legally represented for this purpose by ***Dr Rajiv Seth***, Pro Vice-Chancellor
3	Project reference: the Project is recorded under Solidaridad Project number ***1462***
4.	Project purpose: the Project is intended to ***"Landscape Approach for Land-Water-Community Security*** The white paper is developed in order to establish the need of embedding landscape approach in the River Basin Management. The broad objectives of the project are as follows: 1. Understanding pressures -To analyze the land-water-community nexus in the mid Gangetic river basin. 2. Institutions and governance -To identify the governance structure and its sphere of influence with reference to mid-Gangetic river basin. 3. Gender -To understand gender roles in decision making and its implication for resource sustainability in the basin. 4. "Landscape Approach" as an investable proposition to thrive the business forward 5. Designing a framework for adopting the Landscape Model in the Mid-Ganga Basin.
5.	Project description: a detailed Project description entitled "***SLM in Ganga Basin***" , dated 21st December, 2016 and corresponding budget of ***INR 30,00,000/-***, is attached to this agreement as Annex B ("***Project Description***")
6.	Contract reference: the Contract is recorded under Solidaridad Contract number ***SNAL/2017/1462/714***
7.	Partner Agreement commencement: the Project shall commence on ***1st Febuary'2017***
8.	Partner Agreement end date: the Project shall end on ***30th September'2017***
9.	Countries: the project shall be performed in the following countries: ***India***
10.	Commodities: the Project shall cover the following commodities: ***Sugarcane; Livestock***
11.	Third party contributors[2]: the following external financiers or private donors will contribute funds - either directly or through Solidaridad - to the Project ("Third Party Contributors"): ***N/A***

Annexure 3.2.2 Grants for research projects sponsored by the government sources

List of the research project

Research Project (2015-17)	**Theme**	**PI/Co-PI**
Indian Technical and Economic Cooperation: international capacity building program in Climate change and sustainability	Climate Change	DNR
Black and brown carbon influence on climate and climate change in India from local to regional scale	Climate Change	Dr Anu
Influence of Clouds and atmospheric Aerosols - India and Finland (ICASIF)	Air	Dr Anu
Impact of Ozone and Other Pollutants on Crops	Air	Dr Kamna
Model Building and Developing Customized Algorithm for Climate Studies	Technology	Dr Nithiyanandam
Research Project (2017-20)	**Theme**	**PI/Co-PI**
Space Technology Utilization for Food Security, Agricultural Assessment and Monitoring	Agriculture	Dr Neeti
Landscape approach for Land-Water- Community Security	Water	Dr Neeti
Precession algorithm leveraging logical analysis of varied inputs for Dark ship detection (Indian Navy)	Ocean	Dr Nithiyanandam
Interdisciplinary research to examine the Urban Heat Island intensity in Delhi NCR and its effect on vulnerable communities (HUDCO).	Urban	Dr Nithiyanandam
Developing advanced models for climate studies (NSCS, PMO).	Technology	Dr Nithiyanandam
Hurricane and Tornado Damage assessment with the use of remotely sensed SAR and Thermal imagery (Turkish Higher education council)	Disaster	Dr Nithiyanandam
Impacts of Nitrogen deposition in forests of Himalaya. Supported by Global Challenge Research	Environment	Dr Sudipto
Preliminary studies on pollution and biodiversity with Masters students in India and Sri Lanka	Biodiversity	Dr Sudipto
ISO 17096: Certification of Mucuna sps. Quality Council India, National Medicinal Plants Board and Zandu Pharmaceuticals.	Environment	Dr Sudipto



Monitoring, Evaluation, Learning and Documentation (MEL&D) of Projects under Integrated Watershed Management Programme (IWMP) for batch II, III and IV projects	Watershed	Dr Vinay
Coping with Climate: Assessing Policies for Climate Change Adaptation and Transport Sector Mitigation in Indian Cities (CLIMATRANS)	Water	Dr Vinay
Development of Flood Warning System for Guwahati & Jorhat Towns	Disaster	Dr Vinay
Climate Risk Assessment of the Proposal Petrochemical Complex in Mundra, Gujrat	Water	Dr Vinay
Modelling for Enhancing Water Quality in Uttarakhand using Geospatial Technology	Urban	Dr Vinay
Heat Island Study: IbValley Industrial Cluster, Jharsuguda, Odisha	Water	Dr Vinay
Himalayan Adaptation, Water and Resilience (Hi-ARARE)	Water	Dr Vinay
Water Energy Food Nexus (WEFN) Through Solar-Green House Based Hydroponic Solutions with Android Mobile Application of Vegetable Market for Rural farmers and Urban Users	Agriculture	Dr Vinay
Water Resource Management through spring and Catchment Rejuvenation in Uttarakhand for improving Water Security	Water	Dr Vinay
State-Specific Action Plan for Water Resources- Arunachal Pradesh	Water	Dr Vinay

Grants Received During 2014 -15 to 2016 -17

SN	Name of the Scheme/Project/ Endowments/ Chairs	Name of the Principal Investigator/ Co Investigator (if applicable)	Name of the Funding agency	Type (Government/Non-Government)	Department	Year of Award	Funds provided (INR)	Duration of the project
1	Indian Technical and Economic Cooperation: international capacity building program in Climate change and sustainability		MEA		MEA	2016	25,00,000	2016-17
2	SERB-DST Assistance to conduct short-term training programme		SERB-DST		DST	2016	60,000	3-5 Oct, 2016
SN	**Name of the Scheme/Project/ Endowments/ Chairs**	**Name of the Principal Investigator/ Co Investigator (if applicable)**	**Name of the Funding agency**	**Type (Government/Non-Government)**	**Department**	**Year of Award**	**Funds provided (INR)**	**Duration of the project**
1	Impact of Ozone and Other Pollutants on Crops	Kamna Sachdeva			Department of Energy and Enviroment	2015-2016	2,45,240	2016-2016
2	Sustainable livelihood activities on reclaimed open cast coal mines: a technology enabled integrated approach in Indian Coal sector	Sudipto Chatterjee			Department of Natural Resources	2016-2017	1,00,00,000	2015-2016

SN	Name of the Scheme/Project/ Endowments/ Chairs	Name of the Principal Investigator/ Co Investigator (if applicable)	Name of the Funding agency	Type (Government/Non-Government)	Department	Year of Award	Funds provided (INR in lakhs)	Duration of the project
1	Impact of Ozone and Other Pollutants on Crops	Kamna Sachdeva	CPRC		Department of Energy and Enviroment	2015-2016	2,45,240	2015-2016
2	Model Building and Developing Customized Algorithm for Climate Studies	Nithiyanandam Yogeswaran	NSCS		Department of Natural Resources	2015-2016	88,000	2015-2016
3	Sustainable livelihood activities on reclaimed open cast coal mines: a technology enabled integrated approach in Indian Coal sector	Sudipto Chatterjee	Ministry of Coal		Department of Natural Resources	2016-2017	1,00,00,000	2016-2017

	Year	Grants Received During 2015 - 17				Total	Funds provided (INR)	
	2015 -16	10000000 + 88000 +245240	10000000	88000	245240	1,03,33,240	1,03,33,240	
	2016 - 17	10000000 + 60000+2500000	10000000	60,000	25,00,000	12560000	1,25,60,000	

GRANTS RECEIVED BY

DNR 2017-2020

From: Dhanraj Singh <dhanraj.singh@terisas.ac.in>
Sent: 21 June 2021 23:51
To: Sudipta Chatterjee <s.chatterjee@terisas.ac.in>
Cc: Vinay Shankar Prasad Sinha <sinhav@terisas.ac.in>; Kamal Sharma <kamals@terisas.ac.in>; Devvrata Gugiani <Devvrata.Gugiani@terisas.ac.in>; vikas prasad <vikas.prasad@terisas.ac.in>; Rakesh Joshi <rakesh.joshi@terisas.ac.in>
Subject: Re: DNR Internal Auditing: Metric 3.2.1_Grant for research projects, 2014-2020

Dear Dr. Chatterjee,

As discussed, please find the research projects details for the financial year 2017-18 to 2019-20.

Financial Year	2017-18	2018-19	2019-20
INR in Lakhs	175.20	57.21	87.54

In addition to the above, requesting Mr. Joshi to provide the details already submitted during previous NAAC assessment for the financial year from 2014-15 to 2016-17

Best regards,

Dhanraj Singh

TERI SAS/BM 20.4.1 **30 May 2016**

TERI School of Advanced Studies Policy on dealing with the Student Disciplinary Cases

Preamble

1. The TERI School of Advanced Studies (TERI SAS) expects all students to conduct themselves within and outside precincts of the campus in an honorable and ethical manner, befitting the students of a research institution. TERI SAS students must maintain discipline, bear a good moral character and display responsible behavior towards it and the society. A student discipline system exists to handle infractions against TERI SAS rules and regulations. Students will be penalized for breach of prescribed rules and regulations and the nature of penalty will be decided following a disciplinary procedure and guidelines.

Scope

2. These procedures, here onwards, are referred as **TERI SAS Policy and Guidelines on dealing with the Student Disciplinary Cases**. This Policy shall be applicable to all disciplinary cases involving Students (including regular and distance learning mode) based within the campuses, hostels, or any other location visited by the student for educational purpose facilitated by the TERI SAS.

Definitions

3. **Student.** All Research Scholars, Interns and Students at the TERI SAS who have enrolled/registered/given acceptance for a programme/internship/research work at the University. Students from other universities studying at deemed university under the provision of a Memorandum/Contract agreed between the institutes shall be dealt as per the terms and conditions laid down in the agreement.

4. **Member of TERI SAS Community**. Any person on the rolls of TERI SAS including temporary, part-time or honorary employees including any person engaged on a casual or a project basis, and also those engaged through a contractor, students and campus residents.

5. **Honour Code.** A personal and ethical code of conduct, expected out of a Student of deemed university to facilitate a healthy academic environment during his/her study/research work at the University.

General Rules

6. Each student must show due respect and courtesy to all members of TERI SAS community; they must not infringe upon the fundamental rights of fellow students.

7. It is the responsibility of the student to ensure a comprehensive understanding of deemed university policies.

8. In the event of Students' involvement in any activity which is punishable by the law of the land, the University will not be responsible and is not obliged to provide any support.

9. In the event of an illegal activity on the campus, on the approval from VC, the University is obligated to permit the police to take action as deemed fit.

Violation of Honour Code.

10. Any one or combination of the following actions shall constitute violation of Honour Code and shall be subject to disciplinary sanctions by the Deemed University:-

10.1 Being convicted under any law of the country. Any conviction for an offence involving moral turpitude under the Indian Penal Code or any other law enforced for the time being.

10.2 Noncompliance of TERI SAS policies**, Academic & Examination rules or regulations and Memorandum with partner institute** as promulgated from time to time.

10.3 Academic and Research **Misconduct.** Impersonation, committing forgery, furnishing false **certificate** or information, tampering with TERI SAS documents or records, accessing confidential records/ data of University without permission, adopting unfair means and disorderly conduct during exams, interfering in the laboratory/research work of colleagues, revising/resubmitting a marked test /quiz for re-grading without the instructor's consent and receiving or giving unpermitted aid in any assignment (like take-home tests), misconduct while undertaking an academic/research study or survey or study visit outside the campus and any other activity universally accepted as acts of academic dishonesty.

10.3.1 **Violation of Research Integrity.** Distorting research procedures by fabrication of data, generating and reporting fraudulent data or distortion of the research process in any other ways.

10.3.2 **Plagiarism and Unauthorized Stealing of Others' Intellectual Works.** Plagiarizing from printed or electronic (web-based) material, hijacking ideas discussed, representing someone else"s work as own and misleading faculty members about the condition under which the work was prepared.

10.4 Misuse of Technology Resources. Using technology to gain unfairly *and disrupt* system*/process*, committing cyber offences like *hacking,* spamming, breaking into another"s account, defacing website, hosting sexually explicit material, using social media to host material that goes against the prevailing laws, sending derogatory emails, copying*(cheating)* electronically, planting viruses etc.

10.5 Misuse of Alcoholic Beverages and Controlled Substances. Consuming or possessing alcoholic drinks without the explicit permission of University authorities.Possessing and consuming prohibited narcotic drugs and intoxicants in the University premises. Smoking in the campus including hostel rooms.

10.6 **Assault, Harassment, Injury and Threat**. Any assault (verbal or physical) upon or intimidation of or insulting behaviour towards a member of TERI SAS Community inside or outside the Deemed University campus.

10.7 **Indecent Exposure.** Conduct and exposure undertaken in publicly viewable location, which is deemed obscene.

10.8 **Sexual Misconduct, Sexual Assault and Sexual Harassment.** Offences committed under the relevant law and UGC/**AICTE**/TERI SAS Policy & guidelines for the prevention, prohibition and punishment of Sexual Harassment of Women. Complaints are to be handled as per the relevant policy on the issue.

10.9 **Discrimination.** Discriminating against any one on any ground and creating disharmony among students on grounds of religion, caste, nationality, race disability, gender and culture as defined in TERI SAS Policy on Equality, Diversity and Inclusion.

10.10 **Theft or Damage to Property or Services & Disruption of** activities. Attempt to prevent the members of TERI SAS community from discharging their duty, vandalizing or defacing the Deemed University property, causing or colluding in unauthorised entry of any person in the campus. Willful violation of biohazard/chemical/radioactive safety, fire safety and security rules of the Deemed University.

10.11 **Possession or Misuse of Weapons.** Possessing or misusing weapons such as explosives, firearms, knives, lathis, iron chains and iron rods in the University premises or any other instrument which can cause bodily harm.

10.12 **Violation of Study Abroad/Internship** Contracts. Willful violation of contractual terms and conditions agreed with an Institution/Agency/Organisation. Professional misconduct during study abroad and short or longer internships while at any external institution as part of academic engagement.

10.13 **Ragging.** Committing an act of ragging in any form as laid under UGC, AICTE and TERI SAS policy on the issue.

10.14 **Failure to obey instructions of any TERI SAS disciplinary authority**. Failure to comply with written or oral communications from an authorized TU official to appear for a meeting or hearing.

10.15 **Engage in any conduct which is unbecoming of a student of the TERI SAS.**

Undertaking

11. An Undertaking in the format placed at **Annexure I** is to be obtained from all the Students joining the University stating that they have understood what constitutes violation of **Honour Code** and the same may invite disciplinary action from the University.

Disciplinary Committee

12. The formal procedure of a complaint will be heard and adjudicated by the TU **Disciplinary Committee (DC)** consisting of the following:-

(a)	Nominee of VC	Chairperson
(b)	Deans	Member
(c)	Concerned Head of Centre/Department	Member
(d)	Registrar	Secretary

Procedure to handle Complaints

13. Anyone can lodge a complaint with the Head of the Department about a perceived breach of honour code by a student. All such complaints will be forwarded to the Dean (Academic) who will, in consultation with the Course Instructor and/or Ph.D. supervisor, determine the severity of the breach of conduct and discipline and decide to either deal with the complaint informally or formally. If the case has to be dealt formally, it must be forwarded to the Vice Chancellor for convening a DC.

14. Where an offence is clearly established based on TU official records i.e shortage in attendance, submitting forged document for admission, absence from a certain academic activity like internship etc. the office of the Registrar shall be responsible for taking punitive action and formally communicating the nature of punishments applicable to the student as per the existing orders/policies on the issue.

15. The Warden-in-Charge of the Hostel shall have power to take action against any resident as per the Hostel rules. If the violation is of repeated or of aggravated nature then it is to be raised with Dean (Academics) for further necessary action.

16. In case of a formal procedure a DC has to be convened by the VC which shall assemble within 48 hours of issue of orders, hear all parties concerned in the case and submit its report to the VC within 14 days. Wherever DC is not able to submit the report within the stipulated period, an extension may be obtained by the Chairperson, DC from the VC in writing after providing sufficient reason for such delay. However, such delay will not cross maximum four weeks.

17. The respondent/s shall be notified of the date of the inquiry by the chairperson, DC through a confidential note/email. The DC shall serve the student with a charge sheet containing specific charges requesting to send the reply in writing within the time period granted. If the respondent/s plead/s not guilty a formal inquiry to be conducted and report thereof submitted.

18. The DC shall have the power to summon any faculty, staff and student of the Deemed University as the case may be to render whatever assistance needed to conduct inquiries on matters pertaining to the case. A student who does not so comply shall be guilty of a punishable offence. The student shall be provided with relevant documents or extracts which have been used to frame charges against him/her.

19. If the DC finds an offence has been committed then it shall recommend suitable penalty for the same.

20. The DC after finalizing its recommendations shall submit its report to the VC giving reasons for such findings and the verdict. The VC shall consider the report of the above Committee and decide on the penalty to be imposed on the student/s. The decision of the VC shall be intimated to the Registrar.

21. Sufficient opportunity of being heard may be given to the student(s) in case of punishment by the DC, and the VC if necessary.

Punishments

22. If a student is found responsible for violation(s) of the Honour Code, disciplinary action will be taken as under:-

    22.1 **Minor Punishment**

    22.1.1.**Oral Reprimand.** Advised and cautioned about misconduct orally.

    22.1.2.**Written Reprimand.** Advised and cautioned about misconduct in writing.

    22.1.3.**Written Warning**. Warning may be imposed for a period of not more than one calendar year. To be communicated in writing mentioning that further violations of any section of Honour Code, will result in more severe disciplinary action.

    22.2 **Major Penalties**

22.2.1 **Academic Penalties:-**

22.2.1.1 **Debar from Exam**. Based on the rules promulgated by Controller of Examination.

22.2.1.2. **Reduced Grade/F Grade.** Based on Deemed University policy on various issues other than a legitimate performance in the exam.

22.2.2 **Cancellation of registration and/or Denial of Credit**. Applicable to cases where the student is found guilty of withholding information relating to the student's admission, transfer credits, academic status, records, etc.

22.2.3 **Restrictions/Suspension of Privilege**. Prohibits participation in or attendance at certain events, activities, or class/lab; restricts specific campus student privileges.

22.2.3.1 Hostel Privileges

22.2.3.2 Use of Lab Facilities

22.2.3.3 Use of Library facilities

22.2.3.4 Use of Cafeteria Block

22. 2.3.5 Use of Sports Facilities

22.2.3.6 Membership in Clubs and Other bodies

22.2.3.7 Placement Activity

22.2.3.8 Internship/academic association with partner institution

22.2.4 **Fine for Damage**. An appropriate fine to be levied in addition to the compensation for damage caused by the student.

22.2.5 **Disciplinary Probation**. Written notification that further violations of Honour Code may result in suspension. The terms of disciplinary probation shall be determined oncase-to case basis.

22.2.6 **Suspension**. Student will be withdrawn from all courses carried in that semester and forfeit fees. Student shall be refrained from visiting the university premises unless approved in writing by the Dean (Academics). Suspension may involve course drop, semester drop, rustication for a specified period depending on the severity of the offence(s). The student can be reinstated on receipt of a written request from him/her after completion of the suspension period.

22.2.7 **Expulsion**. Forfeiture of all rights and degrees not actually conferred at the time of the expulsion , forfeiture of right to study and fees. Student can only visit the university premises only if the permission is issued in writing by the Dean (academics).

Communicating the Punishment

23. **Minor** Punishment. The minor punishments will be communicated by the Head of Department/ Centre and Programme Instructor as the case may be.

24. **Major** Punishment.

24.1 The penalty will be communicated in writing to the student by the office of the Registrar, TERI SAS.

24.2 Student found guilty of some major offence may not be recommended to Board of Management (BoM) for the award of a degree/diploma/certificate even if all the academic requirements have been satisfactorily completed by the concerned student.

24.3 The action will be noted on the student"s disciplinary record.

25. Copy of all disciplinary proceeding and final decision and communications shall be forwarded to Office of the Registrar, TERI SAS for record.

26. Discipline records are confidential in accordance with laws of the nation and therefore the contents of the student discipline record may not be released to anyone not associated with campus discipline except upon written approval of the student or court order or order by a competent authority established by law.

27. The case of a defaulting student recommended for expulsion or dismissal from the University shall ordinarily be referred to the Board of Management for its final decision.

Appellate Authority

28. A student who feels aggrieved with the punishment can appeal to the Vice Chancellor who will be the appellate authority for all punishments. The student should appeal within two weeks" time with proper justification.

Annexure I
(Refers to Para 11 of Policy)

THE STUDENT'S HONOUR CODE

1. I .... registration no. ..... do hereby undertake that as a student at the TERI SAS: -

2. I will conduct myself within and outside the Deemed University's premises in a manner befitting the students of a research university, and consider the following as actions that are in violation of the Student's Honour Code of the University, and which would invite disciplinary action:-

2.1 Being convicted under any law of the country. *Any conviction for an offence involving moral turpitude under the Indian Penal Code or any other law enforced for the time being.*

2.2 Noncompliance of TERI SAS policies, *A*cademic & Examination rules or regulations *and Memorandum with partner institute as promulgated from time to time.*

2.3 Academic and Research Misconduct. Impersonation, committing forgery, furnishing false certificate or information, tampering with TERI SAS documents or records, accessing confidential records/ data of University without permission, adopting unfair means and disorderly conduct during exams, interfering in the laboratory*/research* work of colleagues, revising/resubmitting a marked test /quiz for re-gradingwithout the instructor's consent and receiving or giving unpermitted aid in any assignment (like take-home tests), *m*isconduct while undertaking an academic/research study or survey or study visit outside the campus *and any other activity universally accepted as acts of academic dishonesty.*

2.3.1 Violation of Research Integrity. Distorting research procedures by fabrication of data, generating and reporting fraudulent data or distortion of the research process in any other ways.

2.3.2 Plagiarism and Unauthorized Stealing of Others' Intellectual Works. Plagiarizing from printed or electronic (web- based) material, hijacking ideas discussed, representing someone else's work as own and misleading faculty members about the condition under which the work was prepared.

2.4 Misuse of Technology Resources. Using technology to gain unfairly *and disrupt system/process*, committing cyber offences like *hacking,* spamming, breaking into another's account, defacing website, hosting sexually explicit material, using social media to host material that goes against the prevailing laws, sending derogatory emails, copying*(cheating)*electronically, planting viruses etc.

2.5 Misuse of Alcoholic Beverages and Controlled Substances. Consuming or possessing alcoholic drinks without the explicit permission of University authorities. *Possessing and consuming* prohibited narcotic drugs *and* intoxicants in the University premises. Smoking in the campus including hostel rooms.

2.6 Assault, Harassment, Injury and Threat. Any assault (verbal or physical) upon or intimidation of or insulting behaviour towards a member of TERI SAS Community inside or outside the University campus.

2.7 Indecent Exposure. Conduct and exposure undertaken in publicly viewable location, which is deemed obscene.

2.8 Sexual Misconduct, Sexual Assault and Sexual Harassment. Offences committed under the relevant law and UGC/AICTE/TERI SAS Policy & guidelines for the prevention, prohibition and punishment of Sexual Harassment of Women.

2.9 Discrimination. Discriminating against any one on any ground and creating disharmony among students on grounds of religion, caste, culture, nationality, race disability, gender and culture as defined in TERI SAS Policy on Equality, Diversity and Inclusion.

2.10 Theft or Damage to Property or Services & Disruption of activities. Attempt to prevent the members of TERI SAS community from discharging their duty, vandalizing or defacing the University property, causing or colluding in unauthorised entry of any person in the campus. Willful violation of biohazard/chemical safety rules, fire safety and security rules/policies of the University.

2.11 Possession or Misuse of Weapons Possessing or misusing weapons such as explosives, firearms, knives, lathis, iron chains and iron rods in the University premises or any other instrument which can cause bodily harm.

2.12 Violation of Study Abroad/Internship Contracts. Willful violation of contractual terms and conditions agreed with an Institution/Agency/Organisation. Professional misconduct during study abroad and short or longer internships while at any external institution as part of academic engagement.

2.13 Ragging. Committing an act of ragging in any form as laid under UGC, AICTE and TERI SAS policy on the issue.

2.14 Failure to obey instructions of any TERI SAS disciplinary authority. Failure to comply with written or oral communications from an authorized TERI SAS official to appear for a meeting or hearing.

2.15 Engage in any conduct which is unbecoming of a student of the TERI SAS.

Date.....

Place.....

Student's signature.....

Name .....

Registration No.....

---xxx---

Annexure 3.4.4. List of PhD scholars and their details like name of the guide, title of thesis, year of award

SN	Name of the PhD Scholar	Name of the Department	Name of the Guide/s	Title of the thesis	Year of registration of the scholar	Year of award
1	Mr Sourabh Srivastava	Department of Natural Resources	Dr Anu Rani Sharma/ Dr S C Kar	A study of drought occurrences and forecasting of drought events in the Indian Subcontinent	2014	2018
2	Mr Sanjay Kumar Srivastava	Department of Natural Resources	Dr Anu Rani Sharma/ Dr Kamna Sachdeva	Mechanism of Fog Variability and Prediction of Fog Events over the Indo-Gangetic Plains	2014	2019
3	Ms. Pooja Arora	Department of Natural Resources	Dr Suresh Jain	Biomass burning : a comparative analysis of thermal efficiency in advanced & traditional cookstoves, and estimation & characterisation of carbonaceous aerosol emissions based on local practices	Jul-09	2015
4	Mr. Anshuman Bhardwaj	Department of Natural Resources	Prof P K Joshi	Characterisation of glacial terrain and its environs using geospatial tools	23-Jul-12	2015
5	Ms. Neelam Singh	Department of Natural Resources	Dr Prateek Sharma	Environmental Determinants and Their Impact in Various Indian Industries: A Study of Environmental Performance Under EMS Framework	Jan. 2008	01-May-15
6	Ms. Preeti Aggarwal	Department of Natural Resources	Dr Suresh Jain	Health impact of pollutants of surface transport sources: A modelling and epidemiological approach	2010-11	May 29, 2015
7	Mr. Prasant Kumar	Department of Natural Resources	Dr Arabinda Mishra	Study of NTFP hetrogeneity vis-à-vis forest management and livelihood improvement in communities living in and around forests in Madhya Pradesh	Jul-05	2015
8	Mr. Vaibhav Sharma	Department of Natural Resources	Dr P K Joshi	Snow cover monitoring and snowmet runoff modeling in NW Himalaya	2010-11	2015
9	Ms. Priya N	Department of Natural Resources	Dr Kamna Sachdeva	A study of rainfall variability and cloud formation	Jul-10	2016
10	Mr. Sandip Mukherjee	Department of Natural Resources	Dr P K Joshi	Downscaling of coarse resolution open source remotely sensed satellite based land surface temperature	2011-12	2016
11	Pratima Singh	Department of Natural Resources	Dr Arun Kansal	Energy use pattern analysis in STPs for scoping for use opf renewable energy	2009	2016

				resources in centralised and decentralised plants		
12	Brij Mohan Sharma	Department of Natural Resources	Dr Shresth Tayal	Climate induced mobilization of persistent organic pollutants (POPs) in Ganges River, India	23-Jul-12	2016
13	Niyati Naudiyal	Department of Natural Resources	Dr Joachim Schmerbeck	Forest dynamics of the Central Himalaya and related changes in the supply of ecosystem services	30-Jul-12	2016
14	A K Joshi	Department of Natural Resources	Dr P K Joshi	Change in resource utilisation pattern and its impact on forest ecosystems in lesser Himalaya	Jul-08	30 Aug 2017
15	Anusheema Chakraborty	Department of Natural Resources	Dr Kamna Sachdeva	Climate change vulnerability of forests and livelihoods in the central Himalayan landscape	07-Jan-13	3 November 2017
16	Priyanka Kohli	Department of Natural Resources	Dr J V Sharma	Impact of decentralised forest governance under The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 on REDD+ in India"	Jul-10	22 Dec 2017
17	Fawzia Tarannum	Department of Natural Resources	Dr Arun Kansal	Analysis of public perception of water quality and role of Information Communication Technology (ICT) in supporting participative management - A study along River Yamuna in Northern India	26-Jul-10	2018

Annexure 3.4.4.1 List of research articles published from the Department

Research articles published during 2015-17

SN	Department	Staff Name	Publication type	Author	Year	Title of work	Journal_Name	Impact Factor (2yr)	Year impact factor	Link of the recognition in UGC enistment of the journal
1	DNR	Raghav Saraswat (Student)	Journal Article	Saraswat R., Sinha A., Radhakrishna S.	2015	A god becomes a pest? Human-rhesus macaque interactions in Himachal Pradesh, northern India	European Journal of Wildlife Research	1.184	2018	https://www.scopus.com/sourceid/101700
2	DNR	P K Joshi	Journal Article	Bhardwaj A., Singh M.K., Joshi P.K., Snehmani, Singh S., Sam L., Gupta R.D., Kumar R.	2015	A lake detection algorithm (LDA) using Landsat 8 data: A comparative approach in glacial environment	International Journal of Applied Earth Observation and Geoinformation	3.798	2015	https://www.scopus.com/sourceid/39563
3	DNR	Sandip Mukherjee (Student)	Journal Article	Mukherjee S., Mukherjee S., Bhardwaj A., Mukhopadhyay A., Garg R.D., Hazra S.	2015	Accuracy of cartosat-1 DEM and its derived attribute at multiple scale representation	Journal of Earth System Science	1.104	2018	https://www.scopus.com/sourceid/21100855842
4	DNR	P K Joshi	Journal Article	Bhardwaj A., Joshi P.K., Snehmani, Sam L., Singh M.K., Singh S., Kumar R.	2015	Applicability of Landsat 8 data for characterizing glacier facies and supraglacial debris	International Journal of Applied Earth Observation and Geoinformation	3.798	2015	https://www.scopus.com/sourceid/39563
5	DNR	P K Joshi	Journal Article	Roy P.S., Roy A., Joshi P.K., Kale M.P.,	2015	Development of decadal (1985-1995-2005) land use and land cover database for India	Remote Sensing			https://www.scopus.com/sourceid/86430

				Srivastava V.K., Srivastava S.K., Dwevidi R.S., Joshi C., Behera M.D., Meiyappan P., Sharma Y., Jain A.K., Singh J.S., Palchowdhuri Y., Ramachandran R.M., Pinjarla B., Chakravarthi V., Babu N., Gowsalya M.S., Thiruvengadam P., Kotteeswaran M., Priya V., Yelishetty K.M.V.N., Maithani S., Talukdar G., Mondal I., Rajan K.S., Narendra P.S., Biswal S., Chakraborty A., Padalia H., Chavan M., Pardeshi S.N., Chaudhari S.A., Anand A., Vyas A., Reddy M.K., Ramalingam M., Manonmani R., Behera P., Das P., Tripathi P., Matin S., Khan M.L., Tripathi O.P., Deka J.,						

				Kumar P., Kushwaha D.						
6	DNR	J.Schmerbecka	Journal Article	Schmerbeck J., Kohli A., Seeland K.	2015	Ecosystem services and forest fires in India - Context and policy implications from a case study in Andhra Pradesh	Forest Policy and Economics	3.009	2019	https://www.scopus.com/sourceid/22223
7	DNR	P K Joshi	Journal Article	Wani A.A., Joshi P.K., Singha O.	2015	Estimating biomass and carbon mitigation of temperae coniferous forests using spectral modeling and field inventory data	Ecological Informatics	2.31	2019	https://www.scopus.com/sourceid/21001474401
8	DNR	P K Joshi	Journal Article	Mukherjee S., Joshi P.K., Garg R.D.	2015	Evaluation of LST downscaling algorithms on seasonal thermal data in humid subtropical regions of India	International Journal of Remote Sensing			https://www.scopus.com/sourceid/22674
9	DNR	P K Joshi	Journal Article	Sharma R., Chakraborty A., Joshi P.K.	2015	Geospatial quantification and analysis of environmental changes in urbanizing city of Kolkata (India)	Environmental monitoring and assessment	1.959	2018	https://www.scopus.com/sourceid/21482
10	DNR	P K Joshi	Journal Article	Singh M.K., Snehmani, Gupta R.D., Bhardwaj A., Joshi P.K., Ganju A.	2015	High resolution DEM generation for complex snow covered Indian Himalayan Region using ADS80 aerial push-broom camera: a first time attempt	Arabian Journal of Geosciences	1.14		https://www.scopus.com/sourceid/17400154823
11	DNR	Nandini Kumar	Journal Article	Tiwari S., Dahiya A., Kumar N.	2015	Investigation into relationships among NO, NO2, NOx, O3, and CO at an urban background site in Delhi, India	Atmospheric Research	4.114	2019	https://www.scopus.com/sourceid/12092
12	DNR	Anubha Agrawal (Student)	Journal Article	Agrawal A., Tayal S.	2015	Mass Balance Reconstruction Since 1963 and Mass Balance Model for East Rathong Glacier, Eastern Himalaya, Using Remote Sensing Methods	Geografiska Annaler, Series A: Physical Geography	1.609	2016	https://www.scopus.com/sourceid/28630
13	DNR	Brij Mohan Sharma (Student)	Journal Article	Sharma B.M., Nizzetto L., Bharat G.K., Tayal S., Melymuk L., Sáňka O.,	2015	Melting Himalayan glaciers contaminated by legacy atmospheric depositions are important sources of PCBs and high-molecular-weight PAHs for the Ganges floodplain during dry	Environmental Pollution	5.714	2019	https://www.scopus.com/sourceid/23916

				Přibylová P., Audy O., Larssen T.		periods The authors dedicate this paper to the memory of their dear friend and colleague, Maneesh Manjunath.				
14	DNR	P K Joshi	Journal Article	Snehmani, Bhardwaj A., Singh M.K., Gupta R.D., Joshi P.K., Ganju A.	2015	Modelling the hypsometric seasonal snow cover using meteorological parameters	Journal of Spatial Science			https://www.scopus.com/sourceid/62444
15	DNR	P K Joshi	Journal Article	Roy P.S., Behera M.D., Murthy M.S.R., Roy A., Singh S., Kushwaha S.P.S., Jha C.S., Sudhakar S., Joshi P.K., Reddy C.S., Gupta S., Pujar G., Dutt C.B.S., Srivastava V.K., Porwal M.C., Tripathi P., Singh J.S., Chitale V., Skidmore A.K., Rajshekhar G., Kushwaha D., Karnatak H., Saran S., Giriraj A., Padalia H., Kale M., Nandy S., Jeganathan C., Singh C.P., Biradar C.M., Pattanaik C., Singh D.K., Devagiri G.M.,	2015	New vegetation type map of India prepared using satellite remote sensing: Comparison with global vegetation maps and utilities	International Journal of Applied Earth Observation and Geoinformation	3.798	2015	https://www.scopus.com/sourceid/39563

				Talukdar G., Panigrahy R.K., Singh H., Sharma J.R., Haridasan K., Trivedi S., Singh K.P., Kannan L., Daniel M., Misra M.K., Niphadkar M., Nagabhatla N., Prasad N., Tripathi O.P., Rama Chandra Prasad P., Dash P., Qureshi Q., Tripathi S.K., Ramesh B.R., Gowda B., Tomar S., Romshoo S., Giriraj S., Ravan S.A., Behera S.K., Paul S., Das A.K., Ranganath B.K., Singh T.P., Sahu T.R., Shankar U., Menon A.R.R., Srivastava G., Neeti, Sharma S., Mohapatra U.B., Peddi A., Rashid H., Salroo I., Hari Krishna P., Hajra P.K., Vergheese A.O., Matin S., Chaudhary S.A.,						

				Ghosh S., Lakshmi U., Rawat D., Ambastha K., Malik A.H., Devi B.S.S., Sharma K.C., Mukharjee P., Sharma A., Davidar P., Raju R.R.V., Katewa S.S., Kant S., Raju V.S., Uniyal B.P., Debnath B., Rout D.K., Thapa R., Joseph S., Chhetri P., Ramachandran R.M.						
16	DNR	P K Joshi	Journal Article	Mukherjee S., Joshi P.K., Garg R.D.	2015	Regression-Kriging Technique to Downscale Satellite-Derived Land Surface Temperature in Heterogeneous Agricultural Landscape	IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing	2.145		https://www.scopus.com/sourceid/17700155033
17	DNR	Anshuman Bhardwaj (Student)	Journal Article	Sam L., Bhardwaj A., Singh S., Kumar R.	2015	Remote sensing flow velocity of debris-covered glaciers using Landsat 8 data	Progress in Physical Geography:Earth and Environment	3.375	2016	https://mjl.clarivate.com:/search-results?issn=0309-1333&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal

18	DNR	P K Joshi	Journal Article	Snehmani, Singh M.K., Gupta R.D., Bhardwaj A., Joshi P.K.	2015	Remote sensing of mountain snow using active microwave sensors: a review	Geocarto International			https://www.scopus.com/sourceid/28216
19	DNR	Vinay Kumar Tyagi	Journal Article	Khursheed A., Sharma M.K., Tyagi V.K., Khan A.A., Kazmi A.A.	2015	Specific oxygen uptake rate gradient - Another possible cause of excess sludge reduction in oxic-settling-anaerobic (OSA) process	Chemical Engineering Journal	6.216	2016	https://www.scopus.com/sourceid/16398
20	DNR	J. Schmerbeck	Journal Article	Schmerbeck J., Fiener P.	2015	Wildfires, Ecosystem Services, and Biodiversity in Tropical Dry Forest in India	Environmental Management	1.857	2015	https://www.scopus.com/sourceid/21478
21	DNR	C K Singh	Journal Article	Singh CK, Mukherjee S	2015	Aqueous geochemistry of fluoride enriched groundwater in arid part of Western India.	Environmental Science and Pollution Research	2.914	2018	https://www.scopus.com/sourceid/23918
22	DNR	C K Singh	Journal Article	Kumar A, Singh CK	2015	Characterization of hydro-geochemical processes and Fluoride Enrichment in Groundwater of South-Western Punjab	Water Quality, Exposure and Health	1.692	2015	https://www.scopus.com/sourceid/19600157308
23	DNR	C K Singh	Journal Article	Singh CK, Kumar P, Kumar A, Mukherjee S	2015	Depositional environment in Great Indian Desert using grain size parameters and its chemical characterization	Journal of the Geological Society of India	0.994	2018	https://www.scopus.com/sourceid/26477
24	DNR	C K Singh	Journal Article	Mallick J, Singh CK, Al-Wadi H, Ahmed M, Rahman A, Shashtri S, Mukherjee S	2015	Geospatial and geostatistical approach for groundwater potential zone delineation	Hydrological Processes			https://www.scopus.com/sourceid/29467
25	DNR	C K Singh	Journal Article	Maan G.S., Singh C.K., Singh M.K., Nagarajan B.	2015	Tree species biomass and carbon stock measurement using ground based-LiDAR	Geocarto International			https://www.scopus.com/sourceid/28216
26	DNR	C K Singh	Chapter in Books/	Singh CK, Jha N, Eslamian S.	2015	Reuse, Potable Water and Possibilities.				

			Handbooks							
27	DNR	C K Singh	Journal Article	Anand Kumar & Chander Kumar Singh	2015	Characterization of Hydrogeochemical Processes and Fluoride Enrichment in Groundwater of South-Western Punjab	Water Quality, Exposure and Health	1.692	2015	https://www.scopus.com/sourceid/19600157308
28	DNR	Kamna Sachdeva and Anu Rani Sharma	Journal Article	Snehlata ,Kamna Sachdeva , Anu Rani Sharma and Anubha Agrawal	2015	Air Pollution and Health: A Review of Measurement Techniques	Journal of Advanced Research in Medicine			Link not found
29	DNR	Suresh Jain	Journal Article	Arora, P., Jain, S.	2015	Estimation of organic and elemental carbon emitted from wood burning in traditional and improved cookstoves using controlled cooking test.	Environmental Science & Technology	7.149	2018	https://www.scopus.com/sourceid/21537
30	DNR	Suresh Jain	Journal Article	Aggarwal, P., Jain, S.	2015	Impact of air pollutants from surface transport sources on human health: A modelling and epidemiological approach.	Environment International	5.929	2015	https://www.scopus.com/sourceid/20912
31	DNR	Suresh Jain	Journal Article	Arora, P., Jain, S.	2015	Morphological characteristics of particles emitted from combustion of different fuels in improved and traditional cookstoves.	Journal of Aerosol Science	2.24	2019	https://www.scopus.com/sourceid/15759
32	DNR	Suresh Jain	Chapter in Books/ Handbooks	Sharma, P., Jain, S., Sharma, P	2015	Air quality modelling: An effective tool for managing urban air pollution.				
33	DNR	Suresh Jain	Chapter in Books/ Handbooks	Jain, S., S. Kumar and Paramjit	2015	Valuation of Environmental Benefits in Asian Countries				
34	DNR	Suresh Jain	Working/Discussio	Dahiya, S., Jain, S. & Kumar, A.,	2015	Life cycle impacts assessment of select electricity generation technologies in India				

			n papers /Policy Brief/ Technical Report							
35	DNR	Anshuman Bhardwaj	Journal Article	Bhardwaj A., Sam L., Singh S., Kumar R.	2016	Automated detection and temporal monitoring of crevasses using remote sensing and their implications for glacier dynamics	Annals of Glaciology	2.349	2016	https://www.scopus.com/sourceid/110607
36	DNR	Neeti	Journal Article	Neeti Neeti, Robert Kennedy	2016	Comparison of national level biomass maps for conterminous US: understanding pattern and causes of differences	Carbon Balance and Management	4.372	2018	https://www.scopus.com/sourceid/58001796 06
37	DNR	P K Joshi	Journal Article	Chakraborty A., Joshi P.K.	2016	Mapping disaster vulnerability in India using analytical hierarchy process	Geomatics, Natural Hazards and Risk	1.71	2016	https://www.scopus.com/sourceid/19700200835
38	DNR	P K Joshi	Journal Article	Sharma R., Joshi P.K.	2016	Mapping environmental impacts of rapid urbanization in the National Capital Region of India using remote sensing inputs	Urban Climate			https://www.scopus.com/sourceid/21100220478
39	DNR	P K Joshi	Journal Article	Prakash M., Shukla R., Chakraborty A., Joshi P.K.	2016	Multi-criteria approach to geographically visualize the quality of life in India	International Journal of Sustainable Development and World Ecology	1.846	2017	https://www.scopus.com/sourceid/23292
40	DNR	Brij Mohan Sharma (Student)	Journal Article	Sharma B.M., Bharat G.K., Tayal S., Larssen T., Bečanová J., Karásková P., Whitehead P.G., Futter M.N., Butterfield D., Nizzetto L.	2016	Perfluoroalkyl substances (PFAS) in river and ground/drinking water of the Ganges River basin: Emissions and implications for human exposure	Environmental Pollution	5.099	2016	https://www.scopus.com/sourceid/23916

41	DNR	P K Joshi	Journal Article	Bhardwaj A., Joshi P.K., Sam L., Snehmani	2016	Remote sensing of alpine glaciers in visible and infrared wavelengths: a survey of advances and prospects	Geocarto International			https://www.scopus.com/sourceid/28216
42	DNR	Sanjay Kumar Srivastava (Student)	Journal Article	Sanjay Kumar Srivastava, Anu Rani Sharma and Kamna Sachdevaa	2016	Spatial and Temporal variability of fog over the Indo-Gangetic plains, India	World Academy of Science, Engineering and Technology: International Journal of Environmental and Ecological Engineering			Link not found
43	DNR	Vinay S P Sinha	Journal Article	Sam L., Bhardwaj A., Sinha V.S.P., Joshi P.K., Kumar R.	2016	Use of Geospatial Tools to Prioritize Zones of Hydro-Energy Potential in Glaciated Himalayan Terrain	Journal of the Indian Society of Remote Sensing	0.725	2016	https://www.scopus.com/sourceid/26648
44	DNR	P K Joshi	Journal Article	Sinha N., Priyanka N., Joshi P.K.	2016	Using Spatial Multi-Criteria Analysis and Ranking Tool (SMART) in earthquake risk assessment: a case study of Delhi region, India	Geomatics, Natural Hazards and Risk	1.71	2016	https://www.scopus.com/sourceid/19700200835
45	DNR	Sudipto Chatterjee	Magazines	Sudipto Chatterjee	2016	Science and Technology for Sustainable Development	Yojana			
46	DNR	Vinay Kumar Tyagi	Chapter in Books/ Handbooks	Tyagi V.K., Lo S.-L.	2016	Energy and Resource Recovery From Sludge: Full-Scale Experiences				
47	DNR	Nandini Kumar	Chapter in Books/ Handbooks	Chattopadhyay S., Kumar N., Fine C., Olivetti E.	2016	Industrial symbiosis among small and medium scale enterprises: Case of Muzaffarnagar, India				

48	DNR	Nithiyanandam Yogeswaran	Conference Papers	Nithiyanandam Y., Nichol J.E.	2016	A simple and effective retrieval of land surface temperature using a new reflectance based Emissivity estimation technique				
49	DNR	Sudipta Chatterjee	Magazines	Brij Gopal, Anil P. SHarma, Subodh Sharma, Sudipto Chatterjee, Dinesh K. Marothia, M. A.Hassan and K.S.Rao	2016	Capacity Building in the Assessment of Biodiversity and Ecosystem Services for Conserving Wetlands for the Future				
50	DNR	Neeti	Conference Papers	Kennedy, R E. , Hughes, J., Neeti, N. Yang, Zhiqiang, Gregory, M., Roberts, H. and Kane. V., Powell, S. and Ohmann, J.	2016	An Integrated, Observation-based System to Monitor Aboveground Forest Carbon Dynamics in Washington, Oregon, and California				
51	DNR	Neeti	Conference Papers	Neeti, N	2016	Using time legacy to describe land surface dynamics and monitor changes at Landsat scale: A case study of three western states of USA				
52	DNR	C K Singh	Journal Article	Kumari M., Singh C.K., Bakimchandra O., Basistha A.	2016	DEM-based delineation for improving geostatistical interpolation of rainfall in mountainous region of Central Himalayas, India	Theoretical and Applied Climatology	2.64	2016	https://www.scopus.com/sourceid/14171
53	DNR	C K Singh	Journal Article	Ramesh P, Singh CK	2016	Evaluation of LiDAR and image segmentation based classification techniques for automatic building footprint	Geocarto International	1.646	2016	https://www.scopus.com/sourceid/28216

						extraction for a segment of Atlantic County, New Jersey				
54	DNR	C K Singh	Journal Article	Mehra M, Oinam B, Singh CK	2016	Integrated Assessment of groundwater for agriculture use in Mewat District of Haryana, India using Geographical Information System (GIS)	Journal of the Indian Society of Remote Sensing	0.725	2016	https://www.scopus.com/sourceid/26648
55	DNR	C K Singh	Journal Article	Mehra M., Singh C.K.	2016	Spatial analysis of soil resources in the Mewat district in the semiarid regions of Haryana, India	Environment, Development and Sustainability	1.676	2018	https://www.scopus.com/sourceid/20902
56	DNR	Kamna Sachdeva	Journal Article	Sachdeva, Kamna and Yadav, S.	2016	Characterization of Free-Fall Dust Aerosols at Two Different Heights in Delhi: Understanding the Influence of Carbon Fraction.	Journal of Hazardous, Toxic, and Radioactive Waste			https://www.scopus.com/sourceid/19900192156
57	DNR	Kamna Sachdeva	Journal Article	Chakraborty A., Sachdeva K., Joshi P.K.	2016	Mapping long-term land use and land cover change in the central Himalayan region using a tree-based ensemble classification approach	Applied Geography	2.687	2016	https://www.scopus.com/sourceid/27471
58	DNR	Suresh Jain	Journal Article	Arora, P., Jain, S.	2016	A review of chronological development incook stove assessment methods: Challenges and way forward	Renewable and Sustainable Energy Reviews	8.05	2016	https://www.scopus.com/sourceid/27567
59	DNR	Suresh Jain	Journal Article	Aggarwal, P., Jain, S.,	2016	Energy demand and CO2 emissions from urban on-road transport in Delhi: Current and future projections under various policy measures.	Journal of Cleaner Production	5.715	2016	https://www.scopus.com/sourceid/19167
60	DNR	Suresh Jain	Journal Article	Jain, S., Aggarwal, P., Sharma, P., Kumar, P.,	2016	Vehicular exhaust emissions under current and alternative future policy measures for megacity Delhi, India	Journal of Transport & Health	1.718	2017	https://www.scopus.com/sourceid/21100310028
61	DNR	Sanjay Kumar	Journal Article	Sanjay Kumar Srivastava, Anu Rani Sharma and	2017	An observation-based climatology and forecasts of winter fog in Ghaziabad, India	Weather	1.262	2015	https://www.scopus.com/sourceid/14762

		Srivastava (Student)		Kamna Sachdevaa						
62	DNR	P K Joshi	Journal Article	Sharma M., Chakraborty A., Garg J.K., Joshi P.K.	2017	Assessing forest fragmentation in north-western Himalaya: a case study from Ranikhet forest range, Uttarakhand, India	Journal of Forestry Research	0.774	2016	https://www.scopus.com/sourceid/70001532 62
63	DNR	Anu Rani Sharma	Journal Article	S Shrivastava, SC Kar, AR Sharma	2017	Inter-annual variability of summer monsoon rainfall over Myanmar	International Journal of Climatology	3.76	2016	https://www.scopus.com/sourceid/13507
64	DNR	Anu Rani Sharma	Journal Article	Shrivastava S., Kar S.C., Sharma A.R.	2017	Intraseasonal Variability of Summer Monsoon Rainfall and Droughts over Central India	Pure and Applied Geophysics	1.591	2016	https://www.scopus.com/sourceid/28579
65	DNR	Neeti	Journal Article	B Parmentier, N Neeti, E Nickl, M Millones	2017	Multichannel Empirical Orthogonal Teleconnection analysis: a method for space-time decomposition of climate variability	Journal of Applied Meteorology and Climatology	2.364	2018	https://www.scopus.com/sourceid/44001517 17
66	DNR	Anu Rani Sharma	Journal Article	S Shrivastava, SC Kar, AR Sharma	2017	Soil moisture variations in remotely sensed and reanalysis datasets during weak monsoon conditions over central India and central Myanmar	Theoretical and Applied Climatology	2.64	2016	https://www.scopus.com/sourceid/14171
67	DNR	Sandip Mukherjee (Student)	Journal Article	Mondal A., Khare D., Kundu S., Mondal S., Mukherjee S., Mukhopadhyay A.	2017	Spatial soil organic carbon (SOC) prediction by regression kriging using remote sensing data	Egyptian Journal of Remote Sensing and Space Science			https://www.scopus.com/sourceid/19700183014
68	DNR	Niyati Naudiyal (Student)	Journal Article	Naudiyal N., Schmerbeck J.	2017	The changing Himalayan landscape: pine-oak forest dynamics and the supply of ecosystem services	Journal of Forestry Research	0.774	2016	https://www.scopus.com/sourceid/70001532 62
69	DNR	P K Joshi	Journal Article	Shukla R., Chakraborty A., Joshi P.K.	2017	Vulnerability of agro-ecological zones in India under the earth system climate model scenarios	Mitigation and Adaptation Strategies for Global Change	2.216	2016	https://www.scopus.com/sourceid/24083

70	DNR	Niyati Naudiyal (Student)	Journal Article	Naudiyal N., Schmerbeck J., Gärtner S.	2017	What influences the plant community composition on Delhi ridge? The role played by Prosopis juliflora and anthropogenic disturbances	Tropical Ecology			https://www.scopus.com/sourceid/17819
71	DNR	Neeti	Journal Article	Robert E Kennedy, Neeti Neeti et al…	2017	An empirical, integrated forest biomass monitoring system	Environmental Research Letters	4.404	2016	https://www.scopus.com/sourceid/5200152632
72	DNR	Sudipta Chatterjee	Chapter in Books/ Handbooks	Pia sethi, Yatish Lele and Sudipta Chatterjee	2017	Loss of Biodiversity				
73	DNR	Nithiyanandam Yogeswaran	Conference Papers	Prashant H. Pandit, Nithiyanandam. Y	2017	Drought Monitoring Using Open Source Remote Sensing Datasets				
74	DNR	Nithiyanandam Yogeswaran	Conference Papers	Nithiyanandam Yogeswaran, Sayona S Jacob, Vimalathitthan Shanmugam	2017	Temporal Analysis of Summer-Time Urban Heat Island Intensity Over Five Metropolitan Cities in India				
75	DNR	Nithiyanandam Yogeswaran	Conference Papers	Arun Murali C.M,Abhinav Chandel and Nithiyanandam Y	2017	A pilot study on prediction of heat wave events over the coastal area of India using Sea Surface Temperature				
76	DNR	Nithiyanandam Yogeswaran	Conference Papers	Aakanksha, Vinay Hudda, Nithiyanandam Y	2017	An Aseessment of heat impacts on health using thermal zobatuib Techniques				
77	DNR	C K Singh	Journal Article	Mehra M., Singh C.K., Abrol I.P., Oinam B.	2017	A GIS-based methodological framework to characterize the Resource Management Domain (RMD): A case study of Mewat district, Haryana, India	Land Use Policy	3.189	2016	https://www.scopus.com/sourceid/14500

78	DNR	C K Singh	Journal Article	Kumari M., Singh C.K., Basistha A.	2017	Clustering Data and Incorporating Topographical Variables for Improving Spatial Interpolation of Rainfall in Mountainous Region	Water Resources Management	2.848	2016	https://www.scopus.com/sourceid/18853
79	DNR	C K Singh	Journal Article	Kumari M, Singh CK, Oinam B, Basisthae A	2017	Geographically weighted regression-based quantification of rainfall topography relationship and rainfall gradient in Central Himalayas	International Journal of Climatology	3.76	2016	https://www.scopus.com/sourceid/13507
80	DNR	C K Singh	Journal Article	Singh C.K., Kumar A., Shashtri S., Kumar A., Kumar P., Mallick J.	2017	Multivariate statistical analysis and geochemical modeling for geochemical assessment of groundwater of Delhi, India	Journal of Geochemical Exploration	2.464	2016	https://www.scopus.com/sourceid/23222
81	DNR	C K Singh	Journal Article	Kumari M., Singh C.K., Basistha A., Dorji S., Tamang T.B.	2017	Non-stationary modelling framework for rainfall interpolation in complex terrain	International Journal of Climatology	3.76	2016	https://www.scopus.com/sourceid/13507
82	DNR	C K Singh	Journal Article	Prabhat Barnwala, Alexandervan Geen,Janvon der Goltz and Chander Kumar Singh	2017	Demand for environmental quality information and household response: Evidence from well-water arsenic testing	Journal of Environmental Economics and Management	4.175	2019	https://www.scopus.com/sourceid/23352
83	DNR	C K Singh	Journal Article	Pankaj Kumar, Chander Kumar Singh, Chitresh Saraswat, Binaya Mishra, Tejal Sharma	2017	Evaluation of aqueous geochemistry of fluoride enriched groundwater: A case study of the Patan district, Gujarat, Western India	Water Science			https://ugccare.unipune.ac.in/Apps1/User/WebA/ViewDetails?JournalId=101001174&flag=Search
84	DNR	C K Singh	Chapter in Books/ Handbooks	Senjuti Sen, C K Singh G. Areedran	2017	Snow leopard habitat modeling using neuro-fuzzy technique and a comparative analysis between traditional overlay and neuro-fuzzy technique—A Case Study of				

						Chamoli and Pithorgarh District of Uttarakhand				
85	DNR	C K Singh	Journal Article	Chander Kumar Singh, Anand Kumar and Soumendu Shekhar Roy	2017	Estimating Potential Methane Emission from Municipal Solid Waste and a Site Suitability Analysis of Existing Landfills in Delhi, India	Technologies			https://mjl.clarivate.com:/search-results?issn=2227-7080&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal
86	DNR	C K Singh	Journal Article	Chander Kumar Singh, Anand Kumar	2017	Vermicomposting of terrestrial weeds Lantana camara L. and Parthenium hysterophorus L.: agriculture solid waste	Ecological Questions			https://www.scopus.com/sourceid/21100813768
87	DNR	C K Singh	Chapter in Books/ Handbooks	Rumia Basu, Chander Kumar Singh, and Saeid Eslamian	2017	Cause and Occurrence of Drought				
88	DNR	Suresh Jain	Journal Article	Jain, S., Agarwal, A., Jani, V., Singhal, S., Sharma, P., Jalan, R.	2017	Assessment of carbon neutrality and sustainability in educational campuses (CaNSEC): A general framework	Ecological Indicators	3.898	2017	https://www.scopus.com/sourceid/20292
89	DNR	Suresh Jain	Journal Article	Bajaj, N., Sharma, T., Suneja, D., Jain, S., Kumar, P.,	2017	Determinants of respiratory and cardiovascular health impacts of traffic policemen: A perception based comparative analysis.	Journal of Transport & Health	1.718	2017	https://www.scopus.com/sourceid/21100310028
90	DNR	Suresh Jain	Journal Article	Khatri, P., Jain, S.,	2017	Environmental life cycle assessment of edible oils: A review of current knowledge and future research challenges	Journal of Cleaner Production	5.715	2017	https://www.scopus.com/sourceid/19167
91	DNR	Suresh Jain	Journal Article	Jain, S.	2017	Exposure to in-vehicle respirable particulate matter in passenger vehicles under different ventilation conditions and seasons	Sustainable Environment Research			https://www.scopus.com/sourceid/21100287109

Research articles published during 2018-20

SN	Department	Staff Name	Publication type	Author	Year	Title of work	Journal Name	Impact Factor (2yr)	Year impact factor	Link of the recognition in UGC enistment of the journal
1	DNR	Vinay S P Sinha	Journal Article	Matthieu Pommier, Hilde Fagerli, Michael Gauss, David Simpson, Sumit Sharma, Vinay Sinha, Sachin D. Ghude, Oskar Landgren, Agnes Nyiri, and Peter Wind	2018	Impact of regional climate change and future emission scenarios on surface O3 and PM2.5 over India	Atmospheric Chemistry and Physics	5.668	2018	https://www.scopus.com/sourceid/12091
2	DNR	Vinay S P Sinha	Journal Article	Prasoon Singh, Vinay Shankar Prasad Sinha, Ayushi Vijhani, Neha Pahuja	2018	Vulnerability assessment of urban road network from urban flood	International Journal of Disaster Risk Reduction	2.568	2019	https://www.scopus.com/sourceid/21100228018
3	DNR	Snehlata Tigala (student)	Journal Article	Snehlata Tigala, Anu Rani Sharma, Kamna Sachdeva	2018	Health risk assessment due to biomass smoke exposure in Indian indoor environment: An empirical approach using lung deposition model	Science of The Total Environment	5.589	2019	https://www.scopus.com/sourceid/25349
4	DNR	Nithiyanandam Yogeswaran	Journal Article	N. Demir and N. Yogeswaran	2018	Semi-Automated Cemetery Mapping using Smartphones	The International Archives of the Photogrammetry, Remote Sensing and			Link not found

							Spatial Information Sciences			
5	DNR	Nithiyanandam Yogeswaran	Journal Article	Arun Pratap Golaya and Nithiyanandam Yogeswaran	2018	"AIS 2.0": Technological changes, implications and policy recommendations	Maritime Affairs: Journal of the National Maritime Foundation of India			https://www.scopus.com/sourceid/21100456179
6	DNR	Neeti	Magazines	Neeti	2018	Geospatial technology for monitoring natural resources				
7	DNR	Sanjay Kumar Srivastava (Student)	Chapter in Books/ Handbooks	Sanjay Kumar Srivastava, Rohit Sharma, Kamna Sachdeva, and Anu Rani Sharma	2018	Fog—A Ground Observation-Based Climatology and Forecast over North India				
8	DNR	Anu Rani Sharma	Journal Article	Tigala, S., Sharma, A.R. and Sachdeva, K.	2018	Assessing Public Health Vulnerability due to Poor Indoor Air Quality: A Case Study of Rural Population of Rajasthan	Journal of Advanced Research in Medical Science & Technology			Link not found
9	DNR	Nithiyanandam Yogeswaran	Journal Article	Nithiyananda Yogeswaran and Lakshmi P	2018	Applying Geospatial Techniques for Mapping Coastal Resources of Mahatma Gandhi Marine National Park of Andaman and Nicobar Islands	The Indian Geogrpahical Journal			Link not found
10	DNR	Anu Rani Sharma	Conference Papers	Tigala, S., Sharma, A.R. and Sachdeva, K	2018	Assessing Public Health Vulnerability due to Poor Indoor Air Quality: A Case Study of Rural Population of Rajasthan				
11	DNR	Nithiyanandam	Journal Article	Yoshihide Wada... and	2019	Co-designing Indus Water-Energy-Land Futures	One Earth			Link not found

		Yogeswaran		Nithiyanandam Yogeswara						
12	DNR	Anu Rani Sharma	Journal Article	Tigala, S., Sharma, A.R. and Sachdeva, K.	2019	A System Dynamics Approach to Understand Respiratory Health Risk in Rural Population.	Indian Journal of Public Health Research & Development			https://www.scopus.com/sourceid/19700188435
13	DNR	Vinay S P Sinha	Chapter in Books/ Handbooks	Sinha, V. S., Machineni, N., Singh, P., & Singh, H.	2019	Mitigating extreme weather events through wetland conservation.				
14	DNR	Neeti	Conference Papers	Pathak, S., Garg, V., and Neeti, N.	2019	Hydrological modeling to estimate snowmelt using temperature index and energy balance approach				-
15	DNR	Neeti	Conference Papers	Parmentier, B, Millones M., Decatur, A., Omrani, H., Amatuli, G., Jovanovic, T. and Neeti, N.	2019	Modeling land cover change in Houston using Deep Learning				
16	DNR	Vinay S P Sinha	Journal Article	Nehru Machineni, Vinay S.P.Sinha, Prasoon Singh, N.T.Reddyc	2020	The impact of distributed landuse information in hydrodynamic model application in storm surge inundation	Estuarine, Coastal and Shelf Science	2.611	2019	https://www.scopus.com/sourceid/26844
17	DNR	Ram Kumar Singh (Student)	Journal Article	Ram Kumar Singh, Vinay Shankar Prasad Sinha, Pawan Kumar Joshi & Manoj Kumar	2020	Modelling Agriculture, Forestry and Other Land Use (AFOLU) in response to climate change scenarios for the SAARC nations	Environmental Monitoring and Assessment	1.959	2018	https://www.scopus.com/sourceid/21482
18	DNR	Roopam Shukla	Journal Article	Chauhan N., Shukla R., Joshi P.K.	2020	Assessing inherent vulnerability of farming communities across	Environmental	2.4	2020	https://mjl.clarivate.com:/search-results?issn=2211-

						different biogeographical zones in Himachal Pradesh, India	Developme nt			4645&hide_exact_m atch_fl=true&utm_s ource=mjl&utm_me dium=share-by-link&utm_campaign =search-results-share-this-journal
19	DNR	Rituparna Das	Journa l Article	Das P.K., Das R., Das D.K., Midya S.K., Bandyopadhyay S., Raj U.	2020	Quantification of agricultural drought over Indian region: a multivariate phenology-based approach	Natural Hazards	2.427	2019	https://mjl.clarivate.com:/search-results?issn=0921-030X&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal
20	DNR	Ram Kumar Singh, Vinay Shankar Prasad Sinha	Journa l Article	Ram Kumar Singh, Vinay Shankar Prasad Sinha, Pawan Kumar Joshi & Manoj Kumar	2020	A multinomial logistic model-based land use and land cover classification for the South Asian Association for Regional Cooperation nations using Moderate Resolution Imaging Spectroradiometer product	Environme nt, Developme nt and Sustainabili ty	1.676	2018	https://www.scopus.com/sourceid/20902
21	DNR	Sudipto Chatterjee	Journa l Article	Mark A. Sutton, Netty van Dijk, Peter E. Levy, Matthew R. Jones, Ian D. Leith, Lucy J. Sheppard, Sarah Leeson, Y. Sim Tang, Amy Stephens, Christine F. Braban, Ulrike Dragosits, Clare M. Howard, Massimo Vieno,	2020	Alkaline air: changing perspectives on nitrogen and air pollution in an ammonia-rich world	Philosophic al Transaction s of the Royal Society A: Mathematic al, Physical and Engineerin g Sciences	3.093	2018	https://mjl.clarivate.com:/search-results?issn=1364-503X&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal

				David Fowler, Paul Corbett, Mohd Irfan Naikoo, Silvana Munzi, Christopher J. Ellis, Sudipto Chatterjee, Claudia E. Steadman, Andrea Móring and Patricia A.						
22	DNR	J. K. Garg	Journal Article	Krishna Prasad Vadrevu, Aditya Eaturu, Sumalika Biswas, Kristofer Lasko, Saroj Sahu, J. K. Garg & Chris Justice	2020	Spatial and temporal variations of air pollution over 41 cities of India during the COVID-19 lockdown period	Scientific Reports	3.998	2019	https://www.scopus.com/sourceid/21100200805
23	DNR	Vanshika Dhamija	Journal Article	Vanshika Dhamija, Roopam Shukla, Christoph Gornott and P. K. Joshi	2020	Consistency in Vulnerability Assessments of Wheat to Climate Change—A District-Level Analysis in India	Sustainability	2.576	2019	https://mjl.clarivate.com:/search-results?issn=2071-1050&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal
24	DNR	Nithiyanandam Yogeswaran	Journal Article	Arun Pratap Golaya & Nithiyanandam Yogeswaran	2020	Maritime communication: From flags to the VHF Data Exchange System (VDES)	Maritime Affairs: Journal of the National Maritime Foundation of India			https://www.scopus.com/sourceid/21100456179

25	DNR	Nithiyanandam Yogeswaran	Journal Article	Adriano Vinca, Simon Parkinson, Keywan Riahi, Edward Byers, Afreen Siddiqi, Abubakr Muhammad, Ansir Ilyas, Nithiyanandam Yogeswaran, Barbara Willaarts, Piotr Magnuszewski, Muhammad Awais, Andrew Rowe & Ned Djilali	2020	Transboundary cooperation a potential route to sustainable development in the Indus basin	Nature Sustainability	19.36		https://mjl.clarivate.com:/search-results?issn=2398-9629&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal
26	DNR	Nithiyanandam Yogeswaran	Conference Papers	Neslihan Tuztaş, Nithiyanandam Yogeswaran	2020	Detection of Flooded Areas with Radar Image Analysis				https://www.scopus.com/sourceid/21100220478
27	DNR	Neeti	Chapter in Books/ Handbooks	Neeti	2020	Introduction to GIS				
28	DNR	Sonia Grover	Journal Article	Sonia Grover, Tayal S., Beldring S., Li H.	2020	Modeling Hydrological Processes in Ungauged Snow-Fed Catchment of Western Himalaya	Water Resources	0.556	2019	https://mjl.clarivate.com:/search-results?issn=0097-8078&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal

29	DNR	J. K. Garg	Journal Article	Prasad S., Saluja R., Joshi V., Garg J.K.	2020	Heavy metal pollution in surface water of the Upper Ganga River, India: human health risk assessment	Environmental Monitoring and Assessment	1.903	2019	https://mjl.clarivate.com:/search-results?issn=0167-6369&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal
30	DNR	Rituparna Das	Journal Article	Das P.K., Podder U., Das R., Kamalakannan C., Rao G.S., Bandyopadhyay S., Raj U.	2020	Quantification of heat wave occurrences over the Indian region using long-term (1979–2017) daily gridded (0.5° × 0.5°) temperature data—a combined heat wave index approach	Theoretical and Applied Climatology	2.882	2019	https://mjl.clarivate.com:/search-results?issn=0177-798X&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal
31	DNR	Roopam Shukla	Journal Article	Anees M.M., Shukla R., Punia M., Joshi P.K.	2020	Assessment and visualization of inherent vulnerability of urban population in India to natural disasters	Climate and Development			https://mjl.clarivate.com:/search-results?issn=1756-5529&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal
32	DNR	Ram Kumar Singh	Journal Article	Singh R.K., Rani M., Bhagavathula A.S., Sah R., Rodriguez-Morales A.J., Kalita H., Nanda C., Sharma S., Sharma Y.D.,	2020	Prediction of the COVID-19 pandemic for the top 15 affected countries: Advanced autoregressive integrated moving average (ARIMA) model	JMIR Public Health and Surveillance	4.11	2020	https://mjl.clarivate.com:/search-results?issn=2369-2960&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign

				Rabaan A.A., Rahmani J., Kumar P.						=search-results-share-this-journal
33	DNR	Ram Kumar Singh	Journal Article	Singh R.K., Drews M., de la Sen M., Kumar M., Singh S.S., Pandey A.K., Srivastava P.K., Dobriyal M., Rani M., Kumari P., Kumar P.	2020	Short-term statistical forecasts of COVID-19 infections in India	IEEE Access	3.367	2020	https://mjl.clarivate.com:/search-results?issn=2169-3536&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal

H index and citation based on tenure of the faculty in the Department of Natural Resources

Name of the faculty	h index	citation	Year
Prof P K Joshi	32*	401	2015
Prof Suresh Jain	21	275	2015-17
Dr Kamna Sachdeva	10	46	2015-17
Dr Chubanmela Jamir			2015-17
Dr Chander Kumar	21	277	2015-17
Dr Vinay Sinha	7	106	2015-20
Dr Sudipta Chatterjee			2015-20
Dr Anu Rani Sharma	18	636	2015-20
Dr Nithiyanandam Yogeswaran	3	43	2015-20
Dr Neeti	10	397	2015-20

* Not include in the calculation



Annexure 3.4.6 List of books and chapters in edited volumes / books published from the Department

Chapters published in Books / Edited Books during 2015-20

S. No.	Title with page Nos. and year of publication	Book/ Title editor & publisher	Whether National/ International Publisher	ISBN	No. of co-authors
1	Mapping of agriculture productivity variability for the SAARC nations in response to climate change scenario for the year 2050, pp 249-262, 2020	In P. Kumar, H. Sajjad, B. S. Chaudhary, M. Rani, and J.S Rawat, Challenges and Future Directions in Remote Sensing and GIScience Springer Nature, Netherland	International	978-3-030-55092-9	4
2	Mitigating Extreme Weather events through Wetland conservation, pp 15-25, 2019	In P. Sharma, Harnessing Wetland and Sustainable Livelihood, Notion Press, Chennai	International	978-1-68466-656-0	4
3	Introduction to GIS Pp 58-71, 2020	Climate Change and Assessment Tools, IGNOU, V.Venkat Ramanan (Ed.)	National	978-93-89499-65-0	-
4	Fog—A Ground Observation-Based Climatology and Forecast over North India, 2018	Sanjay Kumar Srivastava, Rohit Sharma, Kamna Sachdeva, and Anu Rani Sharma, Geospatial Applications for Natural Resources Management,	International	9781138626287	4
5	CERES-Rice Model to Define Management Strategies for Rice Production; Soil Moisture and Evapotranspiration Estimation during Drought Years—A Study over Parts of Madhya Pradesh, India, 2018.	Sourabh Shrivastava, S.C. Kar and Anu Rani Sharma, Geospatial Applications for Natural Resources Management,	International	9781138626287 -	3

Global to local (2015-20)

Annexure 3.6.1 **Extension activities in the neighbourhood community**

RESEARCHERS CONVERT BARREN LAND INTO FOREST

A barren land covered with carbon particles gets a dramatic makeover, thanks to the hard work of TERI researchers





The land (in Dhanbad) underwent dramatic changes and now has trees which are 9-16 feet high. The climatic conditions have been restored too

जल संरक्षण केंद्र और राज्य सरकार की प्राथमिकता

जिले के कई क्षेत्रों में पेयजल स्रोतों को पुनर्जीवित करने की शुरुआत



सेलाकुई में जल संरक्षण पर आयोजित कार्यशाला में जानकारी देते विशेषज्ञ।

नरेंद्रनगर, 27 मार्च (सह.): पेयजल स्रोतों के पुनर्रुद्धार, संरक्षण और संवर्द्धन के उद्देश्य से नेशनल मिशन फॉर हिमालयन स्टडीज ने महत्वाकांक्षी परियोजना के तहत टेरी स्कूल ऑफ एडवांस स्टडीज नई दिल्ली, उत्तराखंड जल संस्थान देहरादून और डोएवी महाविद्यालय देहरादून के संयुक्त तत्वाधान में उत्तराखंड जन जागृति संस्थान खाड़ी के सहयोग से दो दिवसीय कार्यशाला का शुभारंभ हो गया। जिसमें बड़ी संख्या में स्थानीय महिलाओं और ग्रामीण युवकों ने प्रतिभाग किया। कार्यशाला में प्राकृतिक जल संसाधनों का वैज्ञानिक तरीके से उपयोग और उनके संरक्षण के बारे में गहन जानकारी दी गई।

शनिवार को नरेंद्रनगर ब्लॉक के सेलाकुई में आयोजित कार्यशाला ब्लॉक प्रमुख राजेंद्र भंडारी ने शुभारंभ किया। उन्होंने कहा केंद्र और राज्य सरकार ने जल संरक्षण को प्राथमिकता पर रखा है। केंद्र सरकार ने जल शक्ति मंत्रालय का अलग से गठन किया है। कहा पानी का स्तर बढ़ने से खेती और पशुपालन संभव है। परियोजना अन्वेषक टेरी सेस डा. विनय सिन्हा ने बताया उत्तराखंड के सूखे पेयजल स्रोत के क्षेत्र छांटे गए हैं। जिनमें प्रतापनगर, नई टिहरी, खाड़ी, जाजल, सेलाकुली, धोबीघाट, मसूरी, देहरादून, लंगासू, कर्णप्रयाग, चमोली की विस्तृत रिपोर्ट, जियोफिजिक जांच व वैज्ञानिक अध्ययनों और परिणामों के बाद ही खाड़ी, जाजल, नई टिहरी के सूखे पेयजल स्रोतों को पुनर्जीवित करने की शुरुआत की गई है। मनोज पांडे, दुलारी देवी ने जल संरक्षण, हरियाली और समृद्धता की जानकारी दी।

तकनीकी सत्र में सौरभ भारद्वाज ने बताया कि वैश्विक गर्मी के प्रकोप का असर भारत सहित उत्तराखंड में देखने को मिल रहा है। जलवायु परिवर्तन से प्राकृतिक जल स्रोत सूखते जा रहे हैं। उन्होंने गत 150 सालों की बारिश, जल संरक्षण और रिचार्ज पर रिपोर्ट प्रस्तुत की। इस मौके पर जन जागृति संस्थान के अरण्य रंजन, सह परियोजना अन्वेषक डा. प्रशांत सिंह आदि मौजूद रहे।

सूख रहे जल स्रोतों का करेंगे सर्वे

चंबा (टिहरी)। टेरी स्कूल ऑफ एडवांस स्टडीज नई दिल्ली की ओर से खाड़ी में पेयजल स्रोतों के संरक्षण एवं संवर्द्धन पर दो दिवसीय कार्यशाला शुरू की गई, जिसमें विशेषज्ञों ने ग्रामीणों को प्राकृतिक स्रोतों को दोबारा रिचार्ज करने की जानकारी दी।

शनिवार को डीएवी पीजी कालेज देहरादून और जल संस्थान देहरादून के संयुक्त पहल पर उत्तराखंड जागृति संस्थान खाड़ी में आयोजित कार्यशाला का शुभारंभ नरेंद्रनगर ब्लाक प्रमुख राजेंद्र भंडारी ने किया। टेरी-सेस नई दिल्ली के मुख्य डा. विनय सिन्हा ने बताया कि उत्तराखंड के विभिन्न स्थानों में चयनित सूख चुके पेयजल स्रोतों का विस्तृत सर्वे और जियोफिजीकल जांच की जाएगी। विशेषज्ञ सौरभ भारद्वाज ने कहा कि वैश्विक गर्मी का प्रकोप भारत सहित उत्तराखंड जैसे पर्वतीय राज्य में भी दिख रहा है। इस मौके पर मनोज पांडे, दुलारी देवी, अरण्य रंजन, कार्यशाला समन्वयक डॉ. प्रशांत सिंह आदि मौजूद थे। संवाद



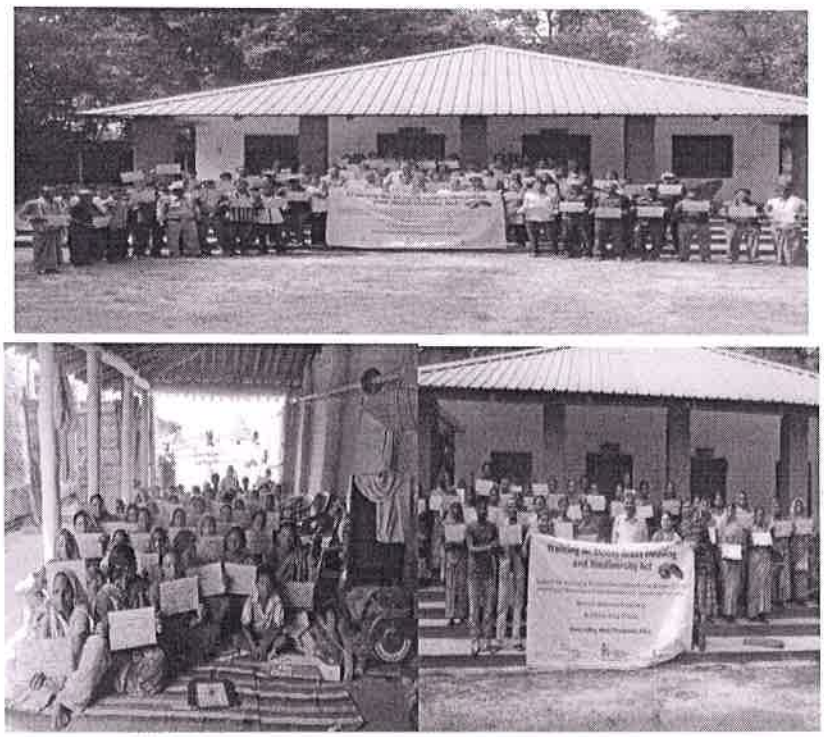


Students University network (SUN)-School students are trained by our University students and teachers in the arena of Sustainability

TRAINING ON BIODIVERSITY CONSERVATION ACT (2002) AND PREPARARTION OF BIODIVERSITY REGISTERS

Valmiki Nagar Tiger Reserve

26th-29th June 2016



REPORT

TERI UNIVERSITY

Plot No. 10 Institutional Area, Vasant Kunj, New Delhi - 110 070 India.

http://www.teriuniversity.ac.in

Project Team

Sudipto Chatterjee, Associate Professor, TERI University
Amit Pandey, Research Scholar, TERI University
Ms Charu Bhanot, Research Scholar, TERI University
Ms Sahaj Kaur, Research scholar, TERI University

gratefully acknowledges all the help and support received from:

Villagers, Done Valley, and
Field Officials, Valmikinagar Tiger Reserve

Ms Indu Kumari, Dr Samir Sinha,
Mr Kaushik and
Field officials, Wildlife Trust of India,

and

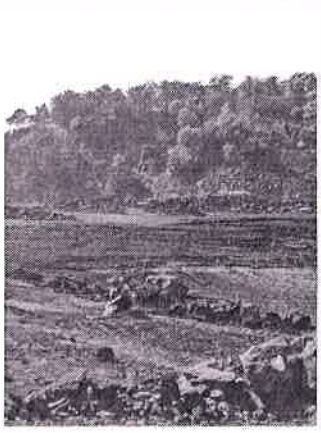
Administration, TERI University, New Delhi

teri school of advanced studies

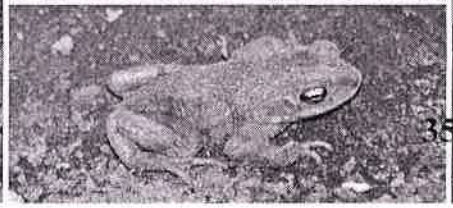
Forest Restoration in Reclaimed Open Cast Mines

A technology enabled integrated approach















FOREST RESTORATION IN RECLAIMED OPEN CAST MINES:

A technology enabled integrated approach

teri school of advanced studies

TERI-SAS

BIODIVERSITY INFORMATION FACILITY (BIF)

सेन्ट्रल माईन प्लानिंग एण्ड डिजाइन इन्स्टीच्यूट लिमिटेड
(कोल इण्डिया लिमिटेड की अनुषंगी कम्पनी / भारत सरकार का एक लोक उपक्रम)
गोण्डवाना प्लेस, कांके रोड, राँची - 834 031, झारखंड (भारत)
Central Mine Planning & Design Institute Limited
(A Subsidiary of Coal India Limited / Govt. of India Public Sector Undertaking)
Gondwana Place, Kanke Road, Ranchi - 834 031, Jharkhand (INDIA)
CORPORATE IDENTITY NUMBER - U14292JH1975GOI001223

पत्र सं. CMPDI/S&T/EE-44/ 8 / दिनांक: 15.02.2019

सेवा में,
Dean (Admin.) and Registrar
TERI University
10, Institutional Area, Vasant Kunj
New Delhi -110 070

Fax No.: (011)26122874
e-mail: registrar@teriuniversity.ac.in

विषय: Draft Project Completion Report and status review of S&T project titled **"Sustainable livelihood activities on reclaimed open cast coal mines: a technology enabled integrated approach in Indian coal sector"** – TERI / TERI University, New Delhi, Environment Department, CMPDI, Ranchi and BCCL, Dhanbad **[Project Code: EE/44]**

महाशय,

The above project was executed by TERI / TERI University, New Delhi in association with Environment Department, CMPDI, Ranchi and BCCL, Dhanbad.

The draft project completion report of the above project was discussed in the 18th Meeting of the Technical sub-committee of SSRC held on 9th January, 2019 (Wednesday) at CMPDI, Ranchi under the Chairmanship of CMD, CMPDI. The extract from the minutes of the meeting relevant to the proposal is reproduced below:.

Quote

Item No. 5.7: **Draft Project Completion Report: *"Sustainable livelihood activities on reclaimed open cast coal mines: a technology enabled integrated approach in Indian coal sector"*** (EE-44) - **Implementing Agencies:** TERI / TERI University, New Delhi, CMPDI, Ranchi and Bharat Coking Coal Limited (BCCL), Dhanbad

Dr. Sudipto Chatterjee from TERI University, New Delhi and Shri Pushkar, GM(Env.), CMPDI informed the committee that a permanent green cover has been developed on overburden dumps / backfilled mined land areas in Muraidih area, BCCL for eco- friendly mine reclamation and utilization of reclaimed land which in turn develop entrepreneurship and vocational skills among local community for empowerment in and around the project affected areas and to promote local economic growth by driving income generation activities.

The committee appreciated the work done by TERI University and advised BCCL to take over and maintain the area developed under the project and replicate the same to the other areas of BCCL.

The Committee after detailed deliberations accepted the project Completion report. The Committee, also, suggested to disseminate the findings of this project to the different Coal producing companies so that the same can be replicated in the other coal companies through concerned Nodal officer of the subsidiary companies of CIL / NLCIL / SCCL.

The Committee also advised TERI University, New Delhi to file IPR of the developed product/process on behalf of Ministry of Coal.

Unquote

This is for your kind information and requesting for further necessary action regarding IPR, with an intimation to the undersigned.

You are, also requested to arrange to submit 50 copies of **Project Completion Report of the above S&T project** with a soft copy incorporating the above details, along with final expenditure statements in Forms – III & IV signed by the project leader and associate finance, along with audited expenditure statements at the earliest possible. While preparing the final expenditure statements, it is also requested to restrict the expenditure incurred up to the project completion date (i.e. March 2018 as admissible) and refund the unspent money (if any). It is also requested to refund the interest earned (if any) on the disbursement made to CIMFR, Dhanbad during the project period (i.e. from Mar. 2015 to Mar. 2018).धन्यवाद,

भवदीय,

(एस. सी. प्रसाद / S C Prasad)
महाप्रबंधक (वि. एवं प्रौ.) / General Manager (S&T)
e-mail: dirrdt.cmpdi@coalindia.in

सादर सूचनार्थ: Director Technical (RD&T), CMPDI

Copy to:

1. Dr. Sudiapto Chatterjee
   Associate Professor & Head-Department of Natural resources
   TERI University, 10, Institutional Area Vasant Kunj
   New Delhi -110 070
   For necessary action.
   e-mail: s.chatterjee@teriuniversity.ac.in
   Fax No.: (011)26122874
2. General Manager (Environment), CMPDI(HQ)
   For necessary action.
   e-mail: gmenv.cmpdi@coalindia.in
3. General Manager (Min / IED)
   Bharat Coking Coal Limited
   Koyla Bhawan, Koyla Nagar
   Dhanbad-826 005
   For necessary action.
   Fax No. (0326) 2230161
   email: gmied.bccl@coalindia.in
4. Head of the Department (Environment)
   Bharat Coking Coal Limited
   Koyla Bhawan, Koyla Nagar, Dhanbad-826 005
   For necessary action.
   Fax No. (0326) 2230161
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Sustainable Agriscape for Future Project

Training on Conservation Agriculture

& Agro Biodiversity Registers

Tentative Agenda for the Training			
Tentative Date (between 19th and 23rd Dec Tentative Schedule : 10:00 AM -4:00 PM Venue : TBD			
Date	Timings	Topic for Discussion	Facilitator
/12/2017	10:00-11:00	Agriscapes Concept : relation between agriculture and Bio diversity	Aditya Petwal
	11:00-12:00	Impact of current Agriculture practices on ecosystem and its services	IUCN Resource Person
	12:00-12:15	Tea Break	
	12:15-1:00	Sustainable Agriculture Practices : Outcome and positive effects on Ecosystem	IUCN Resource Person
	1:00-1:45	Different methods of conservational Farming	IUCN Resource Person
	1:45-2:15	Conclusion	Aditya Petwal
	2:15	Lunch	
	3:00	Discussion while walking through the fields	
/12/2017	10:00-10:30	Recap of previous days Discussion	Aditya Petwal
	10:30-11:30	Our Agriculture and Agro Biodiversity	IUCN Resource Person
	11:30-12:30	Sustainable Agriculture and Agro biodiversity	IUCN Resource Person
	12:30-12:45	Tea break	
	12:45-1:30	How to make Biodiversity Committee and Biodiversity Register	IUCN Resource Person
	1:30-3:00	Address queries of stakeholders	IUCN Resource Person
	3:00	Lunch	

"Air Quality Management - Plans using Decision Support system UrbAir India"

29th November - 1st December 2017

Venue: TERI University, 10, Institutional Area Vasant Kunj, New Delhi - 1100 70 (India)

Day 1 - Wednesday, 29 November 2017	
09:00 - 9:30	Registration
9:30 - 10:30	Inaugural Session • Welcome address by Dr. Leena Srivastava, Vice Chancellor, TERI University • Key note address to the participants (TBD) • Vote of Thanks
10:30- 11:00	**TEA**
11:00 - 12:30	**Introduction to Spatial Decision support system** The session will provide an overview of geospatial tools, techniques and datasets to assist decision makers to solve complex spatially related problems. Speaker: **Professor P K Joshi,** *School of Environmental Sciences, JNU*
12:30 - 13:30	**Lunch Break**
13:30 - 15:00	**Air quality management, techniques and practices** The lecture will provide insights into various AQM techniques and practices. Various strategies will be discussed which are used in regulatory standard setting and emissions reductions methods. **Speaker: Professor Suresh Jain,** *Professor and Head Department of Energy and Environment, TERI University*
15:00 - 15:30	**Tea break**
15:30 - 16:30	**Technical Session 1 Introduction to UrbAirIndia** This session will introduce participants to UrbAirIndia, a web-based system design, develop and facilitate analysis of relevant parameters for urban air quality management. Speaker: **Dr. Prashant Gargava,** *Additional Director & Head AQM Division, CPCB*
Day 2: Thursday, 30 November 2017	
09:30 - 11:00	**Emission Inventory: Introduction and uncertainty analysis** This session will deal with the accounting methods of pollutants emitted in the atmosphere **Speaker: Prof. A K Attri,** *School of Environmental Sciences, JNU*
11:00 - 11:30	**Tea break**
11:30 - 13:00	**Technical Session 2 -** Tutorial (UrbAirIndia) This session will expose participants to different modules of UrbAir India and its applications

	Speaker: Dr. Anu Rani Sharma and Dr. Kamna Sachdeva, *TERI University*
13:00 – 14:00	**Lunch**
14:00 – 15:00	**Statistical methods for air quality data analysis** The session will help participants to interpret air quality data with various statistical methods and tools. **Speaker: Dr. Neeti**, *TERI University*
15:00 – 16:30	**Technical Session 3 –** Tutorial (GIS analysis of air quality) The session will introduce participants to carry out statistical analysis in UrbAir module through queries and display results in the form of GIS maps, graphs and reports. **Speaker: Dr. Anu Rani Sharma and Dr. Kamna Sachdeva**, *TERI University*
Day 3: Friday, 1st December 2017	
09:30 – 11:00	**Importance of meteorological data in air quality management** The session will help participants to understand the importance of Meteorological data in source apportionment of air pollutants and air pollution events such as inversions and high-pollutant concentration days **Speaker: Dr. Dilip Ganguly**, *Department of Atmospheric Sciences IIT Delhi*
11:00 – 11:30	**Tea break**
11:30 – 13:00	**Air pollution dispersion and receptor modelling** Dispersion models assist in predicting the effects of various control strategies to reduce the emissions. The session will focus on various available models for air quality management and prediction. **Speaker: Dr. T K Mandal,** *Principal Scientist National Physical Laboratory, New Delhi*
13:00 – 14:00	**Lunch**
14:00 – 15:30	**Technical Session 4 – Tutorial (UrbAirIndia – Dispersion and Receptor modelling)** In the tutorial participants will get familiarize with 'AERMOD' or 'ISC3' models to predict the air quality of selected city. Also, they will learn how to visualize model output through GIS interface. **Speaker: Dr. Anu Rani Sharma and Dr. Kamna Sachdeva**, *TERI University*
15:30 – 17:00	**Group Discussion** Participants and CPCB experts will discuss on the challenges and opportunity of UrbAir India modules. **Moderator: Dr. Anu Rani Sharma and Dr. Kamna Sachdeva**, *TERI University and CPCB officials*
1700-onwards	**Valedictory session: feedback, experience sharing and certificate distribution**

Capacity building program on "**Climate Change–impacts and responses" March 2-3, 2017**

Venue: TERI University

10, Institutional Area, Vasant Kunj, New Delhi - 110 070, India

Limiting climate change and improving adaptive capacity is need of the time. It is increasingly recognized that, climate change typically occur on different temporal and spatial scales, hence affects human well-being directly through health and food supply at different levels. When considering strategies to deal with this challenge there is a need to assess the impacts and for that we need to enhance the capacity of policy makers. The proposed training program deals with all these aspects and proposed to build capabilities to deal with the challenges of climate risk reduction.

The programme is structured to address the following Objectives:

Day 1: Understanding Climate science, monitoring and impacts

Learning Objectives: Participants will get in-depth knowledge of science behind the climate change phenomenon. Also good understating about the available tools to assess climate change impacts will be discussed

Day 2: Linkages between mitigation, adaptation and Sustainable development

Learning Objectives: focuses on synergies between development goals and local climate actions and how to integrate climate change concerns into development agenda.

Day 1	
Time	**Agenda Item**
09:00 – 9:30	**Registration of Participants**
9:30 – 10:30	**Welcome Note** *Dr Leena Srivastava* Vice Chancellor, TERI University **Shri Ravi Shanker Prasad** *Joint Secretary MoEE &CC* **Importance of capacity building program for mid -level professionals in the proposed subject** *Dr Suresh Jain* HOD, Department of Energy and Environment
10:30 – 11:00	**Tea break and Group Photo** **Course Introduction and objective of the training program**
	Thematic Session – 1 **Science of Climate Change**
11:00-12:00	**Science of Climate Change: Evidence and uncertainties** *Dr. Kamna Sachdeva* Assistant Professor, TERI University
12:00 – 1:00	**Satellite remote sensing for climate Change studies** *Dr. Anu Rani Sharma* Assistant Professor, TERI University
1:00 – 2:00	**Lunch Break**
	Thematic Session – 2 **Impacts and Vulnerability**
2:00 – 3:00	**Understanding the concepts of Impacts, Vulnerability and Adaptation** *Dr Chubamenla Jamir,* Assistant Professor TERI University
3:00– 3:15	Tea break
3:15 – 4:30	**Cities and Climate change** *Dr. Shaleen Singhal, Associate Professor, TERI University*

Day 2	
Time	**Agenda Item**
9:30 – 10:30	**Material flows and its impact on Climate Change – A case of food, water and energy nexus in human settlements** *Prof. Arun Kansal*, Professor, TERI University
	Thematic session – 3 **Adaptation and disaster risk reduction**
10:30– 11:30	**Climate Change and Disaster Risk reduction** *Dr. Anil Gupta,* National Institute of Disaster Management (NIDM)
11:30-12:00	***Tea break***
12:00-1:00	**Remote sensing and GIS for Climate change adaptation** *Prof. P K Joshi*, School of Environmental Science, JNU
1:00-2:00	**Lunch break**
	Thematic session – 4 **National appropriate mitigation options**
2:00 – 3:00	**Sustainable Energy Options** *Dr. Priyanka Kaushal*, Assistant Professor, TERI University
3:00-3:15	**Tea break**
3:15 – 4:15	***Communicating Climate Change : NAPCC and NATCOM*** *Dr. J R Bhat, Advisor, MoEFCC*
4:15 Onwards	**Thank you Note and Valedictory function** Dr. Rajiv Seth (Pro – Vice Chancellor) TERI University

Dr. Kamna Sachdeva and Anu Rani Sharma
Course Coordinators: Assistant Professor (s)
Department of Energy and Environment, TERI University

tezi
university



Department of Natural Resources and Department of Policy Studies

TERI University, New Delhi

July 10-12, 2017

Short-term Training Programme on

"Data Science Applications for Sustainability"

Programme Agenda

Time	Topics	Faculty
Day 1: Overview and application of data science for environmental sustainability		
8 AM–9 AM	Registration	
9 AM–9:30 A M	Inaugural session • Welcome address	Dr Rajiv Seth, Pro Vice-Chancellor, TERI University, New Delhi
9:30 AM–10:30 A M	• Data science for sustainability	Prof Prateek Sharma,TERI University, New Delhi
10:30 AM - 11:00 AM	**Tea**	
Environmental pillar of sustainability and Data Science		
11:00 AM–12:30 PM	• Data science applications for environmental sustainability	Prof Surender Kumar, Delhi School of Economics, New Delhi
12:30 PM - 1:30 PM	**Lunch**	
1:30 PM–2:45 PM	• Coastal Ecosystem Monitoring and Sustainability Using Remote Sensing Data	Dr. K. H. Rao, (Retired) Group Director, Ocean Science Group NRSC/ISRO, Earth and Climate Science Area, NRSC, Hyderabad
2:45 – 3:00	**Tea**	
3:00 PM – 4:15 PM	• Applications of data science for energy and environment planning	Dr. Atul Kumar and Prof. Suresh Jain, TERI University, New Delhi

4:20 PM–5.30 PM	• Hands on training on data analysis for energy and environmental planning	Prof. Suresh Jain, TERI University, New Delhi
Day 2: Social pillar of sustainability and data science		
9:00 AM–10:30 AM	• Data science application for social sustainability	Dr. Abhay Kumar, Executive Director of Lokashraya Foundation, New Delhi
10.30 AM - 11.00 AM	Tea	
11:00 AM–12:30 PM	• Big Data Applications for Affordable Universal Healthcare in India	Dr. Anurag Agrawal (Principal Scientist, CSIR Institute of Genomics & Integrative Biology (IGIB)), New Delhi
12:30 – 1:30 PM	Lunch	
1:30 PM–3: 00 PM	• Community Knowledge Enterprises over Digital India for enhanced quality of life and opportunities for livelihood	Prof. K.R. Srivathsan, Visiting Professor, School of Electrical Sciences,IIT Bhubaneswar, Odisha
3:00 PM to 3:30 PM	Tea	
3:30 PM–5:00 PM	• Understanding energy poverty linkage through different indicators	Dr. Rekha Krishnan Managing Partner, Water Energy Food Transitions (WEFT) Research, New Delhi
Day 3: Economic pillar of sustainability and data science		
9:00 AM–10:30 AM	• Data science applications in economic sustainability	Mr. Joy Mustafi, Principal Applied Scientist, Microsoft, Hyderabad
10.30 – 11.00: Tea		
11:00 AM–12:30 PM	• Synergizing the three pillars of sustainability through data science	Dr. Ashwini Chaitre ISB, Hyderabad
12:30 PM - 1:30 PM	Lunch	
1:30 PM–3:30 PM	• Hands-on exercise on the application of data science for economics	Mr. Joy Mustafi, Principal Applied Scientist, Microsoft, Hyderabad
4:00 PM– 4:30 PM	• Valedictory ceremony and certificate distribution	Dr Rajiv Seth, Pro-Vice-Chancellor, TERI University, New Delhi

Department of Natural Resources and Department of Policy Studies

July 10-12, 2017

Short-term Training Programme on
"Data Science Applications for Sustainability"

S.No.	Name	Designation	Organisation	Email Id	Contact No	Accommo-dation	Sign
1	Apra Sinha	Postgraduate Students/Research Scholars	Jamia Millia Islamia- New Delhi	apra.sinha23@gmail.com	9868010545		
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6	Lisa Varkey MANRM	Specialist: Socio Economics	IRRI	l.varkey@irri.org	90135555481	Rs.1500/-	
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11	Yogita Karpate	Senior Engineer	RBEI	yogitakarpate7@gmail.com	7042299858	Rs.1500/-	
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Department of Natural Resources and Department of Policy Studies
July 10-12, 2017
Short-term Training Programme on
"Data Science Applications for Sustainability"
TU Students

Rs-1000/-

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GIS day celebration-2016

Theme: GIS for Sustainable Development

Venue: TERI University **Date:** 16-11-2016 **Time:** 9.30-11.30am

Agenda:

9.00-9.30 – *Registration*

9.30-9.40am – *Welcome address by HOD Natural Resources.*

9.40-9.55am – *Thoughts about GIS day and inauguration of Geo club* by Vice Chancellor *Teri University.*

10-11am – *Panel discussion comprises of experts (Topic: GIS for Sustainable Development)*

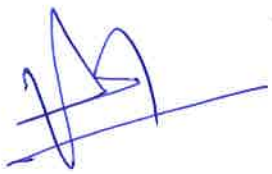
11-11.25am – *A student debate (Future of GIS in India – on the prospective of **opportunities** and **challenges**)*

11.20-11.30am – Vote of thanks

Registration charge: *Nil*

Registration: RSVP using the following link: https://goo.gl/forms/X07AtNhVoH00emEH3 or quickly enroll using the QR code below.

List of the Participants in various workshop/training program conducted by department



DELEGATES

INTERNATIONAL CONFERENCE FOR URBAN GEOINFORMATICS
22nd - 23rd February, 2017

S. No	Name	Designation	Institute/Organisation	Email Id	Contact No	Signature
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]	[illegible]		
5	[illegible]	VP	Mapmyindia	[illegible]		
6	Dr. Raja Chatterjee	Sr. Consultant (GIS&RS)	National Disaster Management Authority	chatterjee@ndma.gov.in	9968184945	
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8	Shashi Kant	Consultant (GIS)	DDA, Yamuna [illegible]	126shashi@gmail.com	[illegible]	
9	Vinod Kumar	Consultant (GIS)	Delhi Jal Board	vinodkr1997@gmail.com	7838225997	
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Delegates

S.No	Name	Desingation	Sign
1	Dr Shailesh Nayak	Distinguished Scientist, MoES	
2	Dr. Y.V.N. Krishna Murthy	Director, NRSC	
3	Mr. Rakesh Verma	MD, MapmyIndia	
4	Er Sanjeeb Patjoshi IPS	Joint Secretary, Ministry of Panchayat Raj	
5	Dr Vishnu Chandra	Deputy Director General, NIC	
6	Dr. Vijay Veer	Technical Director, GIS, NIC	
7	Mr. C.M. Panda	Technical Director, Utility Mapping, NIC	
8	Mr. B.S. Rawat	PSA, Utility Mapping Division, NIC	
9	Ms. Bhavana	SSA, GIS Division, NIC	
10	Shri Anil Kumar Sanghi	Joint Secretary (Mit), NDMA	
11	Shri Raja Chakraborty	Consultant (GIS), NDMA	
12	Dr. OP Mishra	Scientist-F, National Centre for Seismology, Ministry of Earth Sciences	
13	Mr. Vijay Kumar	Vice President, ESRI India	
14	Prof. Anjana Vyas	CEPT University	
15	Satyam Khurana		
16	Mustreet	Map my India .	
17	[illegible]	[illegible]	
18	[illegible]		
19	Ash. Dutta	NRDMS	
20			
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List of Participants

S.No	Name	Organisation	Course	Sign
1	Sanvita Rani	TERI (consultant)	M. Tech (Remote Sensing)	
2	Sneha Mallick	TERI University	M.Sc EERM	
3	Varsha.B	TERI University	M.Sc EERM	
4	Anjishi Vihan	TERI University	PhD SD DNR	
5	Hifzur Rahman	"	M Tech UDM	
6	Rajat Ranjan	"	M Tech EERM	
7	Rose	"	MA SDP	
8	Anusha	"	MA SDP	
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Presenters

S.No	Name of the presenter	Paper ID	Country	Institution
1	Anjali kumari	ICUG X231	India	TERI University
2	SUHINA TARIQ	ICUG X243	INDIA	ALIGARH MUSLIM UNIVERSITY
3	Aditi Chaturvedi	ICUG X244	India	Poornima University Jaipur
4	Biswajit Mondal	ICUG X247	India	Jawaharlal Nehru University
5	Srikanta Sannigrahi	ICUG X279	India	Indian Institute of Technology, Kharagpur,India
6	Srikanta Sannigrahi	ICUG X280	India	Indian Institute of Technology, Kharagpur, West Bengal
7	Anurag Varma	ICUG X295	India	TERI University
8	Harikesh	ICUG X296	India	Central University Of Jharkhand
9	taha alfadul taha	ICUG X307	sudan	Alzaim alazhar university	AAU
10	Jianfa Shen	ICUG X203	Hong Kong (China)	The Chinese University of Hong Kong
11	Judit Bartholy	ICUG X204	Hungary	Eotvos Lorand University
12	Rita Pongracz	ICUG X205	Hungary	Eotvos Lorand University
13	Hiroyuki Miyazaki	ICUG X264	Japan	University of Tokyo
14	Jimoh Rafiu.A & Afonjo Yusuf.O	ICUG X266	Nigeria	DoGeogydorlogy,Geomodelling and Geoexplore Nigeria
15	Bidur Devkota, Hiroyuki Miyazaki	ICUG X268	Thailand	Asian INstitute of Technology
16	Vanshaj Verma	ICUG X298	India	PEC University of Technology, IIST Vellamala, NIT Kurukshetra
17	Someshwar Kumar Das	ICUG X201	Nepal	Government of Nepal, Department of Forest, District Forest Office, Taplejung
18	Surabhi Mehrotra	ICUG X238	India	IIT Bombay
19	Usman A. Kibon	ICUG X273	Nigeria	Ahmadu Bello University, Zaria Kaduna, Nig.
20	Prajakta Sonar	ICUG X277	USA & INDIA	SPA, New Delhi
21	Kamal Kumar Tanti	ICUG X299	India	University of Technology and Management, Shillong
22	Vinay Pratap Singh	ICUG X206	India	Jawaharlal Nehru University New Delhi
23	Mainak Bhattacharyya	ICUG X207	India	Sidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal
24	DWIJENDRA PANDEY	ICUG X208	INDIA	DELHI TESHNOLOGICAL UNIVERSITY
25	Dinesh Kumar	ICUG X209	India	Central University of Jammu, jammu
26	NASEER AHMAD	ICUG X210	INDIA	CENTRAL UNIVERSITY OF PUNJAB
27	Ashish Kumar Singh	ICUG X211	India	Motilal Nehru National Institute of Technology Allahabad
28	PRIYANKA KUMARI	ICUG X213	INDIA	JAWAHARLAL NEHRU UNIVERSITY
29	SANDESH YADAV	ICUG X214	INDIA	Jamia Milia Islamia, Delhi
30	Sagarika Ghosal	ICUG X215	India	TERI University
31	Ishan Saraswat	ICUG X218	India	Delhi Technological University
32	K.SRIMADHI	ICUG X219	INDIA	ANNA UNIVERSITY REGIONAL CAMPUS, TIRUNELVELI
33	Bakul Budhiraja	ICUG X220	India	Nehru Nagar University

Presenters

34	Brigit Maria Baby	ICUG X222	India	TERI UNIVERSITY
35	A. Rahul Khanna	ICUG X223	India	School of Planning & Architecture, New Delhi
36	Yadvendra Pratap Singh	ICUG X224	India	Motilal Nehru National Institute of Technology Allahabad
37	DINESH KUMAR AZAD	ICUG X225	INDIA	MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY ALLAHABAD
38	Sahil Singh Kapoor	ICUG X226	India	TERI University, New Delhi
39	C. A. Rishikeshan	ICUG X228	India	National Institute of Technology Karnataka, Surathkal
40	Venkata Sai Krishna Vanama	ICUG X235	India	IIT Bombay
41	MOHIT MODI	ICUG X236	INDIA	NATIONAL REMOTE SENSING CENTRE
42	Meghna Joshi	ICUG X237	India	Ambedkar University Delhi
43	C. A. Rishikeshan	ICUG X239	India	National Institute of Technology Karnataka, Surathkal
44	DIVYA VIJAYAN V	ICUG X240	INDIA	NATIONAL REMOTE SENSING CENTRE
45	SUKANYA GHOSH (not present)	ICUG X241	INDIA	AMITY UNIVERSITY, NOIDA
46	MAHUA BARDHAN	ICUG X246	INDIA	Netaji Satabarshiki Mahavidyalaya
47	Purnima Bhardwaj	ICUG X248	India	Jawaharlal Nehru University
48	Rama Dasu M	ICUG X250	INDIA	National Remote Sensing Centre
49	Archana M V	ICUG X252	India	Symbiosis International University
50	Bhavani K	ICUG X253	India	Symbiosis International University
51	MOHAMMAD ARIF	ICUG X254	INDIA	Visva-Bharati University
52	SHYAMAL DUTTA	ICUG X255	India	Department of Geography, The University of Burdwan, W.B.
53	Brigit Maria Baby	ICUG X257	India	TERI UNIVERSITY
54	RAHUL RAJAK	ICUG X258	INDIA	INTERNATIONAL INSTITUTE FOR POPULATION SCIENCES, MUMBAI
55	Ashwani Kumar Agnihotri	ICUG X259	India	Indian Institute of Technology (BHU), Varanasi 221005, India
56	Surbhi Gaur	ICUG X262	India	Jawaharlal Nehru University
57	Mukund Pratap Singh	ICUG X263	Indian	MNNIT Allahabad
58	Shivesh Berwal	ICUG X271	India	Jawharlal Nehru University
59	R ARAVINTH	ICUG X274	INDIA	UNIVERSITY OF MADRAS
60	Vivek Agarwal	ICUG X276	India	IIT Roorkee
61	CHARU BHANOT	ICUG X278	India	Tata university
62	Vasundhara Deogawanka	ICUG X281	India	University of Petroleum and Energy Studies, Dehradun
63	Vasundhara Deogawanka	ICUG X282	India	University of Petroleum and Energy Studies, Dehradun
64	Ramesh V	ICUG X284	India	Tata Institute of Social Sciences (TISS)
65	Sugandha Panwar	ICUG X285	India	Indian Institute of Technology, Roorkee
66	Surendran D	ICUG X286	INDIA	Department of GAngraphy, University of Madras, Chennai
67	Amit Aryan	ICUG X288	India	University of Petroleum and Energy Studies, Dehradun

Presenters

68	Aman Arora	ICUG X290	India	Jamia Millia Islamia, New Delhi
69	Anurag Kashyap	ICUG X291	India	Shoolini University, Solan
70	Niyati gupta	ICUG X292	India	TERI University
70	DURGADEVI KALAIYARASAN	ICUG X293	INDIA	A V C COLLEGE OF ENGINEERING
72	Meenakshi Kumar	ICUG X294	India	TERI University
73	Pritanka Sandbhor	ICUG X300	India	Symbiosis Institute of Geoinformatics
74	B Aneesha Satya	ICUG X301	India	National Institute of Technology Warangal
75	P.V.S Sylesh	ICUG X302	India	National Institute of Technology Warangal
76	Pareen Ghosh (not presenting)	ICUG X303	India	Symbiosis Institute of Geoinformatics, Pune
77	KUMARAPU KUMAR	ICUG X304	INDIA	NIT WARANGAL
78	Meena Kumari K	ICUG X305	India	National Institute of Technology, Warangal
79	HINOTOLI V SEMA	ICUG X306	INDIA	TATA INSTITUTE OF SOCIAL SCIENCES
80	Nusret Demir	ICUG X269	Turkey	Akdeniz University
81	Nusret Demir	ICUG X270	Turkey	Akdeniz University
82	Payel Ghosh Dastidar	ICUG X283	India	Indian Institute of Remote Sensing
83	Rohan Kumar	ICUG X308	India	C V Raman College of Engineering

Presenters

S.No	Title	Payment	Pay info	Oral	Sign
1	Spatio-temporal dynamics of lakes of Bengaluru city using remote sensing	UP	On site	Poster	
2	Adverse Air Quality In Indian Cities- A Never Ending Story	UP	On site (23 M/S)	Oral	
3	Estimation of urban land coverage using GIS based tools	UP	TBC Monday	Oral	
4	Local association of housing price and urban lake, open space and tree cov	UP		Oral	
5	Effects of urbanization on Urban Heat Island intensity and thermal changes	UP	On site	Poster	
6	Urban Flood Vulnerability and Risk Mapping Using RS-GIS based MCDM a	UP	On site	Poster	
7	Dimensions Of Spatial Linkages Between Culture And Urban Planning For	UP		Oral	
8	Persistent scatterer interferometry synthetic aperture radar technique for mo	UP		Oral	
9	GIS based Mobile Business Hotels Tourism Site In Khartoum, Sudan	UP		Poster	
10	Analysis of urban competitiveness in the Yangtze River Delta and Pearl Riv	USD 200		Oral	
11	Combined Use of Simulations and Satellite Measurements in Urban Studies	USD 250		Poster	
12	Analysis of the Urban Heat Island Effect Using In-situ Measurements	USD 250		Poster	
13	DEVELOPMENT OF AN ON-DEMAND SERVICE OF SETTLEMENT MAPP	USD 250	On site	Oral	
14	SPATIO-TEMPORAL URBAN EXPANSION ANALYSIS IN A GROWING C	USD 75		Oral	
15	Development of a System to Collect Social Media Data and Preliminary Ana	NA		Oral	
16	Comparative analysis of Pixel Based and Object Based Classification in urb	2000		Oral	
17	Assessment of Aboveground Phytomass and Carbon in Trees outside Fore	USD 200		Oral	
18	Decoding Thermal Characteristics Of Urban Built Typologies: Case of Mum	1000		Oral	
19	The effect of Urban-Induced Change on Vegetation cover in Katsina State,	USD 200		Oral	
20	Applications of GIS in Planning	2000		Poster	
21	Development of a GPS-based Real-time Road Traffic Monitoring System	3500		Poster	
22	Temperature Inversion and its Impact on Air Quality: a case study of Delhi	2000		Oral	
23	Air Pollution, its consequences on insects herbivory and the strategic contr	1500		Poster	
24	Satellite Clock and Ionospheric Error Correction for Static GNSS Precise Po	2000		Poster	
25	Parametrization schemes for thunderstorm prediction over Indian region	3500		Oral	
26	A Mini-Review On Land Conversion Dynamics With Special Reference To C	1500		Poster	
27	Dynamic Visualization of Optical Fiber Network Using Web-GIS: An Open S	2500		Oral	
28	A STUDY OF THE SEASONAL VARIATIONS IN SPECTRAL DIFFUSE AN	1500		Oral	
29	Urban Air Pollution Due to Deepawali Celebration: A Case Study of NCT of	1500		Oral	
30	Colours of a Red Light Area: A Study of Multiple Push Factors of Entry of W	2000		Oral	
31	Object Oriented Image Analysis for Extraction of Urban Built up Land from E	2000		Oral	
32	APPLICATION OF LAND SURFACE TEMPERATURE FOR ROOFTOP SO	2000		Poster	
33	Urban Heat Island Dynamics in Local Climate Zones Of Delhi	2000		Poster	

Presenters

34	ANALYSIS OF LANDSCAPE DYNAMICS IN THE PUNE-MUMBAI INDUST	NA		Poster	
35	Geoinformatics for Urban Forestry	1500		Oral	
36	Using Smart Phone for Lodging Solid Waste Complaint and its Monitoring u	2000		Oral	
37	Village level Geospatial Framework for "Digital India"	2000		Oral	
38	Optimization of Land-use Along the Proposed Metro Corridor in Zone-"N" (I	2500		Poster	
39	Multi Temporal NDVI and Land use Land cover Change Assessment of We	1500		Oral	
40	Spatial analysis of satellite driven urban land surface temperature using geo	2000		Poster	
41	A SEMI-AUTOMATIC APPROACH TO EXTRACT AND CLASSIFY URBAN	3500		Oral	
42	URBANISATION, LAND USE TYPES, AND IT'S IMPACT ON ECOLOGY C	1500		Oral	
43	Automated extraction of road networks in urban areas from remote sensing	NA		Oral	
44	VARIATIONS IN BIOPHYSICAL PARAMETERS UNDER DIFFERENT LAN	3500		Oral	
45	SPATIO TEMPORAL CHANGES IN URBAN LAND USE OF NOIDA, NCR (	1500		Oral	
46	Assessment of Water Quality and Geo Hydrological Condition of Urban We	2500		Oral	
47	SEASONAL-SPATIAL VARIATIONS OF AOD AND SOLAR IRRADIANCE (	2000		Oral	
48	BUILTUP AREA EXTRACTION BY COMBINING UNSUPERVISED LINEAR	3500		Oral	
49	Sustainable Cities: The Dark Knight the World Needs	2000		Oral	
50	Sustainable Cities: The Dark Knight the World Needs	2000		Oral	
51	Mapping Peri-Urbanization Of Burdwan City, West Bengal: A Longitudinal S	1500		Oral	
52	Regional Significance and Governance Problems in Census Towns and Fa	1500		Oral	
53	ANALYSIS OF LANDSCAPE DYNAMICS IN THE PUNE-MUMBAI INDUST	3500		Oral	
54	Urban sprawl in India by size-class of towns: analysis of 1901 to 2011 censu	1500		Oral	
55	URBAN GREEN SPACE ASSESSMENT USING REMOTE SENSING AND	2000		Oral	
56	Mapping and Modelling of Urban Heat Island of Jaipur City	2000		Oral	
57	GIS based MCDA optimization method for designing and evaluation of routi	2000		Oral	
58	Spatial Dynamics of Thermal Inertia and its Relationship with Urban Heat Is	2000		Oral	
59	URBANIZATION EFFECTS ON NATURAL LANDFORMS – A CASE STUD	1500		Poster	
60	Study of Change In Water Content of Uttarakhand Using Grace Satellite Da	2000		Oral	
61	Spatio-temporal dynamics of land use change due to rapid urbanization rea	2000		Oral	
62	A Comprehensive Approach To Building Climate Resilient Cities	NA		Poster	
63	Managing Urban Surveillance Through Geoinformatics Enabled Geointelliga	2000		Oral	
64	Landslide Susceptibility Mapping using Bivariate Statistics and Analytical Hi	2500		Oral	
65	Uniqueness of Ground Water Occurrence and Potential in Deccan Volcanic	2000		Oral	
66	APPLICATION OF HYBRID CA-MARKOV MODEL FOR URBAN GROWTH	1500		Oral	
67	Hotspot analysis of road accident and landslide using GIS thereby creating	2000		Oral	

Presenters

68	Measuring Urban & Peri-urban changes using Remote Sensing and GIS: A	NA		Oral	
69	Solan City as a Smart City: A Geospatial Based Study	2000	nourAnushalKashya	Oral	
70	Master plan preperation- capacitating smart city mission	2000		Oral	
70	ENHANCING SATELLITE DATA QUALITY USING ATMOSPHERIC CORR	NA		Oral	
72	Multi-functionality of Urban Green Infrastructure for the Competitive Advant	2000		Oral	
73	An Initiative Of Geospatial Technology To Identify Post Globalization Urban	2000		Oral	
74	Urban Flood vulnerability Impact assessment using microwave data	2000		Oral	
75	Optima' solution for re-use of urban sewage water using Geo spatial techno	2000		Oral	
76	Temporal Land Surface Temperature Analysis of Pune City (PMC) using Ge	2000		Oral	
77	MONITORING OF CURING ACTIVITY IN CONSTRUCTION SITE USING	2000		Oral	
78	Offline use of LBS app for Healthcare Services	2000			
79	LANDSLIDE SUSCEPTIBILITY ZONATION(LSZ) MAPPINGIN PARTS OF	2000		Oral	
80	Detecting an ecological networks and connectivity and their effects on susta	USD 200		Poster	
81	Matching of existing geo-datasets with UAV images to generate GCPs	NA		Poster	
82	A Study of the Urban Boundary layer using different Urban Physics options	1500		Oral	
83	GIS based Geo-environmental appraisal for the land development of part of	UP		Oral	

Participants

S.No	Name	Payment Status	Amount (Rs)	Sign
1	Sivaram Ramachandran		3500	
2	Sugandhi Gosain		2000	
3	Poornima Badrinath		3500	
4	Dyutisree Haldar		2000	
5	Harshit Verma		2000	
6	Srishtisolanki		2000	
7	loveneet misra		1500	
8	Nasreen Rasid		1000	
9	Soubhik karmakar		1000	
10	Anusha Choudhary		1000	
11	Athisii Kayina		2500	
12	Ashlesha Nayak		1000	
13	Sushant lal		1500	
14	Manish Pilwar		3500	
15	Vivek Agarwal		2000	
16	Ashwani Kumar Agnihotri		2000	
17	~~Hiralal Soma~~		~~2000~~	
18	Meena Kumari Kolli		2000	
19	Sarvesh tripathi	BT	1500	
20	Davinder Singh	BT	2000	
21	Surabhi Mehrotra	BT	1000	
22	DK CARG	CE CPWD.		
23	D.P TRIPATHI	CE (CPWD)		
24	D K CHOWDHURY	SE (CPWD)		
25	Hari Sharma	Online (failure)	2000	
26	~~Prakhar Garg~~			
27	Prakhar Jaiela	online	3500/-	
28	C M Pandey	NIC (GOVT.)		
29	VIJAY VEER	NIC (Govt.)	—	
30	BHAVNA CHOPRA		—	
31	B. S. Rawat	"	—	
32	A. C. Srivastava	NDMA	—	
33				



24-28, July 2017
Poultry farming

Name	Phone number	Signature
1.		26
2.		
3.		
4.		
5.		
6.	9570196033	
7.	9534168813	
8.		
9.		
10.		

Bhadra Mahali

Bhadra Mahali

Bhadra Mahali

Fishries
26-28, July 2017

27/07/17	28/07/17	Name	Phone number	Signature 26/07/17
		1. रिंकु देवी	7250699951	Rinku Devi
		(2) रुकु देवी	8873179479	रुकु देवी
3. ललिता देवी	ललिता देवी	3. ललिता देवी		ललिता देवी
4. सुरेश कुमार स्वामी नीमलाल प्र० गोप	सुरेश कुमार स्वामी नीमलाल प्र० गोप	4. सुरेश कुमार स्वामी		सुरेश कुमार स्वामी
		5. निमलाल प्र० गोप		नीमलाल प्र० गोप
		6. दिनेश रावत		दिनेश रावत
7. Dinesh ka Gope	Dinesh ka Gope.	7. दिनेश गोप		Dinesh ka Gope
8. कोलिया	कोलिया	8. कोलिया		कोलिया
		9 डब्बी देवी		
		10 बिनोद मोहली		Binood mahali

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Computer Training Programme
26-28 July.

Name	Phone	Signature 26/07/17	27/07/17	28/07/17
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Nisha Puja Soren	8294430111	Nisha Puja Soren	Nisha Puja Soren	Nisha Puja Soren
Sahin Akhtar	9709809186	Sahin Akhtar	Sahin Akhtar	Sahin Akhtar
Rijwan Alam	7255025204	Rijwan Alam	Rijwan Alam	Rijwan Alam
Parmeshwar Roy	9708323452	Parmeshwar Roy	Parmeshwar Roy	Parmeshwar Roy
Punam Kumari	8298174213	Punam Kumari	Punam Kumari	Punam Kumari
PUJA KUMARI	9534121153	PUJA KUMARI	PUJA KUMARI	PUJA KUMARI
Bipath Soren	9060233357	Bipath Soren	Bipath Soren	Bipath Soren
Sachin Kisku	7870756847	Sachin Kisku	Sachin Kisku	Sachin Kisku
Naushad	-	-	Naushad Alam	Naushad Alam

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21 Day Training Programme on Geospatial Technologies (Equivalent to Refresher Course) on Capacity-Building in Geospatial Technologies during 01-21 December 2016

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3	Ms	Anjali Kumari	Student	TERI University	New Delhi	23	kumarianjali304@gmail.com,	9990092364	
4	Ms	Anshika Gautam	Student	DRDO	Delhi	25	sharma.anshika990@gmail.com,	9968366477	
5	Dr	Anup Kumar Das	Documentation Officer	JNU	New Delhi	43	anupdas2072@gmail.com,	9911479926	
6	Ms	Ayushi Vijhani	Student	TERI University	New Delhi	25	ayushivijhani@ymail.com,	9899952051	
7	Dr	JS Lohia	Documentation Officer	JNU	New Delhi	55	jslohia.jnu@gmail.com,	9810431892	
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9	Ms	Karabi Mukherjee	Scientist E	DRDO	Delhi	41	kmukherjee28@gmail.com,	9871292769	
10	Ms	Kundan	Research Scholar	JNU	New Delhi	25	kundandeval@gmail.com,	9717309202	
11	Mr	Nandan Srivastava	Research Scholar	IIT Delhi	New Delhi		nandan146@yahoo.co.in,	9540849928	
12	Ms	Neelima	Jr Research Fellow	DRDO	Delhi	28	neelima.chauhan17@gmail.com,	9717798639	
13		Nominated 1	Scientist	Orissa Pollution Control Board	Bhubneshwar			9437417913	
14		Nominated 2	Scientist	Orissa Pollution Control Board	Bhubneshwar			9437417913	
15		Nominated 3	Scientist	Orissa Pollution Control Board	Bhubneshwar			9437417913	

16	Mr	Pankaj Notani	Student	TERI University	New Delhi	34	pankaj.kavidayal@students.teriuniversity.ac.in	8376826619	
17	Dr	Pooja Kukreti	Assistant Professor	Pt. LMS Govt PG College	Rishikesh, Dehradun	43	pooja_kukreti@yahoo.co.in,	9411128449	
18	Dr	Pratap Singh	Associate Professor	Dronacharya Govt. College	Gurgaon	54	singhp61@gmail.com,	9810148929	
19	Ms	Priyanka Jhanwar	Jr Research Fellow	DRDO	Delhi	25	maheshwari.priyanka5@gmail.com,	9821202039	
20	Mr	Rajman Gupta	Student	JNU	New Delhi	23	rajmangupta61@gmail.com,	9953945748	
21	Mr	Ram Kumar Singh	Student	TERI University	Dehradun	34	singhramkumar@gmail.com	9990096437	
22	Ms	Richa Prasad	Student	TERI University	New Delhi	24	richa.prasad63@gmail.com,	9891671514	
23	Mr	Rintu Sarkar	Research Scholar	North-Eastern Hill University	Shillong	27	sarkarrintu37@gmail.com,	9851472543, 9089465195	
24	Mr	Rohit Kumar	Jr Research Fellow	DRDO	Delhi	29	rohitgeologist@gmail.com,	9709371371	
25	Ms	Sangeeta Rani	Consultant	TERI	New Delhi	24	vermasangeeta242@gmail.com	9811581193	
26	Mr	Sarath Chandran	Research Scholar	North-Eastern Hill University	Shillong	29	sarathchandran0000@gmail.com,	9089627434	
27	Mr	Satish Kumar Sharma	Research Scholar	University of Rajasthan	Jaipur	37	satish_120dhanbad@yahoo.in	9460286760, 7073095983	
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Date: 1 December 2016

27 Dr Bhawna Bali

Participant from TU

Annexure 3.6.3.B List of participants in extension and outreach programmes

List of Outreach programme funded by Govt. of India/Industry

Name of the activity	Organising unit/ agency/ collaborating agency	Year of the activity	Number of teachers participated in such activities	Number of students participated in such activities
DATA Science Applications for Sustainability	SERB-DST	2017	4	19
Livelihood training Programme - Poultry, Fisheries and Computer Literacy	COAL India	2017	3	48
Air Quality Management Workshop	CPCB	2017	3	14
Capacity Building Programme on Climate Change-Impacts and Responses	Ministry of Earth Sciences	2017	3	20
ICUG - International conference on urban geoinformatics	Map my India, DST and HUDCO	2017	50	150
Training on Geospatial Technologies under Natural Resources Data Management	DST	2016	4	25
GIS Day	TERI University	2016	4	70



Evrak Tarih ve Sayısı: 25/03/2019-8851

Annexure 3.7.1 Collaborative Activity Organized by with Turkish Higher Education Council

T.C.
FEN BİLİMLERİ ENSTİTÜSÜ MÜDÜRLÜĞÜ
Uzaktan Algılama ve Coğrafi Bilgi Sistemleri Anabilim Dalı Başkanlığı

Sayı : 86017654-604.99-8851 25/03/2019
Konu : Project exchange student

To the Department of Natural Resources- TERI School of Advances Studies

The Project with title 'Hurricane and Tornado Damage Assessment with Use of Remotely Sensed SAR and Thermal Imagery' is funded by Turkish Higher Education Council under the framework of Mevlana Exchange Program with 23.800 Turkish Liras budget. The budget covers the expenses for the travel of the project partners and the students.

Neslihan TUZTAŞ MSc. student of Remote Sensing-GIS Program from Akdeniz University- Institute of Science and Technology, is the student project member, needs to work on the project for one semester at the partner institute, TERI School of Advanced Studies under supervision of Assistant Prof. Dr. Nithiyanandam Yogeswaran. with taking the course Major project.

Yours sincerely.

Dr. Öğr. Üyesi Nusret DEMİR
Öğretim Üyesi

*Approved project proposal is attached.
*Under the project conditions, the approved student, Duygugül AKSU is excluded from the project, because of her low grades.

Evrakı Doğrulamak İçin : https://ebys.akdeniz.edu.tr/enVision/Validate_Doc.aspx?V=BENN6K1HT

Adres:Fen Bilimleri Enstitüsü Dumlupınar Bulv Enstitüler Binası A Blok 3. Kat Kampüs ANTALYA
Telefon:0 242 310 21 45 İç hat 21 45 Faks0 242 227 23 70
e-Posta:fenbilimleri@akdeniz.edu.tr Elektronik Ağ:http://fenbilimleri.akdeniz.edu.tr - Pin Kodu:17512

Bilgi için: Nusret DEMİR
Unvanı: Öğretim Üyesi
Tel No: 3826

HURRICANE AND TORNADO DAMAGE ASSESMENT WITH USE OF REMOTELY SENSED SAR AND THERMAL IMAGERY

Duration 300 days
Start 01.10.2108
End 01.07.2019
Budget : 23.800 **TL**

1.PROJECT AIMS AND TIME PLAN

Storms and tornados occurs without human control, and cause large-scale loss of life and property. They will be on a very short time line and will not be stopped by people after they occur. For this reason, speed is an important factor in determining the damages that occur.

Some researchers used radar imaging and performed flood analysis according to the reflection analysis (Ayala-Silva and Twumasi, 2004; Aosier et al., 2007; Wang et al., 2007; Wang et al., 2014) (Richards et al., 1987, Fransson et al., 2002, Ermert et al., 2012, Eriksson et al., 2012, Gokaraju and Turlapaty, 2015).

In this regard, radar satellites are advantageous because they can capture data in all weather conditions. Because natural weather like storms, hurricanes, hoses etc are mostly cloudy, the use of radar images will be a great advantage. In addition, thermal images will be used for damage detection when the weather is clear, and compliance with the radar results will be tested.

Within the scope of the project, Antalya Kumlucu and India Channai regions were selected. On November 13, 2017, a hurricane came to the waterfall in Kumluca and caused massive damage especially in agricultural areas with many greenhouses. Within the scope of the project, two radar images belonging to the same satellite were used from one period before the disaster and the other after the disaster. Demir et al. (2018) tested the potential of SENTINEL 1A images with back scatter analysis. In this project, the fuzzy logic method will be developed and the analysis of the damage areas will be realized by using the multiband images obtained at different dates belonging to the same region, parameter independent.

The other test site is the Chennai region, which experienced a major flood disaster between November and December 2015. The methods developed for the sander will be applied to the Chennai region in the same way.

The steps for processing the radar images are given below. The method is based on pattern recognition. Areas affected by the disaster will be realized by the following process steps for defining patterns from images.

1- Pre-processing of radar images

2-Determination of land use classes without parameters by classifying uncontrolled classification of thermal images (ISODATA or K-Means)

3-Classification of radar images with use of learned classes as learning areas in radar view. Here, it is planned to use the fuzzy logic method proposed by Demir et al. (2016) as a method.

4- Detection of affected areas through different classification results. The difference between the relevant classes will be imaged and the affected areas will be found. Regarding the re-use of radar images, the degree of influence of the regions concerned can also be determined.

5-Creating a thematic analytical map with the creation of the map of the affected areas

The project will be carried out according to the following business plan. The project is scheduled to start in October 2018 and finish in June 2019.

Work Package 1 - Data acquisition October-November 2018

Work Package 2 -Radar images pre-processing November-December 2018

Work Package 3- Processing of thermal images November 2018-March 2019

Work Package 4 - Processing of radar images January 2019 - April 2019

Work Package 5- Creation of maps of the damaged areas April 2019 June 2019

Work Package 6- Project Management October 2018 - June 2019

2. OBJECTIVES FOR BILETERAL COLLABORATION AND REASON FOR SELECTING THE PARTNER

Monitoring natural disasters such as hurricanes, storms and floods that cause great damage will be quick, accurate and precise detection of damages. This is very important for decision makers such as municipalities, governorships. In reorganising damaged urban areas, important data will also be provided to decision-makers.

With the analysis of the damaged agricultural areas, it will be useful in determining the risk situation in the agricultural potential of the region.

With the study, after the launch of the Göktürk-3, which is the design radar of our compatriot Göktürk-3, will be able to be used completely for the detection of disaster damage with domestic resources.

significant outcomes of the joint research on the prevention of disasters in India and Turkey will provide.

Because fully open source tools and data are used, the work will be reproducible and economical for each similar disaster situation without the need for any commercial writing.

It is also aimed to share the work with the world scientific community by presenting the study of scientific events that deal with pattern recognition in disaster management.

There are all hardware and software possibilities for research in this field in the field of Remote Sensing and Remote Sensing Research Application Center of Remote Sensing and Science Institute of the Department of Space Science and Technology of Akdeniz University. The Indian side is expert in the processing of thermal images to be used to train radar images. Thus, the two sides will gain knowledge and experience in a different area. The Turkish side will gain experience on thermal images, while the

Indian side will gain knowledge and experience on radar. With joint efforts, a model will be developped to be used for disaster management in Turkey and India.

3. EXPECTED OUTCOMES

The project will have several outcomes, both scientifically and economically. It is foreseen that the detection of disaster areas damaged by satellite images as scientific output since the method will be parameter independent.

As an economic benefit, the developed method can then be used without cost with use of open source tools. When national SAR satellite Gokturk-3 starts to operate, the method can also applied to on its data. That is beneficial for Turkish economy.

Another economic benefit would be to help decision makers such as municipalities, governors and governments to make decisions correctly, since disaster areas are needed to be monitored quickly, and preciese information are needed to minimize the damage to agriculture, urban planning and subsequent disasters.

4. PROJECT TEAM

PI: Dr.Nusret DEMIR

Co-PI: Dr. Nithiyanandam YOGESWARAN

Students :

Duygugül AKSU (1 Semester exchange) (SAR Image processing)

Pujasree MAHANTA (1 Semester exchange) (Thermal Image processing)

Jyoti RATHOUR (1 Semester exchange) (Algorithm development and coding)

5.REFERENCES :

Aosier, B., Kaneko, M., Takada, M. (2007): Evaluation of the forest damage by typhoon using remote sensing technique. In: IEEE International Geoscience and Remote Sensing Symposium (IGARSS), pp. 3022-3026.
Ayala-Silva, T., Twumasi, Y. A., 2004. Hurricane Georges and vegetation change in Puerto Rico using AVHRR satellite data. International Journal of Remote Sensing, 25(9), pp. 1629-1640.

Chehata, N., Orny, C., Boukir, S., Guyon, D., Wigneron, J. P., 2014. Object-based change detection in wind storm-damaged forest using high-resolution multispectral images. International journal of remote sensing, 35(13), pp. 4758-4777.

Demir N., Kaynarca M. , Oy S., "Extraction Of Coastlines With Fuzzy Approach Using Sentinel-1 SAR Image ", ISPRS 23.CONGRESS, Prag, CEK CUM., 11-19 Temmuz 2016

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Ermert, J., Dees, M., Koch, B., 2012. Mapping of forest damages caused by a tornado 2012 in Gera, Germany using TERRASAR-X change detection.

Eriksson, L. E., Fransson, J. E., Soja, M. J., & Santoro, M., 2012. Backscatter signatures of wind-thrown forest in satellite SAR images. In: IEEE International Geoscience and Remote Sensing Symposium (IGARSS), pp. 6435-6438.

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Wang, W., Qu, J. J., Hao, X., Liu, Y., Stanturf, J. A., 2010. Post-hurricane forest damage assessment using satellite remote sensing. Agricultural and Forest Meteorology, 150(1), pp. 122-132.

Annexure 3.7.2 Details of linkages with institutions/industries for internship

Form 2
Joining Report

Dear Vidhya Sharma ,

This is to confirm that Aakanksha (Name of student), enrolled in MSc Geoinformatics (stream), at TERI University, has joined ESRI India (organization name), in Noida (name of city) on 22/01/2018 (date) for completion of his/her Major Project.

She/he is expected to stay with our organization until 22/07/2018 (Date).

Regards,

Vishal Garg
Name of thesupervisor



Form 2
Joining Report

Dear Ms. Vidhya Sharma~~Dr~~,

This is to confirm that ~~,~~ Abhinav Chandel ~~(Name of student)~~, enrolled in MSc. ~~(~~Geoinformatics ~~(stream)~~, at TERI University, has joined ~~,~~ Indian Institute of Remote Sensing ~~(organization name)~~, in Dehradun ~~(name of city)~~ on 8 January 2018 ~~(date)~~ for completion of his~~/her~~ Major Project.

H~~She/he~~ is expected to stay with our organization until 15 June 2018. ~~(Date).~~

Regards,

Dr. Shefali Agrawal

-

-

~~Name of the supervisor~~

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arun cm <arun.cm@students.teriuniversity.ac.in>

Request for Major Project

Sonika Goyal <sonika.goyal@teriuniversity.ac.in> Thu, Dec 21, 2017 at 7:13 PM
To: Nithiyanandam Yogeswaran <nithiyanandam.y@teriuniversity.ac.in>, "Dr. Neeti" <neeti@teriuniversity.ac.in>
Cc: arun cm <arun.cm@students.teriuniversity.ac.in>

Fyi

From: chowdary vemuri <chowdary_isro@yahoo.com>
Sent: Thursday, December 21, 2017 5:08:35 PM
To: Sonika Goyal
Subject: Re: Request for Major Project

To
Sonika Goyal
Manager
Placements & External Relations
TERI SAS

From
Dr.V.M.Chowdary
Sci/Eng 'SG'
RRSC(N)
NRSC,ISRO
New Delhi,
+9434754217

Thanks for your interest and shall be happy to guide **Arun Murali for his major project.**

Regards
V.M.Chowdary

On Friday, 15 December 2017 9:06 AM, Sonika Goyal <sonika.goyal@teriuniversity.ac.in> wrote:

To
Dr. Chowdary
Senior Scientist
Regional Remote Sensing Centre
Department of Space
New Delhi

Dear Sir,

It is my pleasure to introduce TERI School of Advanced Studies as a leading academic institute imparting high quality education in the fields of Engineering, Science, Management and Policies.

TERI SAS's strength lies in its unique and exciting research and education programs directed towards enabling and fostering sustainable development. Each program is multidisciplinary, focusing on students gaining knowledge across a wide spectrum of subjects with emphasis on developing innovative solutions.

TERI SAS offers an M.Sc. (Geoinformatics) program. As an essential component of curriculum, the students are required to work for their major project for about 4-6 months. Students are expected to submit a dissertation at the end of the internship and make a presentation, both of which are evaluated by a panel of faculty members and an external expert.

Arun Murali C.M, one of our students of M.Sc (Geoinformatics) of 2016-18 batches, is keen to work with your organization for his Major Project starting from January 2018. We would like him to be assigned a supervisor and a specific research problem for the project.

I will request you to kindly allow him for the same.

Looking for your confirmation.

With Warm Regards
Sonika Goyal
Manager
Placements & External Relations
TERI SAS

भारत सरकार
अंतरिक्ष विभाग
भारतीय सुदूर संवेदन संस्थान
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फैक्स : +91-135-2741987, 2748041

सत्यमेव जयते

Government of India
Department of Space
Indian Institute of Remote Sensing
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Dehradun - 248 001, India
Telephone : +91-135-2524399
Fax : +91-135-2741987, 2748041

No. IIRS/PPEG/External Training/2017

Dated: October 13, 2017

Dr. Nithiyanandam Y
TERI University
10 Industrial Area
Vasant Kunj
New Delhi- 110070

Dear Sir / Ma'am,

Please refer your letter No. dated 11.10.2017 regarding Internship of student from TERI University at IIRS. I am happy to confirm that **Ms.Khushboo Jain, M.Sc student** will be allowed for doing project/dissertation work at IIRS, Dehradun for the period from January 2018 – May 2018 subject to the execution of a Letter of Agreement (LoA) between your institute and IIRS. Copy of the LoA can be downloaded from our website- *www.iirs.gov.in.* The student is advised to contact concerned faculty at IIRS for finalization of topic of project/dissertation. This is merely a letter of confirmation of attachment. It should not be treated as a certificate of completion of project work.

She should report at 0900 hours on all working days and maintain proper office decorum. Any unruly behavior and/or absence without prior permission will lead to automatic cancellation of attachment with no obligation/liability on the part of this Institute. Please note that no accommodation shall be provided to the student in IIRS Hostel. **The candidate should also bring the filled-up and verified registration form (enclosed) along with them.** The student has to submit two copies of passport size photographs at the time of reporting. She should carry her valid ID card for entry into IIRS.

Thanking you,

Yours sincerely,

13/10/17

(Vandhana K.V)
Administrative Officer (A)
Programme Planning & Evaluation Group

Copy to:

1. Mr. Justin George K, Scl./Engr.-SC, ASD (Guide)
2. Head, ASD /GH, PPEG
3. Security
4. Library

Scanned by CamScanner

On 19-Dec-2017 12:51 PM, "Somendra Sharma" <somendra.waterharvest@gmail.com> wrote:

Dear Momisha,

Greetings from WaterHarvest (Earlier known as Wells for India).

In reference to your previous email communications with Shri OP Sharma Ji, I am sharing here the draft note about the research which you will be doing with WaterHarvest as part of your final semester project work.

Kindly do provide your feedback and do let us know the time-frame of the proposed work plan.

All the best,

Somendra

Form 2
Joining Report

Dear Ms. Vidhya Sharma,

This is to confirm that Puneeta Pokhriyal, enrolled in MSc Geoinformatics, at TERI University, has joined Teri SAS, in New Delhi on 08/01/2018 for completion of her Major Project. Dr. Florencia Sangermano, Assistant Professor of Geography, Clark University, USA is her external supervisor.

She/he is expected to stay with our organization until end of semester_____ (Date).

Regards,

Dr. Neeti



Web www.teriin.org

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E-mail mailbox@teri.res.in
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Regional centres within India

North-Eastern Regional Centre
Guwahati
Tel. (361) 233 4790
E-mail terine@teri.res.in
Fax (361) 233 4869

Southern Regional Centre
Bangalore
Tel. (80) 2535 6590 (5 lines)
E-mail terisrc@teri.res.in
Fax (80) 2535 6589

Goa
Tel. (832) 245 9306 or 245 9328
E-mail terisrc@teri.res.in
Fax (832) 245 9338

Western Regional Centre
Mumbai
Tel. (22) 2758 0021 or 4024 1615
E-mail terimumbai@teri.res.in
Fax (22) 2758 0022

Himalayan Centre
Mukteshwar
Tel. (5942) 286 433
E-mail praveen.sharma@teri.res.in
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E-mail teri@iges.or.jp
Fax +81 33 5195 1084

Prasoon Singh
Associate Fellow

January 22, 2018

Joining Report

To whom it may concern

This is to confirm that **Ms Rajdeep Kaur**, enrolled in M.Sc. Geoinformatics, at TERI School of Advanced Studies, has joined The Energy and Resources Institute, New Delhi on 18-01-2018 for completion of her Major Project.

She is expected to stay with our organization until 20-05-2018.

Regards,

(Prasoon Singh)

An ISO 9001:2008 certified organization

Tutorial 6
Advances in GIS and Current Trends
Submitted by Rituparna Das

1.Determine the range of the following.

- **Integer**
- **Varchar**
- **Double precision**
- **Float**

Integer

Integer, Storage size -2 bytes, value range -32768 to 32767

Storage size - 4 bytes, value range -2147483648 to -2147483647

Unsigned integer, storage size- 2 bytes, value range 0 to 65535

Storage size - 4 bytes, value range 0 to 4294967295

Varchar

Values in VARCHAR columns are variable-length strings. The length can be specified as a value from 0 to 65,535.

Double precision

Double-precision floating-point format is a computer number format that occupies 8 bytes (64 bits) in computer memory and represents a wide, dynamic range of values by using a floating point.

Float

Floating precision number data from -1.79E + 308 to 1.79E + 308.

2. **Determine the maximum number of records that can be stored in a.**

- **Shapefile**
- **Personal Geodatabase**

- **File Geodatabase**

Shapefile

The maximum record length for an attribute is 4,000 bytes.

The maximum number of fields is 255. A conversion to shapefile will convert the first 255 fields if this limit is exceeded.

Personal Geodatbase

Personal Geodatabase can rerecord 2 GB per Access database.

Effective limit before performance degrades is typically between 250 and 500 MB per Access database file.

File Geodatabase

File geodatabase can record 1 TB for each dataset. Each file geodatabase can hold many datasets.

Each feature class can scale up to hundreds of millions of vector features per dataset.

3 **Determine the geometry of GIS data types in.**

- **PostgreSQL**

Name	Storage Size	Description	Representation
point	16 bytes	Point on a plane	(x,y)
line	32 bytes	Infinite line	{A,B,C}
lseg	32 bytes	Finite line segment	((x1,y1),(x2,y2))
box	32 bytes	Rectangular box	((x1,y1),(x2,y2))
path	16+16n bytes	Closed path (similar to polygon)	((x1,y1),...)
path	16+16n bytes	Open path	[(x1,y1),...]
polygon	40+16n bytes	Polygon (similar to closed path)	((x1,y1),...)
circle	24 bytes	Circle	<(x,y),r> (center point and radius)

Points. Points are the fundamental two-dimensional building block for geometric types.

Lines. Lines are represented by the linear equation $Ax + By + C = 0$, where A and B are not both zero.

Line Segments. Line segments are represented by pairs of points that are the endpoints of the segment.

Boxes. Boxes are represented by pairs of points that are opposite corners of the box.

Paths. Paths are represented by lists of connected points. Paths can be open, where the first and last points in the list are considered not connected, or closed, where the first and last points are considered connected.

Polygons. Polygons are represented by lists of points (the vertexes of the polygon). Polygons are very similar to closed paths, but are stored differently and have their own set of support routines.

Circles. Circles are represented by a center point and radius.

- When a connection between Arcsde and postgres is established.

To connect to a database or a geodatabase in PostgreSQL from ArcGIS for Desktop, place the PostgreSQL client files in the Desktop bin folder and create a database connection from the Catalog tree.PostgreSQL client files are included with ArcGIS for Desktop. You need to configure the database to accept connections, and create a database connection from the Catalog tree to connect to PostgreSQL from ArcGIS for Desktop.Alter the PostgreSQL pg_hba.conf file on the database server to accept connections from the ArcGIS client machines. To connect from ArcGIS for Server, register the database with ArcGIS Server.

4. **Mention the databases supported by postgreSQL. Also determine the functionalities provided by postgreSQL.**

Name	Aliases	Description
bigint	int8	signed eight-byte integer
bigserial	serial8	autoincrementing eight-byte integer
bit [(*n*)]		fixed-length bit string
bit varying [(*n*)]	varbit	variable-length bit string
boolean	bool	logical Boolean (true/false)
box		rectangular box on a plane
bytea		binary data ("byte array")
character [(*n*)]	char [(*n*)]	fixed-length character string
character varying [(*n*)]	varchar [(*n*)]	variable-length character string
cidr		IPv4 or IPv6 network address
circle		circle on a plane
date		calendar date (year, month, day)

double precision	float8	double precision floating-point number (8 bytes)
inet		IPv4 or IPv6 host address
integer	int, int4	signed four-byte integer
interval [*fields*] [(*p*)]		time span
json		JSON data
line		infinite line on a plane
lseg		line segment on a plane
macaddr		MAC (Media Access Control) address
money		currency amount
numeric [(*p*, *s*)]	decimal [(*p*, *s*)]	exact numeric of selectable precision
path		geometric path on a plane
point		geometric point on a plane
polygon		closed geometric path on a plane
real	float4	single precision floating-point number (4 bytes)
smallint	int2	signed two-byte integer
smallserial	serial2	autoincrementing two-byte integer
serial	serial4	autoincrementing four-byte integer
text		variable-length character string
time [(*p*)] [without time zone]		time of day (no time zone)
time [(*p*)] with time zone	timetz	time of day, including time zone
timestamp [(*p*)] [without time zone]	date and time (no time zone)	
timestamp [(*p*)] with time zone	timestamptz	date and time, including time zone
tsquery		text search query
tsvector		text search document
txid_snapshot		user-level transaction ID snapshot

uuid	universally unique identifier
xml	XML data

5. **Differentiate between.**

- **Melog v/s Kellogg**

Malloc	Calloc
The name malloc stands for *memory allocation.*	The name calloc stands for *contiguous allocation.*
Void *malloc(size_t n) returns a pointer to n bytes of uninitialized storage, or NULL if the request cannot be satisfied. If the space assigned by malloc() is overrun, the results are undefined.	Void *calloc(size_t n, size_t size)returns a pointer to enough free space for an array of n objects of the specified size, or NULL if the request cannot be satisfied. The storage is initialized to zero.
Malloc() takes one argument that is, *number of bytes.*	Calloc() take two arguments those are, *number of blocks* and *size of each block.*
Syntax of malloc(). Void *malloc(size_t n); Allocates n bytes of memory. If the allocation succeeds, a void pointer to the allocated memory is returned. Otherwise null is returned.	Syntax of calloc(). Void *calloc(size_t n, size_t size); Allocates a contiguous block of memory large enough to hold n elements of sizebytes each. The allocated region is initialized to zero.
Malloc is faster than calloc.	Calloc takes little longer than mallocbecause of the extra step of initializing the allocated memory by zero. However, in practice the difference in speed is very tiny and not recognizable.

- **Blob v/s Clob**

BLOB. Variable-length binary large object string that can be up to 2GB (2,147,483,647) long. Primarily intended to hold non-traditional data, such as voice or mixed media. BLOB strings are not associated with a character set, as with FOR BIT DATA strings.

CLOB. Variable-length character large object string that can be up to 2GB (2,147,483,647) long. A CLOB can store single-byte character strings or multibyte, character-based data. A CLOB is considered a character string.

Form 2
Joining Report

Dear Ms Vidhya Sharma ,

This is to confirm that _____Sabnam Kalita_____(Name of student), enrolled in MSc__Geoinformatics_____(stream), at TERI University, has joined _____Asian Institute of Technology_____ (organization name), in _____Pathum Thani, Thailand_____ (name of city) on __15/01/2018_____ (date) for completion of his/her Major Project.

She/he is expected to stay with our organization until __10/05/2018_____ (Date).

Regards,

Dr. Kavinda Gunasekara

Name of the supervisor



AIT
Asian Institute of Technology

Government Relations Unit

Postal Address:
P.O. Box 4
Klong Luang
Pathumthani 12120
Thailand

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http://www.ait.ac.th

ที่ สทอ. 3056/2560

สถาบันเทคโนโลยีแห่งเอเชีย

8 ธันวาคม 2560

เรื่อง ขอรับการตรวจลงตราหนังสือเดินทาง
เรียน อธิบดี กรมการกงสุลฯ
สิ่งที่ส่งมาด้วย 1) รายชื่อเจ้าหน้าที่สัญชาติอินเดีย
2) สำเนาหนังสือเดินทาง

ด้วยสถาบันเทคโนโลยีแห่งเอเชีย มีความประสงค์ขอรับการตรวจลงตราหนังสือเดินทางให้กับ MISS SALONI RANKA บุคคลสัญชาติอินเดีย ถือหนังสือเดินทางหมายเลข Z 3776633 ซึ่งจะเดินทางเข้าราชอาณาจักรไทยเพื่อดำรงตำแหน่งเป็นเจ้าหน้าที่ประจำศูนย์ภูมิสารสนเทศของสถาบันฯ

MISS SALONI RANKA มีกำหนดจะเดินทางเข้าราชอาณาจักรไทยเพื่อการปฏิบัติหน้าที่ดังกล่าวประมาณวันที่ 25 ธันวาคม 2560 หรือในทันทีที่ได้รับการตรวจลงตราหนังสือเดินทาง

จึงเรียนมาเพื่อโปรดพิจารณาและอนุมัติการตรวจลงตราหนังสือเดินทางประเภท คนอยู่ชั่วคราว รหัส "F" ให้กับเจ้าหน้าที่ของสถาบันฯ ดังกล่าว และโปรดแจ้งไปยังสถานทูตไทย ณ กรุง NEW DELHI ประเทศ INDIA เพื่อดำเนินการต่อไปด้วย จักเป็นพระคุณยิ่ง

Could you please show this document
to the Royal Thai Embassy in

NEW DELHI, INDIA

with your Thai visa applications,
2 photographs, AIT Work Certificate,
and visa fee. (Non-Immigrant "F").
Thank you,

Mrs.Suda Inta/AIT Visa Officer

MoFA. No. 0303/912/2560
Date: 14 Dec. 2017

ขอแสดงความนับถือ

(นางชลิตา เลิศวิญญู)
ผู้อำนวยการฝ่ายประสานงานส่วนราชการไทย

รายชื่อเจ้าหน้าที่สัญชาติอินเดีย

NAME	DATE OF BIRTH	PASSPORT NO.	EMBASSY
1. MISS SALONI RANKA	03/01/1996	Z 3776633	NEW DELHI

ส่งพร้อมหนังสือสถาบันเทคโนโลยีแห่งเอเชีย
ที่ สทอ. 3056/2560 ลงวันที่ 8 ธ.ค. 2560



ศิริเดช เลิศวิญญ์

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Asian Institute of Technology

Human Resources Office

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(For local calls, dial 02 before the tel/fax nos.)
Tel: (66-2) 524-5018-9
E-mail: hro@ait.asia
http://www.hro.ait.ac.th

Our Ref: OHRS1230/2017

29th November 2017

Employment Certificate

The Asian Institute of Technology (AIT) hereby certifies that **Ms. Saloni Ranka** will be employed by the Institute for the period from 15 January 2018 to 16 May 2018. This incumbent's position is classified as Research Staff category in the AIT Geoinformatics Center.

Sincerely yours

Mr. Jiraphong Lumpenyoo
Interim Director
Office of Human Resources Services

Dear Ms Laxmi

Can you meet me on Friday (December 22, 2017) at 2:00 in SES/JNU! Lets discuss.

regards
Joshi, PK



vinay hudda <vinay.hudda@students.teriuniversity.ac.in>

Concept Note for dissertation

Nithiyanandam Yogeswaran <nithiyanandam.y@terisas.ac.in> Wed, Jan 31, 2018 at 2:53 PM
To: vinay hudda <vinay.hudda@students.teriuniversity.ac.in>
Cc: Sudipta Chatterjee <s.chatterjee@terisas.ac.in>, Rajiv Seth <rseth@terisas.ac.in>, "Dr. Neeti" <neeti@terisas.ac.in>

Ok.

Best wishes,
Nithi.

****

Y Nithiyanandam, PhD.,
Assistant Professor,
Placement and Lab Coordinator (Geoinformatics),
Department of Natural Resources,
TERI School of Advanced Studies,
28.544542° N, 77.148274° E

From: vinay hudda <vinay.hudda@students.teriuniversity.ac.in>
Sent: 31 January 2018 14:45:08
To: Nithiyanandam Yogeswaran
Cc: Sudipta Chatterjee; Rajiv Seth; Dr. Neeti
Subject: Re: Concept Note for dissertation

Dear sir,

I won't be joining Intergraph for my dissertation. I would be happy to work under your supervision for my dissertation at TERI - SAS.

As per our discussion, the topic for the project would be "Remote Sensing Data Fusion Techniques".

I look forward to working with you.

Regards,
Vinay Hudda.

On Wed, Jan 31, 2018 at 10:20 AM, Nithiyanandam Yogeswaran <nithiyanandam.y@terisas.ac.in> wrote:

> Hello Vinay,
>
> 1. Till yesterday I was under the impression that you are working with Intergraph India (based on your previous email) after deserting map my India for the major project. It is disheartening that you haven't joined Intergraph too for some reason.
>
> 2. Many thanks for responding my request by sharing a concept note on your proposed research. After reading it thoroughly, I felt your idea is good however I may not be able to guide you on this topic since it is different from my area of interest and expertise. Kindly speak to any other faculty who may have expertise in this area.
>
> Best wishes,

Nithi.

From: Vinay hudda [mailto:vinay.hudda@students.teriuniversity.ac.in]
Sent: Tuesday, January 30, 2018 4:45 PM
To: Nithiyanandam Yogeswaran <nithiyanandam.y@terisas.ac.in>
Subject: Concept Note for dissertation

Dear Sir,

I want to do my dissertation at TERI - SAS. I would like to work on WebGIS and would like you to guide me for the major project as an internal supervisor.

I am attaching the concept note for the dissertation along with this mail.

Regards,

Vinay Hudda.

1661 MNG



Major Project

Dr. Neeti

Wed 1/2/2019 10:09

To: Nithiyanandam Yogeswaran <nithiyanandam.y@terisas.ac.in>;

Cc: Sukanya Das <sukanya.das@terisas.ac.in>; Sonika Goyal <sonika.goyal@terisas.ac.in>; Amrutha Manoj <Amrutha.Manoj@terisas.ac.in>; Jyoti Rathour <Jyoti.Rathour@terisas.ac.in>;

Dear Dr. Nithiyanandam

I would like to confirm that Ms. Jyoti and Ms. Amrutha will be doing their major project here in campus. Dr. Sukanya and I will be co-supervising both the students.

Best regards
Neeti

Gmail

Gourav Panchal <gouravpanchal417@gmail.com>

Joining letter

1 message

Arjun B M <arjunkanyana@gmail.com> Fri, Jan 11, 2019 at 2:14 PM
To: gouravpanchal417@gmail.com, Gourav.Panchal@terisas.ac.in

TO WHOM SO EVER CONCERNED

Mr. Gourav Panchal (M.Sc GeoInformatics, TERI) has joined NESAC on 10th January 2019.

His tentative thesis topic is "Study on Urban Flooding for Guwahati"

Regards

--

Dr. Arjun B M
Scientist/Engineer - 'SD'
North Eastern Space Applications Centre (NE-SAC)
Department of Space, Government of India
Umiam, Shillong, Meghalaya - 793103

Phone: 0364 - 2308728, 07275371540
Alternate Email: arjunb.m@nesac.gov.in

Major Project

Dr. Neeti

Wed 11/5/2019 11:49

To: Nithiyanandam Yogeswaran <nithiyanandam.y@terisas.ac.in>;

Cc: Sukanya Das <sukanya.das@terisas.ac.in>; Sonika Goyal <sonika.goyal@terisas.ac.in>; Amrutha Manoj <Amrutha.Manoj@terisas.ac.in>; Jyoti Rathour <Jyoti.Rathour@terisas.ac.in>

Dear Dr. Nithiyanandam

I would like to confirm that Ms. Jyoti and Ms. Amrutha will be doing their major project here in campus. Dr. Sukanya and I will be co-supervising both the students.

Best regards
Neeti

WWF-India Secretariat
Panjana Gadhaj National
Conservation Centre
172-B, Lodi Estate
New Delhi 110 003
India

Tel: +011-41504814/5
Fax: +011-41504779
+011-24691328
www.wwfindia.org

118/PS/HR/IGUMC/HRD/2018
13.12.2018

Mr. Odhisey Sahoo
Gadaghat Chandanati, Ward No. 11
Assam 783637

Dear Mr. Sahoo,

This is with reference to your application for Internship with WWF-India. We are happy to offer you an Intern position with the WWF-India's IGUMC from 8th **January, 2019** to 7th **July, 2019**, with no right or claim for regular appointment in the organization after the expiry of the above period.

1. You shall not be paid any stipend, for the above duration of your internship, and you are responsible for your own travel, boarding and lodging and other miscellaneous expenses incurred during your internship period at the location of internship.

2. You will not be entitled to any other benefits such as leave, contributory provident fund, gratuity and insurances etc. as admissible to regular employees of WWF-India.

3. Your duties, responsibilities, and working hours will be fixed by the **Director-IGUMC** and you will report to him for directions for internship.

4. Your headquarters will be **WWF-India Secretariat, New Delhi.**

5. Broad Terms of Reference of your assignment are enclosed as Annexure.

6. You shall not divulge any of the confidential or propriety affairs of the Organization to any other Organization, person or persons either during or after your assignment with WWF-India, without authorization / directions by an outsider or person not concerned with the matter, strict action, which may include termination of services, will be taken.

7. It shall be your responsibility to coordinate with your mentor to sign the relevant declaration pertaining to the WWF-India Fraud & Corruption Prevention Policy, to be kept as records of the duration with which shall be are doing the internship.

8. If required, your assignment can be terminated without any advance notice in lieu thereof.

9. Notwithstanding any of the foregoing clauses, WWF-India reserves the right to terminate this assignment at any stage, without assigning any reasons whatsoever.

If the above offer of internship, on the terms and conditions stipulated is acceptable to you, please signify your acceptance by signing the duplicate copy of this letter and return the same to us.

The WWF-India Management extends to you a warm welcome to the organization.

Yours faithfully,
For **World Wide Fund for Nature – India**

Ritika Agrawal
Director-HR & Manpower Development

Annexure

TERMS OF REFERENCE

1. The intern would be working on the project as assigned by the Director-IGCMC.
2. He/She would help in designing database and applying the GIS techniques in the concerned project of IGCMC.
3. The intern would submit their two copies of the project report on completion.
4. Only application of GIS and Remote Sensing software is permitted for use during work.
5. No transfer of data through floppy, USB would be entertained.
6. All interns will be assigned a scheduled task under IGCMC along with their individual training project, which would be considered as their contribution towards organization.
7. Punctuality in time should be strictly maintained.
8. Have to inform the Director-IGCMC in case of taking leave form duty.
9. Report writing of the project needs to be completed during the assigned tenure of involvement under the supervision of the Head of the Division.
10. The facilities provided by the division and organization are to be acknowledged by the intern in their Project report.
11. Maintaining the office decorum should also remain a priority.

Ritika Agrawal
Director-HR & Manpower Development

Joining of Pujashree and Upangna

Chander Kumar Singh

Fri 11/01/2019 15:44

To: Nithiyanandam Yogeswaran <nithiyanandam.y@terisas.ac.in>;

Cc: Upangana Goswami <Upangana.Goswami@terisas.ac.in>; Pujasree Mahanta <Pujasree.Mahanta@terisas.ac.in>;

Dear Nithiya,
Pujashree and Upangana will be doing there major project with me. This is to confirm that they have joined with me.

RE: Changing external supervisor's name

Sukanya Das

Wed 1/16/2019 12:05 PM

To:Amrutha Manoj <Amrutha.Manoj@terisas.ac.in>; Vishal Kumar <vishal.kumar@terisas.ac.in>;

Cc:Dr. Neeti <neeti@terisas.ac.in>;

Dear Vishal,

Kindly note I am external supervisor for Amrutha.

Regards

Sukanya

From: Amrutha Manoj <Amrutha.Manoj@terisas.ac.in>
Sent: 16 January 2019 11:58
To: Sukanya Das <sukanya.das@terisas.ac.in>
Cc: Dr. Neeti <neeti@terisas.ac.in>
Subject: Changing external supervisor's name

Respected Ma'am

I had gone to Vishal sir again to get the supervisor's name changed. He has asked me for a letter/mail from you saying you will be my external supervisor, he said else Shobit sir will not change the name in the portal.

Sincerely
Amrutha

Reply all | Delete Junk | •••

Re: Major project

NB Nitika Bhakuni <nitika@cept.ac.in> Reply all |
Thu 1/3, 1:03 PM
Shiv Shyam; Nithiyanandam Yogeswaran

Inbox

Dear Shiv,
Thank you for your email. I will be away from office on the 5th January and would like you to please join from the 7th January, 2019 10 am at Centre of Excellence in Urban Transport, NILPA Building, near Boys hostel University Ground, CEPT University. Our office phone number is 7265800070 in case you have in issues finding the place.

Regards,
Nitika

On Thu, Jan 3, 2019 at 12:52 PM Shiv Shyam <shiv.shyam@terisas.ac.in> wrote:

> Ma'm,
> With due respect, I want to say that I would be reaching Ahmedabad on 5th of January 2019 and would like to join and start my major project on the same date only.
>
> Sincerely Yours,
> Shiv Shyam,
> Geoinformatics (2017-19)
> TERI School of Advanced Studies, New Delhi
>
> Get Outlook for Android

--
Nitika Bhakuni, PhD

Associate Professor, (Centre of Excellence in Urban Transport)

Faculty of Planning,
CEPT University,
Ahmedabad 300009

Disclaimer : The information transmitted with this email is intended only for the person or entity to which it is addressed and may contain confidential and/or privileged material. Any review, re-transmission, dissemination or other use of this information by persons or entities other than the intended recipient is prohibited. If you received this in error, please contact the sender and delete the material from any computer.

Reply all | Delete Junk | ...



भारतीय सुदूर संवेदन संस्थान
4, कालीदास मार्ग, पी.बी.सं. 135
देहरादून- 248001, भारत
दूरभाष: +91-135-2524399
फैक्स: +91-135-2741987, 2748041

सत्यमेव जयते

Government of India
Department of Space
Indian Institute of Remote Sensing
4, Kalidas Road, P.B. No. 135
Dehradun - 248 001, India
Telephone : +91-135- 2524399
Fax : +91-135- 2741987, 2748041

No. IIRS/PPEG/External Training/2018

Dated: December 04, 2018

Dr. Nithiyanandam Y
TERI University
10 Industrial Area
Vasant Kunj
New Delhi- 110070

Dear Sir,

Please refer your letter No.Nil dated 21.11.2018 regarding internship of a student from TERI University at IIRS. I am happy to confirm that **Ms. Shivani Pathak** will be allowed for doing project/dissertation work at IIRS, Dehradun for the period from January 2019 – May 2019 subject to the execution of a Letter of Agreement (LoA) between your institute and IIRS. Copy of the LoA can be downloaded from our website- ***www.iirs.gov.in***. The student is advised to contact concerned faculty at IIRS for finalization of topic of project/dissertation. This is merely a letter of confirmation of attachment. It should not be treated as a certificate of completion of project work.

She should report at 0900 hours on all working days and maintain proper office decorum. Any unruly behavior and/or absence without prior permission will lead to automatic cancellation of attachment with no obligation/liability on the part of this Institute. Please note that no accommodation shall be provided to the students in IIRS Hostel. **The student should also bring the filled-up and verified registration form (enclosed) & original LoA along with her**. The student has to submit two copies of passport size photographs at the time of reporting. She should carry her valid ID card for entry into IIRS

Thanking you,

Yours sincerely,

Ugale

(Ugale Keshav)
Administrative Officer (A)
Programme Planning & Evaluation Group

Copy to:

1. Dr. Vaibhav Garg, Sci./Engr.-SE, WRD (Guide)
2. GH, WRD/GH, PPEG
3. Library
4. CISF

अंतरिक्ष विभाग
भारतीय सुदूर संवेदन संस्थान
4, कालीदास मार्ग, पो. बक्सा सं. 135
देहरादून- 248001, भारत
दूरभाष : +91- 135- 2524399
फैक्स : +91- 135- 2741987, 2748041

सत्यमेव जयते

Government of India
Department of Space
Indian Institute of Remote Sensing
4, Kalidas Road, P.B. No. 135
Dehradun - 248 001, India
Telephone : +91-135- 2524399
Fax : +91-135-2741987, 2748041

सं° भा°सु°सं°सं°/का°नि°मू°स°/ बाह्य प्रशिक्षण/2018

दिनांक: दिसंबर 04, 2018

सेवा में,

डॉ. निधनानंदम वाई
टेरी विश्वविद्यालय
10 औद्योगिक क्षेत्र
वसंत कुंज नई दिल्ली - 110070

प्रिय महोदय,

भारतीय सुदूर संवेदन संस्थान में टेरी विश्वविद्यालय के विद्यार्थियो की प्रशिक्षुता के प्रसंग में कृपया आपके पत्र सं. दिनांक नवंबर 21, 2018 का संदर्भ ग्रहण करें। आपको इस बात की पुष्टि करते हुए हमे हर्ष हो रहा है कि सुश्री शिवानी पाठक को इस संस्थान में जनवरी 2019 से मई 2019 की अवधि के दौरान परियोजना/शोध-निबंध कार्य हेतु अनुमति प्रदान की जाती है। उक्त अनुमति आपके विश्वविद्यालय व इस संस्थान के बीच करार-पत्र के निष्पादन के अधीन होगी। उक्त करार-पत्र हमारी वैबसाइट www.iirs.gov.in से डाउनलोड किया जा सकता है। परियोजना/शोध-निबंध कार्य के विषय के निश्चयन हेतु विद्यार्थी से यह अपेक्षित है कि वह संस्थान में रिपोर्ट करने के उपरांत संबन्धित विभागाध्यक्ष से संपर्क करे। यह पत्र परियोजना/शोध-निबंध कार्य हेतु उक्त विद्यार्थियों को संस्थान से केवल संलग्न करने की पुष्टि करता है। अतः इसे परियोजना/शोध-निबंध कार्य का समापन प्रमाण-पत्र नहीं समझा जाना चाहिए।

उक्त विद्यार्थी को प्रत्येक कार्य दिवस पर सुबह 0900 बजे संस्थान में रिपोर्ट करना होगा तथा उपयुक्त कार्यालयीन शिष्टता/मर्यादा का अनुपालन व निर्वहन करना होगा। किसी भी प्रकार के उच्छृंखल व्यवहार तथा/अथवा बिना पूर्वानुमति के अनुपस्थिति के फलस्वरूप उक्त संलग्नता स्वतः ही रद्द हो जाएगी, जिसका इस संस्थान पर किसी भी प्रकार का आबंध/दायित्व नहीं होगा। कृपया नोट करें कि, विद्यार्थी को संस्थान के छात्रावास में आवास उपलब्ध नहीं कराया जाएगा। विद्यार्थी को अपने साथ विधिवत भरा हुआ तथा सत्यापित पंजीकरण फार्म(संलग्न) एंव करार पत्र लाना होगा। संस्थान में रिपोर्ट करते समय विद्यार्थी को पासपोर्ट आकार की दो फोटो जमा करना आवश्यक होगा। संस्थान में प्रवेश हेतु विद्यार्थी को विधिमान्य पहचान पत्र साथ लाना होगा।

सधन्यवाद,

भवदीय,

(उगले केशव)
प्रशासनिक अधिकारी (अकादमी)
कार्यक्रम नियोजन एंव मूल्यांकन समूह

वितरण:

1. डॉ. वैभव गर्ग/ इंजीनियर-एसई, जल संसाधन विभाग, (गाइड)
2. समूहाध्यक्ष, जल संसाधन विभाग / समूहाध्यक्ष का°नि°मू°स°
3. लाइब्रेरी
4. केन्द्रीय औद्योगिक सुरक्षा बल

Gmail Sucheta Bhattacharjee <suchetabhattacharjee12@gmail.com>

Fwd: Letter of Acceptance for Project work at RRSC-east

1 message

Sucheta Bhattacharjee <Sucheta.Bhattacharjee@terisas.ac.in> Thu, Dec 6, 2018 at 7:47 AM
To: Sucheta Bhattacharjee <suchetabhattacharjee12@gmail.com>

Get Outlook for Android

From: Nithiyanandam Yogeswaran
Sent: Wednesday, December 5, 2018 4:50:41 PM
To: Sucheta Bhattacharjee
Subject: Fw: Letter of Acceptance for Project work at RRSC-east

****

Y Nithiyanandam, PhD.,
Assistant Professor,
Placement and Lab Coordinator (Geoinformatics),
Department of Natural Resources,
TERI School of Advanced Studies,
28.544542° N, 77.148274° E

From: Sonika Goyal
Sent: 03 December 2018 13:03
To: Nithiyanandam Yogeswaran; Dr. Neeti
Cc: Sudipta Chatterjee
Subject: FW: Letter of Acceptance for Project work at RRSC-east

FYI

With Warm Regards

Sonika Goyal

Manager - External Relations

TERI School of Advanced Studies

Ph: 011-71800222

www.terisas.ac.in

Environmental and Sustainability Studies - TERI School of Advanced Studies

www.terisas.ac.in

Located in Delhi, India, TERI School of Advanced Studies is dedicated to providing the most advanced education and training in Sustainable Development, Energy Studies, Biosciences, Environmental Studies, Management and Public Policy.

From: neethu chacko <neethuchacko@gmail.com>
Sent: Monday, December 03, 2018 12:53 PM
To: Sonika Goyal <sonika.goyal@terisas.ac.in>
Cc: S Bandyopadhyay <sbanerjee377@gmail.com>; Neethu Chacko <neethuchacko@gmail.com>
Subject: Reg: Letter of Acceptance for Project work at RRSC-east

Dear Ms. Goyal,

Based on merit based selection process , Ms. Sucheta Bhattacharjee has been selected to carry out project work at RRSC-East, Kolkata. She can join our institution from January 2019 onward.

Please get back to us if you have any queries.

Sincerely,

Neethu Chacko

Scientist and Member Secretary, Student Selection Committee.

RRSC East- Kolkata



भारतीय सुदूर संवेदन संस्थान
पो.बा. सं. 135
देहरादून - 248001, भारत
दूरभाष : +91-135-2524399
फैक्स : +91-135-2741987, 2748041

सत्यमेव जयते

Indian Institute of Remote Sensing
P.B. No. 135
4, Kalidas Road
Dehradun - 248 001, India
Telephone : +91-135-2524399
Fax : +91-135-2741987, 2748041

No. IIRS/PPEG/External Training/2018

Dated: December 13, 2018

Dr. Nithiyanandam Y
TERI University
10 Industrial Area
Vasant Kunj
New Delhi- 110070

Dear Sir,

Please refer your letter No.Nil dated 30.11.2018 regarding internship of a student from TERI University at IIRS. I am happy to confirm that **Ms. Shweta Kumari Shaw** will be allowed for doing project/dissertation work at IIRS, Dehradun for the period from January 03, 2019 – June 15, 2019 subject to the execution of a Letter of Agreement (LoA) between your institute and IIRS. Copy of the LoA can be downloaded from our website- *www.iirs.gov.in*. The student is advised to contact concerned faculty at IIRS for finalization of topic of project/dissertation. This is merely a letter of confirmation of attachment. It should not be treated as a certificate of completion of project work.

She should report at 0900 hours on all working days and maintain proper office decorum. Any unruly behavior and/or absence without prior permission will lead to automatic cancellation of attachment with no obligation/liability on the part of this Institute. Please note that no accommodation shall be provided to the students in IIRS Hostel. **The student should also bring the filled-up and verified registration form (enclosed) & original LoA along with her**. The student has to submit two copies of passport size photographs at the time of reporting. She should carry her valid ID card for entry into IIRS

Thanking you,

Yours sincerely,

Ugale

(Ugale Keshav)
Administrative Officer (A)
Programme Planning & Evaluation Group

Copy to:

1. Mr. Pankaj Dhote, Sci./Engr.-SD, WRD (Guide)
2. GH, WRD/GH, PPEG
3. Library
4. CISF

अंतरिक्ष विभाग
भारतीय सुदूर संवेदन संस्थान
4, कालीदास मार्ग, पी. बाक्स सं. 135
देहरादून - 248 001, भारत
दूरभाष : +91-135-2524399
फैक्स : +91-135-2741987, 2748041

सत्यमेव जयते

Government of India
Department of Space
Indian Institute of Remote Sensing
4, Kalidas Road, P.B. No. 135
Dehradun - 248 001, India
Telephone : +91-135-2524399
Fax : +91-135-2741987, 2748041

सं॰ भा॰सु॰सं॰सं॰/का॰नि॰मू॰स॰/ बाह्य प्रशिक्षण/2018 दिनांक: दिसंबर 13, 2018

सेवा में,

डॉ. निथनानंदम वाई
टेरी विश्वविद्यालय
10 औद्योगिक क्षेत्र
वसंत कुंज नई दिल्ली - 110070

प्रिय महोदय,

भारतीय सुदूर संवेदन संस्थान में टेरी विश्वविद्यालय के विद्यार्थियो की प्रशिक्षुता के प्रसंग में कृपया आपके पत्र सं. दिनांक नवंबर 30, 2018 का संदर्भ ग्रहण करें। आपको इस बात की पुष्टि करते हुए हमे हर्ष हो रहा है कि सुश्री श्वेता कुमारी शॉ को इस संस्थान में जनवरी 03, 2019 से जून 15, 2019 की अवधि के दौरान परियोजना/शोध-निबंध कार्य हेतु अनुमति प्रदान की जाती है। उक्त अनुमति आपके विश्वविद्यालय व इस संस्थान के बीच करार-पत्र के निष्पादन के अधीन होगी। उक्त करार-पत्र हमारी वैबसाइट www.iirs.gov.in से डाउनलोड किया जा सकता है। परियोजना/शोध-निबंध कार्य के विषय के निश्चयन हेतु विद्यार्थी से यह अपेक्षित है कि वह संस्थान में रिपोर्ट करने के उपरांत संबन्धित विभागाध्यक्ष से संपर्क करे। यह पत्र परियोजना/शोध-निबंध कार्य हेतु उक्त विद्यार्थियों को संस्थान से केवल संलग्न करने की पुष्टि करता है। अतः इसे परियोजना/शोध-निबंध कार्य का समापन प्रमाण-पत्र नहीं समझा जाना चाहिए।

उक्त विद्यार्थी को प्रत्येक कार्य दिवस पर सुबह 0900 बजे संस्थान में रिपोर्ट करना होगा तथा उपयुक्त कार्यालयीन शिष्टता/मर्यादा का अनुपालन व निर्वहन करना होगा। किसी भी प्रकार के उच्छृंखल व्यवहार तथा/अथवा बिना पूर्वानुमति के अनुपस्थिति के फलस्वरूप उक्त संलग्नता स्वतः ही रद्द हो जाएगी, जिसका इस संस्थान पर किसी भी प्रकार का आबंध/दायित्व नहीं होगा। कृपया नोट करें कि, विद्यार्थी को संस्थान के छात्रावास में आवास उपलब्ध नहीं कराया जाएगा। विद्यार्थी को अपने साथ विधिवत भरा हुआ तथा सत्यापित पंजीकरण फार्म(संलग्न) एंव करार पत्र लाना होगा। संस्थान में रिपोर्ट करते समय विद्यार्थी को पासपोर्ट आकार की दो फोटो जमा करना आवश्यक होगा। संस्थान में प्रवेश हेतु विद्यार्थी को विधिमान्य पहचान पत्र साथ लाना होगा।

सधन्यवाद,

भवदीय,

(उगले केशव)
प्रशासनिक अधिकारी (अकादमी)
कार्यक्रम नियोजन एंव मूल्यांकन समूह

वितरण:

1. श्री पंकज धोते, वैज्ञानिक/इंजीनियर-एसई, जल संसाधन विभाग, (गाइड)
2. समूहाध्यक्ष, जल संसाधन विभाग / समूहाध्यक्ष का॰नि॰मू॰स॰
3. लाइब्रेरी
4. केन्द्रीय औद्योगिक सुरक्षा बल

Joining of Pujashree and Upangna

Chander Kumar Singh

Fri 11-01-2019 15:44

To: Nithiyanandam Yogeswaran <nithiyanandam.y@terisas.ac.in>;

Cc: Upangana Goswami <Upangana.Goswami@terisas.ac.in>; Pujasree Mahanta <Pujasree.Mahanta@terisas.ac.in>;

Dear Nithiya,
Pujashree and Upangana will be doing there major project with me. This is to confirm that they have joined with me.



Form 2
Joining Report

Dear Dr ,

This is to confirm that Sabnam Kalita, enrolled in MSc Geoinformatics, at TERI University, has joined TERI School of Advanced Studies, in Delhi on1st August 2018 for completion of his/her Major Project.

She/he is expected to stay with our organization until 13th November 2018.

Regards,

Dr. Nithiyanandam Yogeshwaram

Assistant Professor,
Placement and Lab Coordinator (Geoinformatics),
Department of Natural Resources,
TERI School of Advanced Studies



Centre for
Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

Centre for Ecology & Hydrology
Maclean Building, Benson Lane
Crowmarsh Gifford, Wallingford
Oxfordshire, OX10 8BB
United Kingdom

Telephone: +44 (0) 1491 838800
Main Fax: +44 (0) 1491 692424
www.ceh.ac.uk

Charu Bhanot,
TERI School of Advanced Studies,
New Delhi,
India.

16/03/2018

Dear Charu,

CONFIRMATION OF VISIT

I am pleased to confirm that you are invited to visit the Natural Environment Research Council (NERC) and be based at the Centre for Ecology and Hydrology (CEH) in Edinburgh for the period 1st June to 1st October 2018. The purpose of the visit is to complete part of your PhD research into the linkages between wetland physio-chemical parameters and bird diversity and its conservation, to gain further understanding of the economic value of these services.

The placement is subject to the terms of the Grant Agreement from the British Council being agreed with NERC CEH. The terms and conditions of the Newton Fund Grant Agreement, once confirmed, shall apply to your placement. In accordance with the terms of the Grant agreement, CEH reserves the right to put in place further conditions in relation to intellectual property rights should they be required. The grant includes, in principle, payment of a stipend of £5,200 for subsistence. The method of payment is still to be finalised and may be subject to tax deductions as applicable.

It is our understanding that your visa fee, travel insurance and travel costs, to and from the UK will be covered by TERI School of Advanced Studies (formerly known as TERI University), New Delhi, India, through a separate funding agreement by Department of Biotechnology, Ministry of Science and Technology, Government of India to which NERC CEH, UK is not party.

During your visit, as part of the requirements laid down by the Natural Environment Research Council, the following conditions will be observed by yourself:

1. You will not be filling a research post;
2. NERC is not hosting a formal research project in respect to yourself;
3. You will not be working under the control of the NERC during any part of your visit;
4. You will use NERC facilities to conduct your own research (which may involve some collaboration or sharing of information on research techniques);
5. You must have obtained the required immigration entry clearance for the duration of your visit, you will abide by the conditions appropriate to your immigration entry clearance and you have supplied the relevant documentation to your local NERC contact Bryan Spears, Host Supervisor, in support of your visit.

Failure to adhere to any of the above conditions will result in your refusal of entry onto any NERC site.

Please can you sign and return a copy of this letter to me confirming your agreement to these conditions.

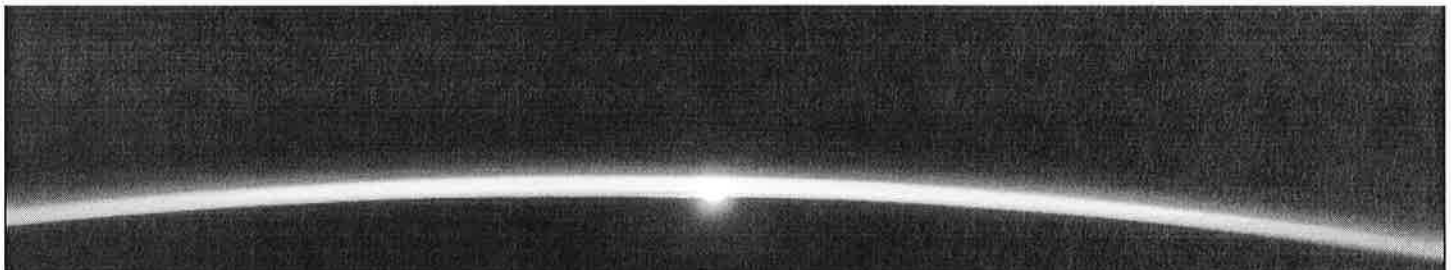
Yours sincerely,

Megan Webb
Researcher Development Coordinator
Email: PhDStudentEng@ceh.ac.uk

I have read, understood and accept the above conditions.

Print name:

Signed: Date:



Earth Engine Training

10 - 5pm, Thursday 22nd Feb
Room 304

TERI School of Advanced Studies is hosting Dr. Nicholas Clinton, Google Developer Advocate for a hands-on technical training on Google's Earth Engine Platform, used by researchers in GIS & Remote Sensing for analysis and visualization of geographical data sets.

This training is designed for Geoinformatics students, researchers and instructors who are actively working on research projects and teaching courses related to remote sensing or mapping.

Visit _____ to know more

Google Earth Engine

teri school of advanced studies
Knowledge for Sustainable Development
(Deemed to be University under Section 3 of the UGC Act)
Accredited with grade 'A' by NAAC

Coordinators: Dr. Neeti, Department of Natural Resources, neeti@teriuniversity.ac.in
Dr. Anu Rani Sharma, Department of Natural Resources, anu.sharma@teriuniversity.ac.in

List of the Internship candidates

Title of the linkage	Name of the partnering institution/ industry /research lab with contact details	Year of commencement	Duration (From-To)	Nature of linkage	Name of the participant
Internship	The Energy and Resources Institute	2015	Jan-June	Major Project internship	Mridu Prakash
Internship	Indian Institute of Techonolgy Delhi	2015	Jan-June	Major Project internship	Garima Sachdeva
Internship	Indian Institute of Technology-Delhi	2015	Jan-June	Major Project internship	Anshul Kashyap
Internship	Defence Terrain Research Laboratory (DTRL), DRDO	2015	Jan-June	Major Project internship	Isha Sharma
Internship	International Centre for Integrated Mountain Development (ICIMOD)	2015	Jan-June	Major Project internship	Florencia Matina Tuladhar
Internship	WWF INDIA	2015	Jan-June	Major Project internship	Pragati Jhamb
Internship	Indian Institute of Techonolgy Delhi	2015	Jan-June	Major Project internship	Siddham Gaur
Internship	Wildlife Institute of India	2015	Jan-June	Major Project internship	Subhodip Mukherjee
Internship	National Geophysical Research Institute	2015	Jan-June	Major Project internship	Jagriti Dabas
Internship	Archaeological Survey of India	2015	Jan-June	Major Project internship	Priyanka Tiwary
Internship	Archaeological survey of India	2015	Jan-June	Major Project internship	Vikash Shivhare
Internship	Teri University	2015	Jan-June	Major Project internship	Abdulhakim Ahmed

Internship	UNECA	2016	Jan-June	Major Project internship	Feven Zerihun Tesfaye
Internship	National Institute of Hydrology	2016	Jan-June	Major Project internship	Chanchal
Internship	Watershed organization Trust, (WOTR) Ahmednagar	2016	Jan-June	Major Project internship	Aksheyta Gupta
Internship	JNU	2016	Jan-June	Major Project internship	Ankit Khajuria
Internship	Department of Scienceand Technology	2016	Jan-June	Major Project internship	Lakshmi P
Internship	Indian Institute of Technology, Delhi	2016	Jan-June	Major Project internship	Nilesh Maiti
Internship	CSIR-CRRI	2016	Jan-June	Major Project internship	Amritesh Singh
Internship	JNU	2016	Jan-June	Major Project internship	Vanshika Dhamija
Internship	The energy and resources institute, IEE division.	2016	Jan-June	Major Project internship	Saarthak Bhola
Internship	RMS Pvt. Ltd.	2016	Jan-June	Major Project internship	Madhur Chanana
Internship	SCSS, JNU	2016	Jan-June	Major Project internship	Ashish Agarwalla
Internship	national institute of rural development and panchayati raj	2016	Jan-June	Major Project internship	G Navya Reddy
Internship	WWF-DELHI	2016	Jan-June	Major Project internship	Ashima
Internship	Pitney Bowes	2016	Jan-June	Major Project internship	Poonam Chandel
Internship	Watershéd Organisation Trust (WOTR)	2016	Jan-June	Major Project internship	Anuja Negi

Internship	Indian Institute Of Science,Bangalore	2016	Jan-June	Major Project internship	Brigit Maria Baby
Internship	National Centre for Antarctic and Ocean Research (ESSO-NCAOR)	2017	Jan-June	Major Project internship	Prashant
Internship	Climate Connect	2017	Jan-June	Major Project internship	Anjali Kumari
Internship	HERE Solutions India Pvt. Ltd.	2017	Jan-June	Major Project internship	Aditi Rastogi
Internship	ESRI India Technologies Ltd.	2017	Jan-June	Major Project internship	Sagarika Ghosal
Internship	National Institute of Hydrology (NIH)	2017	Jan-June	Major Project internship	Shahnaz Khatun
Internship	National Centre For Antarctic and Ocean Research (ESSO-NCAOR)	2017	Jan-June	Major Project internship	Prashant
Internship	Wildlife Trust of India	2017	Jan-June	Major Project internship	Suman Behera
Internship	School of Environmental Sciences (SES), JNU	2018	Jan-June	Major Project internship	Vijay Laxmi
Internship	TERI SCHOOL OF ADVANCED STUDIES	2018	Jan-June	Major Project internship	Sabnam Kalita
Internship	TERI School of Advanced Studies	2018	Jan-June	Major Project internship	Puneeta Pokhriyal
Internship	SES, Jawaharlal Nehru University	2018	Jan-June	Major Project internship	Vijay Laxmi
Internship	Teri SAS	2018	Jan-June	Major Project internship	Puneeta Pokhriyal
Internship	Asian Institute Of Technology	2018	Jan-June	Major Project internship	Sabnam Kalita
Internship	TERI - SAS	2018	Jan-June	Major Project internship	Vinay Hudda

Internship	The Energy and Resources Institute	2018	Jan-June	Major Project internship	Rajdeep Kaur
Internship	Regional Remote Sensing Centre(RRSC) North	2018	Jan-June	Major Project internship	Arun Murali C M
Internship	Water Harvest (Wells for India)	2018	Jan-June	Major Project internship	Momisha
Internship	Indian Institute of Remote Sensing	2018	Jan-June	Major Project internship	Abhinav Chandel
Internship	Indian institute of remote sensing	2018	Jan-June	Major Project internship	Khushboo Jain
Internship	Asian Institute of Technology	2018	Jan-June	Major Project internship	Saloni Ranka
Internship	ESRI India	2018	Jan-June	Major Project internship	Aakanksha
Internship	Regional Remote Sensing Centre-EAST	2018	Jan-June	Major Project internship	Rituparna Das
Internship	TERI School of Advanced Studies	2019	Jan-June	Major Project internship	Jyoti Rathour
Internship	North Eastern Space application Centre, Shillong	2019	Jan-June	Major Project internship	Gourav Panchal
Internship	Indian Institute of Remote Sensing (IIRS - ISRO)	2019	Jan-June	Major Project internship	Sweta Kumari Shaw
Internship	Indian Institute of Remote Sensing (IIRS - ISRO)	2019	Jan-June	Major Project internship	Shivani Pathak
Internship	Regional Remote Sensing Centre	2019	Jan-June	Major Project internship	Sucheta Bhattacharjee
Internship	TERI UNIVERSITY	2019	Jan-June	Major Project internship	Amrutha Manoj
Internship	TERI School of Advanced Studies,New Delhi	2019	Jan-June	Major Project internship	Upangana Goswami

Internship	TERI School of Advanced Studies	2019	Jan-June	Major Project internship	Pujasree Mahanta
Internship	World Wildlife Fund	2019	Jan-June	Major Project internship	Odyssey Saikia
Internship	Centre of Urban Excellence - CEPT University	2019	Jan-June	Major Project internship	Shiv Shyam



List of the students carried their project to Industry/ Govt Organization

SESSION	REG. NO.	NAME	ORGANISATION NAME	ORGANISATION ADDRESS	DOJ	PROJECT NAME
2013-2014	1309MNG	Mridu Prakash	The Energy and Resources Institute	10, Institutional Area, Vasant Kunj New Delhi	01-06-2015	Assesssment of quality of life and agricultural vulnerabilty in india using geospatial technologies
2013-2014	1304MNG	Garima Sachdeva	Indian Institute of Techonolgy Delhi	Hauz khas, New Delhi	01-02-2015	Study of microphysical properties of fog and modelling using satellite datasets.
2013-2014	1302MNG	Anshul Kashyap	Indian Institute of Technology - Delhi	Indian Institute of Technology Delhi, Hauz Khas , New Delhi	01-02-2015	linking surface ozone with mortality rate in India
2013-2014	1305MNG	Isha Sharma	Defence Terrain Research Laboratory (DTRL), DRDO	Ministry Of Defence Defence Research and Development Organisation Metcalfe House Delhi-1100054	01-01-2015	Comparison between microwave sensors and optical sensor
2013-2014	1303MNG	Florencia Matina Tuladhar	International Centre for Integrated Mountain Development (ICIMOD)	Khumaltar, Lalitpur G.P.O. Box 3226, Kathmandu, Nepal Email_infoaticimod.org	01-15-2015	Determination of factors influencing recession of Himalayan Glaciers using remote sensing
2013-2014	1310MNG	Pragati Jhamb	WWF INDIA	172 B, Lodhi Estate, Lodhi Road, Block 18, Institutional Area, Lodhi	01-06-2015	Habitat quality assessment of biodiversity using

				Colony, New Delhi, Delhi 110003		INVEST tools in ARCGIS
2013-2014	1312MNG	Siddham Gaur	Indian Institute of Techonolgy Delhi	Hauz khas, New Delhi	01-02-2015	Cloud radiative forcing and its adaptability in the model for Indian Region
2013-2014	1313MNG	Subhodip Mukherjee	Wildlife Institute of India	Post Box 18, Chandrabani Dehradun - 248001 Uttarakhand India	01-06-2015	Distribution Modeling using Remote Sensing and Gis
2013-2014	1306MNG	Jagriti Dabas	National Geophysical Research Institute	NGRI-CSIR, Uppal Road, Hyderabad-500007, A.P	01-14-2015	Aquiefer mapping using advanced remote sensing and geostatistics
2013-2014	1311MNG	Priyanka Tiwary	Archaeological Survey of India	ASI,3rd floor,VUDA Bhavan near,VIP Road,Karelibaug,Vadodara 390018 Gujarat	01-13-2015	Vadnagar excavation works
2013-2014	1314MNG	Vikash Shivhare	Archaeological survey of India	Excavation Branch V,Archaeological survey of India,3rd floor, VUDA bhavan, L and T circle, VIP Road,Karelibaug,vadodara 390018, Gujarat	01-10-2015	Archaeological project on space and landscape of vadnagar,Gujarat
2013-2014	1301MNG	Abdulhakim Ahmed	Teri University	10 Institutional Area, Vasant Kunj, New Delhi, Delhi 110070	01-22-2015	Urban land Expansion and its implication on agricultural land loss and groundwater

						depletion using geospatial technology
2014-2015	1460MNG	Feven Zerihun Tesfaye	UNECA	UNECA,Addis Ababa,Ethiopia	01-04-2016	Volunteer GIS for mapping public facility
2014-2015	1459MNG	Chanchal	National Institute of Hydrology	NIH Near IIT-Roorkee	01-04-2016	Modelling of Stream Flow in Himalayan Basin under Climate change
2014-2015	1452MNG	Aksheyta Gupta	Watershed organization Trust, (WOTR) Ahmednagar	Paryavaran, Behind Market Yard, Sarasnagar Rd, Ahmednagar, Maharashtra 414001	01-04-2016	Identifying critical soil erosion prone areas and average soil loss in watershed regions of Maharashtra using RUSLE Model and AHP Analysis techniques
2014-2015	1454MNG	Ankit Khajuria	JNU	New Mehrauli Road, Near Munirka, New Delhi, Delhi 110067	01-04-2016	Forest cover dynamics in India quantified using Google Earth Engine
2014-2015	1461MNG	Lakshmi P	Department of Scienceand Technology	Technology bhavan, New Mehrauli road, New Delhi-110016	01-04-2016	A study on coastal resources in Mahatama Gandhi National Marine Park, Wandoor,Andaman and nicobar islands using remote sensing and GIS tools

2014-2015	1464MNG	Nilesh Maiti	Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi Hauz Khas, New Delhi-110 016, INDIA	01-04-2016	Intercomparison of various CMIP5 models with satellite data for estimating aerosol variability over the oceans of India.
2014-2015	1453MNG	Amritesh Singh	CSIR-CRRI	Mathura Road, New Delhi, Delhi 110025	01-14-2016	Patterns and trends of road accidents in Delhi using GIS
2014-2015	1467MNG	Vanshika Dhamija	JNU	New Mehrauli Road, Near Munirka, New Delhi, Delhi 110067	01-04-2016	To assess the vulnerability of wheat and paddy crop to climate change for present and in near future in India
2014-2015	1466MNG	Saarthak Bhola	The energy and resources institute, IEE division.	The energy and resources institute, Darbari Seth Block, IHC complex, Lodhi road, Delhi 03.	01-07-2016	Analyzing the particulate pollution from the emission of Brick kiln in Varanasi region.
2014-2015	1462MNG	Madhur Chanana	RMS Pvt. Ltd.	PLOT 15A, Sector 127, Noida, Uttar Pradesh	01-04-2016	Development and Visualisation of Spatial Data Repository using WebGIS Technologies
2014-2015	1457MNG	Ashish Agarwalla	SCSS, JNU	Jawaharlal Nehru University	01-15-2016	Classification using multi-resolution imagery

2014-2015	1463MNG	G Navya Reddy	national institute of rural development and panchayati raj	National Institute of Rural Development and Panchayati Raj Rajendranagar, Hyderabad	02-07-2016	Identifying and analyzing the Gaps in utilization of Land Resources using Geo spatial Technologies - A Case study on Pedripahad micro watershed, Maddu
2014-2015	1456MNG	Ashima	WWF-DELHI	172 B, Block 18, Lodhi Estate, Lodi Road, Institutional Area,, New Delhi, Delhi 110003	01-04-2016	ELEPHANT DISTRIBUTION MODELING IN CHHATTISGARH-JHARKHAND USING MAXENT
2014-2015	1465MNG	Poonam Chandel	Pitney Bowes	C-28-29, 5th Floor, Tower-B, Logix Cyber Park, Sector 62, Uttar Pradesh 201307	01-18-2016	Automated conflation of multi-source Point of Interests for creation of Best Of Breed datasets
2014-2015	1455MNG	Anuja Negi	Watershed Organisation Trust (WOTR)	Watershed Organisation Trust Paryavaran - Behind Market Yard. Ahmednagar - 414001	01-04-2016	impact assessment of completed watershed development projects in Aurangabad and Vidharbha region of Maharashtra using remote sensing data.
2014-2015	1458MNG	Brigit Maria Baby	Indian Institute Of Science,Bangalore	Center for ecological sciences,Third floor	01-11-2016	Landscape dynamics of Pune-Mumbai Corridor

				biological science building,Indian Institute of Science ,Bangalore		
2015-2016	1565MNG	Prashant	National Centre for Antarctic and Ocean Research (ESSO-NCAOR)	Ministry Of Earth Science, Government Of India Headland Sada,Vasco-da-Gama, Goa 403804, INDIA Tel- 91-832-2520876,2525511, Fax- 91-832-2520877	12-27-2016	Interferometric synthetic aperture radar for generation of DEM and retrieval of glacier velocity from east Antarctic glacier
2015-2016	1564MNG	Anjali Kumari	Climate Connect	Top Floor, Plot 42, Sector 13 Main Rd, Pocket B, Dwarka, Delhi, 110075	01-16-2017	The study of wheat, Sugarcane and Tea using Remote sensing techniques .
2015-2016	1570MNG	Aditi Rastogi	HERE Solutions India Pvt. Ltd.	Unit No 1 3rd Floor Building No 5 and 6 Serene Properties SEZ Thane Belapur Road Mindspace Airoli	01-02-2017	Traffic Congestion and Road Accidents
2015-2016	15100MNG	Sagarika Ghosal	ESRI India Technologies Ltd.	H-7, Sector 63 Noida- 201301 Uttar Pradesh, India	01-05-2017	Role of Web GIS in Rural Development
2015-2016	1567MNG	Shahnaz Khatun	National Institute of Hydrology (NIH)	National Institute of Hydrology Roorkee-247667,Uttarakhand,India	01-11-2017	River Basin Modelling

2015-2016	1565MNG	Prashant	National Centre For Antarctic and Ocean Research (ESSO-NCAOR)	Ministry Of Earth Science, Government Of India Headland Sada, Vasco-da-Gama, Goa 403 804, INDIA Tel-91-832-2520876/ 2525511, Fax-91-832-2520877,	12-27-2016	Interferometric synthetic aperture radar for generation of DEM and retrieval of glacier velocity from east Antarctic glacier.
2015-2016	1568MNG	Suman Behera	Wildlife Trust of India	F-13, Sector 8, Noida.	01-10-2017	Ecology Landscape Modeling
2016-2017	1660MNG	Vijay Laxmi	School of Environmental Sciences (SES), JNU	School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, Delhi 110067	01-01-2018	Forest characterization and stress assessment using hyperspectral and optical data
2016-2017	1658MNG	Sabnam Kalita	TERI SCHOOL OF ADVANCED STUDIES	PLOT 10 INSTITUTIONAL AREA,VASANT KUNJ	08-01-2018	USING LULC TRAJECTORIES TO QUANTIFY THE RELATIONSHIP BETWEEN LULC AND LAND SURFACE TEMPERATURE FOR BANGALORE

2016-2017	1654MNG	Puneeta Pokhriyal	TERI School of Advanced Studies	10, Institutional Area Vasant Kunj New Delhi	12-02-2017	Geostatistical modelling of Elephant's habitat suitability
2016-2017	1660MNG	Vijay Laxmi	SES, Jawaharlal Nehru University	School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, Delhi 110067	01-01-2018	Forest Nitrogen Assessment using Hyperspectral and Optical data
2016-2017	1654MNG	Puneeta Pokhriyal	Teri SAS	Plot No. 10, Institutional Area, Vasant Kunj, New Delhi	01-08-2018	Species distribution modelling of Elephas Maximus in Rajaji National Park, Uttarakhand
2016-2017	1658MNG	Sabnam Kalita	Asian Institute Of Technology	58 Moo 9 - Paholyothin Highway Tambon Khlong Nung, Khlong Nung Chang Wat Pathum Thani,Thailand	01-15-2018	Flood and Storm Surge Risk Assessment in Hue City,Vietnam
2016-2017	1661MNG	Vinay Hudda	TERI - SAS	Plot No. 10, Institutional Area, Vasant Kunj	01-31-2018	Remote Sensing Data Analysis Advancement using Data Fusion
2016-2017	1656MNG	Rajdeep Kaur	The Energy and Resources Institute	Indian Habitat Centre,Lodhi Road	01-18-2018	Storm surge analysis over coastal states and economic analysis
2016-2017	1649MNG	Arun Murali C M	Regional Remote Sensing Centre(RRSC) North	Regional Remote Sensing Centre-North NRSC,ISRO	01-08-2018	Drought Monitoring using timeseries earth observation data.

				New Delhi		
2016-2017	1652MNG	Momisha	Water Harvest (Wells for India)	1139, Sector 4 Hiran Magri Udaipur, Rajasthan, India	01-06-2018	Gangeshwar Watershed Study through Remote Sensing and GIS
2016-2017	1648MNG	Abhinav Chandel	Indian Institute of Remote Sensing	Kalidas road, Dehradun	01-08-2018	Bathymetry
2016-2017	1651MNG	Khushboo Jain	Indian institute of remote sensing	Dehradun,kalidas road	01-08-2018	Soil erosion modelling
2016-2017	1659MNG	Saloni Ranka	Asian Institute of Technology	58 Moo 9 - Paholyothin Highway Tambon Khlong Nung, Khlong Nung Chang Wat Pathum Thani 12120	01-15-2018	Monitoring Variations of Groundwater Storage from Satellite Gravimetry and designing of a Water Resource Information System.
2016-2017	16100MNG	Aakanksha	ESRI India	H-7, Sector 63, Noida	01-22-2018	GIS in Transport Utility
2016-2017	1657MNG	Rituparna Das	Regional Remote Sensing Centre-EAST	BG-2 Street No 77 Sub Central Business District Action Area 1B Newtown, Kolkata, West Bengal 700156	01-03-2018	Characterizing Indian agriculture based on climate resilience/ vulnerability using timeseries vegetation and rainfall data
2017-2018	1700018MSG	Jyoti Rathour	TERI School of Advanced Studies		04-01-2019	Investigating applications of Remote Sensing for crop insurance

2017-2018	1700138 MSG	Gourav Panchal	North Eastern Space application Centre, Shillong	North Eastern Space application Centre,Umiam, Meghalaya 793103	10-01-2019	Study on urban flooding for Guwahati
2017-2018	1700147 MSG	Sweta Kumari Shaw	Indian Institute of Remote Sensing (IIRS - ISRO)	4, Kalidas road	03-01-2019	Flood hazard mapping using integrated modeling and geospatial techniques
2017-2018	1700126 MSG	Shivani Pathak	Indian Institute of Remote Sensing (IIRS - ISRO)	4, Kalidas road	02-01-2019	Hydrological Modelling of a Snowfed Basin
2017-2018	1700184 MSG	Sucheta Bhattacharjee	Regional Remote Sensing Centre	BG2, Street No 77, SubCentral Business District Action Area 1B, Newtown, Kolkata, West Bengal 700156	07-01-2019	In-season crop identification using multi-sensor approach
2017-2018	1700199 MSG	Amrutha Manoj	TERI UNIVERSITY	Plot no.10, Institutional Area, Vasant Kunj New Delhi, 110070	08-01-2019	Monitoring and predicting Vector borne diseases using GIS
2017-2018	1700042 MSG	Upangana Goswami	TERI School of Advanced Studies,New Delhi	Plot no.10, Institutional Area, Vasant Kunj New Delhi, 110070	07-01-2019	Bio-thermal effect of open landfill detected by remote sensing
2017-2018	1700106 MSG	Pujasree Mahanta	TERI School of Advanced Studies	Plot no.10, Institutional Area, Vasant Kunj New Delhi, 110070	11-01-2019	Effect of iirigation on groundwater level changes in agricultural areas
2017-2018	1700185 MSG	Odyssey Saikia	World Wildlife Fund	Pirojsha Godrej Building 172 B Lodhi Road	01-01-2019	Species Distribution Modelling

				New Delhi 110003		
2017-2018	1700266 MSG	Shiv Shyam	Centre of Urban Excellence - CEPT University	Ground, NILPA building Near AES Boys Hostel Campus, University, Navrangpura, Ahmedabad, Gujarat - 380009	07-01-2019	Suitable location for outstation bus stops in Ahmedabad city of Gujarat



Read on 22/1/18

Annexure 3.7.3 **MoUs with institutions of national & international importance**

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE TERI SCHOOL OF ADVANCED STUDIES
New Delhi, India

AND

FACULTY OF GRADUATE STUDIES,
UNIVERSITY OF SRI JAYEWARDENAPURA,
Nugegoda,, Sri Lanka

1. By this Memorandum the TERI School of Advanced Studies, India, and Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP), wishing to establish collaborative relations, agree to cooperate with each other. The areas of cooperation may include any program at either institution that could help foster and develop the relationship. The terms of cooperation for each activity under the *Memorandum of Understanding* shall be mutually discussed and agreed upon in the future, should the need arise, and shall be subject to appropriate and separate *Agreements*. Cooperation shall be carried out through activities such as;

    a. Exchange of faculty and/or staff.
    b. Joint research activities and publications.
    c. Collaboration in activities such as seminars, workshops and conferences.
    d. Special short-term academic programs, with prior approval from each institution's respective authorities.
    e. Short and medium-term research visits for graduate students (Master's and Doctoral) and postdoctoral fellows, with prior approval from each institution's respective authorities.
    f. Joint supervision for doctoral candidates and / or collaborative degrees.
    g. Exchange information pertaining to developments in teaching, learning and research

For the activities described above to take place, a *Grant* or an *Agreement* must be formally in place.

2. The *Memorandum of Understanding* imposes no financial obligation on either institution; co-operative activities that require funding should not be initiated before the necessary resources have been secured.

3. This MoU outlines the framework of a working relationship between the parties. Except as expressly noted, it is not intended to constitute a contract, but is built on goodwill and is binding in honour only.

4. Each institution shall designate a liaison officer to develop and coordinate the specific activities.

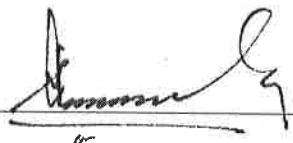
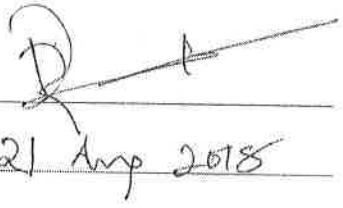
5. Each institution name or logo will be used only with express written consent from the senior executive of the other institution or his/her designate.

6. The Intellectual Property policies in place at each institution shall apply to the activities initiated and implemented by the respective researchers.

7. Participants under this *Memorandum of Understanding* will be selected on the basis of merit without regard to race, national or ethnic origin, colour, religion, age, sex, marital status, physical handicap, or sexual orientation. TERI School of Advanced Studies and Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP) will each accept the participants selected by the other Party if mutually acceptable academic and/or professional qualifications and standards are met. All participants will be treated in the same non-discriminatory manner in carrying out the provisions of this *Memorandum of Understanding*, subject to the provisions of the policies and requirements of each of the institutions.

8. This *Memorandum of Understanding* shall remain in force for a period of five (5) years from the date of the last signature and may be renewed on mutual agreement. Either institution may terminate their involvement with six months advance written notice to the other institution.

9. The activities under the MoU shall be undertaken in accordance with established statutes, regulations, policies, procedures and laws of the TERI School of Advanced Studies in India and Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP) in Sri Lanka.

Name:	Prof. Sampath Amarathunga	**Name:**	Capt.Pradeep Kr.Padhy (Retd.)
Title:	Vice-Chancellor	**Title:**	Registrar
Institution:	Faculty of Graduate Studies, University of Sri Jayewardenapura (FGS-USJP)	**Institution:**	TERI School of Advanced Studies
Signature:		**Signature:**	
Date:	6th June 2018	**Date:**	21 Aug 2018

o/c

MEMORANDUM OF UNDERSTANDING

BETWEEN

TERI UNIVERSITY
New Delhi, 110 070, India

AND

ANANTH TECHNOLOGIES Ltd.,
Hyderabad - 500 081, India

1. By this Memorandum the TERI University (TU), India, and Ananth Technologies Ltd., (ATL)wishing to establish collaborative relations, agree to cooperate with each other. The areas of cooperation may include any program at either institution that could help foster and develop the relationship. The terms of cooperation for each activity under the *Memorandum of Understanding* shall be mutually discussed and agreed upon in the future, should the need arise, and shall be subject to appropriate and separate *Agreements*. Cooperation shall be carried out through activities such as:
    a. Exchange of faculty and/or staff
    b. Joint research activities in the field of remote Sensing, and other space related technologies with special focus on sustainable development and climate change
    c. Sharing of technical expertise on requested scientific topics or application
    d. Mutual support to build capacity in both TU and ATL on specific Remote sensing and other Space related technologies/applications
    e. Building a small satellite for TU to carry out extensive studies in Environment Monitoring.
    f. Short and medium-term research visits for graduate students (Master's and Doctoral) and scientists, with prior approval from both TU and ATL authorities.

For the activities described above to take place, a *Grant* or an *Agreement* must be formally in place.

2. The *Memorandum of Understanding* imposes no financial obligation on both TU and ATL; co-operative activities that require funding should not be initiated before the necessary resources have been secured.

Capt. Pradeep Kumar Padhy (Retd.)
Registrar and Head (Outreach)
TERI University
10, Institutional Area, Vasant Kunj
New Delhi -110 070

3. This MoU outlines the framework of a working relationship between the parties. Except as expressly noted, it is not intended to constitute a contract, but is built on goodwill and is binding in honor only.

4. Both TU and ATL shall designate a liaison officer to develop and coordinate the specific activities.

5. TU and ATL name or logo will be used only with express written consent from the senior executive of the other institution or his/her designate.

6. The Intellectual Property policies in place at each institution shall apply to the activities initiated and implemented by the respective researchers.

7. Whenever a novel innovation arises out of collaboration both the parties are the beneficiaries and patent shall be filed jointly for the same.

8. This *Memorandum of Understanding* shall remain in force for a period of five (3) years from the date of the last signature and may be renewed on mutual agreement. Either institution may terminate their involvement with six months advance written notice to the other institution.

9. The activities under the MoU shall be undertaken in accordance with established statutes, regulations, policies, procedures and laws of the TERI University, New Delhi and Ananth Technologies Ltd., Hyderabad.

Name: Capt. Pradeep Kumar Padhy (Retd.)

Title: Registrar and Head (Outreach)

Institution: TERI University

Signature:

Capt. Pradeep Kumar Padhy (Retd.)
Registrar and Head (Outreach)
TERI University
10, Institutional Area, Vasant Kunj
New Delhi-110 070

Date: 05 June 2017

Name: Mr C.D. Shridhara

Title: Director

Institution: Ananth Technologies Limited

Signature:

Date: 5.6.2017

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE TERI UNIVERSITY
10 Institutional area, Vasanth Kunj, New Delhi, 110 070

AND

GURUGRAM METROPOLITAN DEVELOPMENT AUTHORITY,
316/18, Civil Line Rd, Civil Lines, Gurugram, Haryana 122001

1. By this Memorandum the TERI University (TU), India, and Gurugram Metropolitan Development Authority (GMDA) wishing to establish collaborative relations, agree to cooperate with each other. The areas of cooperation may include any program at either institution that could help foster and develop the relationship. The terms of cooperation for each activity under the *Memorandum of Understanding* shall be mutually discussed and agreed upon in the future, should the need arise, and shall be subject to appropriate and separate *Agreements*. Cooperation shall be carried out through activities such as:

    a. Joint research activities in the field of Geoinformatics, urban transport, water, energy, sustainability, and health.
    b. Sharing of technical expertise on requested scientific topics or application
    c. Building capacity in GMDA on selected areas mentioned above.
    d. Internship opportunity in GMDA for Masters students of TU.
    e. TU to guide GMDA on leash areas in which TU has expertise
    f. Developing research proposals jointly

For the activities described above to take place, a *Grant* or an *Agreement* must be formally in place.

2. The *Memorandum of Understanding* imposes no financial obligation on both TU and GMDA; co-operative activities that require funding should not be initiated before the necessary resources have been secured.

3. This MoU outlines the framework of a working relationship between the parties. Except as expressly noted, it is not intended to constitute a contract, but is built on goodwill and is binding in honor only.

Gurugram Metropolitan Development Authority.
Gurugram.

teri university

4. Both TU and GMDA shall designate a liaison officer to develop and coordinate the specific activities.

5. TU and GMDA name or logo will be used only with express written consent from the senior executive of the other institution or his/her designate.

6. The Intellectual Property policies in place at each institution shall apply to the activities initiated and implemented by the respective researchers.

7. Whenever a novel innovation arises out of collaboration and both the parties are the beneficiaries, the patent shall be filed jointly for the same.

8. This *Memorandum of Understanding* shall remain in force for a period of five (5) years from the date of the last signature and may be renewed on mutual agreement. Either institution may terminate their involvement with six months advance written notice to the other institution.

9. The activities under the MoU shall be undertaken in accordance with established statutes, regulations, policies, procedures and laws of the TERI University, New Delhi and Gurugram Metropolitan Development Authority, Haryana.

Name	:	Dinesh Singh Chauhan	**Name**	:	Capt. Pardeep Kumar Padhy (Retd.)
Designaton	:	Chief Town Planner	**Designaton**	:	Registrar
Institution	:	Gurugram Metropolitan Development Authority, Gurugram	**Institution**	:	TERI University
Signature	:		**Signature**	:	
Date	:	06.09.2017	**Date**	:	06.09.2017

Gurugram Metropolitan Development Authority,
Gurugram.

teri university New Delhi

teri university New Delhi

teri school of advanced studies
(a Deemed-to-be University)
(Established under Section 3 of the UGC Act, 1956)
Accredited by the NAAC

TERI School of Advanced Studies
10, Institutional Area
Vasant Kunj
New Delhi – 110 070

Tel. 7180 0222
Fax 2612 2874
India +91 • Delhi (0) 11

MEMORANDUM OF UNDERSTANDING

This is a Memorandum of Understanding between TERI School of Advanced Studies (TERI SAS), New Delhi and Kalindi College, Delhi University, New Delhi for initiating scientific studies on microbial diversity in Forest Landscape Restoration initiatives at TERI SAS.

Kalindi college will provide the basic infrastructure and available equipment for the project. TERI SAS will provide the chemicals and other consumables alongwith labour charges if any. TERI SAS will also provide certification to the students of Kalindi College for the work undertaken by them in the project.

Following shall be the activities carried out by the two institutions:

A. Kalindi College :
   1. To isolate the microbes from the three types of soil samples
      a. Reclaimed and un restored land
      b. Reclaimed sites with afforestation and
      c. Overburdens
   2. To identify and characterise the bacteria isolated from the aforementioned types of soil
   3. To create a database and assess the changing diversity if any correlated with changing soil profile

B. TERI SAS :
   1. To do a spore count of arbuscular mycorrhizal fungi (AMF) from the soil of the site.
   2. To apply the enumerated AMF to the reclaimed site.
   3. To assess effect of AMF on the inoculated plants.

In addition to the aforementioned activities, both the institutions will work towards the pursuit of higher education through faculty and students participation in scientific research.

This MOU shall be valid until March 31st 2018 and will be extended with mutual consent of both the institutions.

Dated 27 December 2017

Capt.Pradeep Kr.Padhy (Retd.)
Registrar
TERI School of Advanced Studies
Vasant Kunj, New Delhi

On behalf of TERI School of Advanced Studies

(Anula Maurya)
Principal
Kalindi College
East Patel Nagar, New Delhi

On behalf of Kalindi College

Capt. Pradeep K Padhy (Retd.)
Registrar
TERI School of Advanced Studies
10, Institutional Area, Vasant Kunj
New Delhi-110070

3.7.3 Number of functional MoUs with institutions of national, international importance, other universities, industries, corporate houses etc. during the last five years (only functional MoUs with ongoing activities to be considered) (10)

Organisation with which MoU is signed	Name of the institution/ industry/ corporate house	Year of signing MoU	Duration	List the actual activities under each MoU year wise	Number of students/teachers participated under MoUs
Ananth Technologies Ltd., Hyderabad, India	Ananth Technologies Ltd., Hyderabad, India	05.06.2017	3 years	Exchange of faculty & staff, joint research activities, etc.	-/ 1 faculty
GMDA, Gurugram	GMDA, Gurugram	06.9.2017	5 years	Joint research activities in the field of Geoinformatics, Urban Transport, water, energy, sustainability and health	7 students/ 1 faculty
Kalindi College	Kalindi College	08.1.18	1 year	To isolate the microbes from the three types of soil samples a. Reclaimed and un restored land b. Reclaimed sites with a afforestation and c. Overburdens	10 students/ 1 faculty
Faculty of Graduate Studies, University of Sri Jayewardenapura	Faculty of Graduate Studies, University of Sri Jayewardenapura	21.8.2018	5 years	Joint research activities and publications	3 students/ 1 faculty

Annexure 5.3.2 **List of the Committee and Notification from 2015-20**

teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 71800222

NOTIFICATION
No.41 of 2019-20

Ref.: NOT/R35 23 June 2020

Sub: Entrepreneurship Development Cell (EDC)

1. Refer to Para of TERI School of Advanced Studies (TERI SAS) notification No.21 2018-19 dated 26 February 2019.

2. The Committee is reconstituted as Entrepreneurship Development Cell as under and notified herewith:-

(a) Dr Shruti Sharma Rana, Assistant Professor, Department of Business and Sustainability - Coordinator

Faculty Advisors

(b) Dr Sapan Thapar, Associate Professor, Department of Energy and Environment

(c) Dr Anu Rani Sharma, Assistant Professor, Department of Natural Resources

(d) Dr Gopal Sarangi, Assistant Professor, Department of Policy Studies

(e) Dr Deepty Jain, Assistant Professor, Department of Energy and Environment

(f) Dr Udit Soni, Assistant Professor, Department of Plant Biotechnology

Student Members

(g) Ms Zeenat Farooq, 1900075MTR

(h) Ms Viral Dipakbhai Joshi 1900091MTU

(i) Ms Pallavi Keshri, 1900237MBS

(j) Ms Pooja, 1900223MBS

(k) Mr Sandipan Samanta, 1900081MTW

Alumni Member

(l) Mr Lucky Agarwal, Alumni

Admin

(m) Ms Jyoti Mehlawat - Secretary

teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.36 of 2019-20

Ref.: NOT/R35

Date: 29 May 2020

Sub: Anti Ragging Committee

1. Refer to UGC Regulations on curbing the menace of ragging in higher education institutions 2009.

2. The following will constitute the Anti Ragging Committee of TERI School of Advanced Studies: -

(a) The Vice Chancellor - Chairperson

(b) Representative of Faculty members - Dr Kavita Sardana , Dr Akash Sondhi

(c) Representative of non-teaching Staff – Associate Director (Admin) - Convener

(d) Representative of Students belonging to fresher category (To be nominated by Deputy Registrar each AY by 01st Sep, on advice of Dean(Academic))

(e) Representative of Senior Student (To be nominated by Deputy Registrar each AY by 01st Aug on advice of Dean (Academic))

(f) Representative of Parents (To be nominated by Deputy Registrar each Academic Year by 01st Aug every year)

(g) Representative of NGO involved in youth activities (To be suggested by Placement & External Relations Officer by 01st Aug every year on advice of Chairperson)

(h) Representative of Civil/Police organization (to be invited by Convener to each meeting)

(i) Communication Coordinator - Secretary

3. The terms and conditions of the Committee shall be as laid down in the relevant regulations. The Convener will intimate the members on receipt of names and keep it updated. The Secretary shall maintain the minutes and all records wrt the provisions of the relevant regulations. An annual report on the activities of the Committee in the academic year be shared with IQAC.

4. This issues with the approval of the Vice Chancellor.

29 May 2020

Capt. Pradeep Kr. Padhy (Retd.)
Registrar

Copy to :
The Vice Chancellor
All Members & Secretary
Dy Registrar (Academic Admin)

teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.35 of 2019-20

Ref.: NOT/R35

Date: 29 May 2020

Sub : Diversity, Equality and Ethics Committee

1. Refer to the following :-

(a) Policy on Equality, Diversity and Inclusion,2015 at Chapter XII of Compendium Part I.

(b) Para F(iv)(i) of Chapter II of Compendium Part II of Rules of TERI SAS.

(c) Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989.

2. The following will constitute "Diversity, Equality and Ethics Committee" of the TERI SAS:-

(a) Dean (Academic) - Presiding Officer

(b) One member from faculty – Dr Chubamenla Jamir

(c) One student member from minority/disadvantaged group (Gender Champion to be selected by Presiding Officer on 01 Aug of every year)- Member

(d) One International Student (Name to be provided by Dy Registrar by 01 Aug of every year) – Member

(e) Associate Director (Admin) – Member Secretary

3. Suitable member(s) from SC / ST etc. to be co-opted if the complaint/issue pertains to member(s) of such scheduled caste, tribe or group duly notified by the Government.

4. The terms and conditions of the committee shall be as per the guidelines specified in the extant rules. The members will be intimated by the Secretary on receipt of their names and the Committee names to be kept updated annually. The Secretary shall maintain the minutes and all records wrt the matters related to the Committee. An annual report on the activities of the Committee in the academic year be shared with IQAC.

5. This issues with the approval of the Vice Chancellor.

29 may 2020

Capt. Pradeep Kr. Padhy (Retd.)
Registrar

Copy to :
The Vice Chancellor
The Presiding Officer, All members & Secretary

teri school of advanced studies
10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.27 of 2019-20

Ref.: NOT/R35

Date: 13 March 2020

1. In accordance with the rules in the Compendium of Policies, Guidelines Part I & II, the following committees have been constituted in the TERI School of Advanced Studies. All the committees are required to act in their respective areas as per the roles and responsibilities laid down in the above guidelines.

2. All Convenors are requested to take over from the former Convenors the previous minutes and get briefed about the progress of the committees (wherever applicable).

3. The files/documents related to the committee shall be held by the Secretary of the Committee.

1. Alumni Committee
(a) Ms Ranjana Ray Chaudhuri (Convenor)
(b) All Programme Coordinators
(c) Ms Sonika Goyal (Secretary)

2. Library Committee
(a) Dr Shantanu De Roy (Convenor)
(b) Dr Som Mondal
(c) Dr Bhawna Bali
(d) Mr Ratan Kumar Jha (Secretary)

3. Hostel, Canteen and Security Committee
(a) Dr Sherly M.A., Warden (Convenor)
(b) Dr Sudipta Chatterjee
(c) Dr Pallavi Somvanshi
(d) Ms Gauri Rana
(e) Mr Devinder Kumar
(f) One Day Scholar & One Hosteller for representing students' problems. (As on required basis to be nominated by Registrar)
(g) Mr Sandeep Arora (Secretary)

teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070; Phone: 26122222

NOTIFICATION
No.22 of 2019-20

Ref.: NOT/R35

Date: 25 February 2020

Refer to guidelines for the creation of IQAC version 7 dated 20 February 2020 promulgated by NAAC. The composition of IQAC at TERI School of Advanced Studies shall be as follows:-

Chairperson

(a) Prof. Manipadma Datta, Vice Chancellor (Acting)

Member, Board of Management

(b) Prof. Ramakrishnan Sitaraman, Professor, Department of Biotechnology

Faculty Members

(c) Prof. Anandita Singh, Professor, Department of Biotechnology
(d) Dr. Chander K Singh, Asst. Professor, Department of Energy and Environment
(e) Dr. Abhijit Datey, Asst. Professor, Department of Energy and Environment
(f) Dr. Aviruch Bhatia, Asst. Professor, Department of Energy and Environment
(g) Dr. Vidhi Madaan Chadda, Asst. Professor, Centre for Post Graduate Legal Studies
(h) Dr. Naqui Anwer, Associate Professor, Department of Energy and Environment
(i) Dr. Manish K Shrivastava, Asst. Professor, Department of Energy and Environment
(j) Dr. Neeti, Asst. Professor, Department of Natural Resources

Senior Administrative Officers

(k) Capt. Pradeep K Padhy (Retd.), Registrar
(l) Mr. Dhanraj Singh, Deputy Finance Officer
(m) Mr. Sandeep Arora, Associate Director (Administration)
(n) Mr. Kamal Sharma, Deputy Registrar (Academic Administration)
(o) Mr. V Ganesh, Asst. Registrar (Academic Administration)
(p) Mr. Ratan K Jha, Asst. Librarian
(q) Ms. Pooja Choudhary, System Analyst (IT)
(r) Mr. Rakesh Joshi, Asst. Controller of Examination

Nominee from Alumni

(s) Ms. Ananya Khosla, Schneider Electric (Member, EC, TERI SAS Alumni Association)

Student nominee

(t) Ms. Tanvi Khurana, Doctoral Student, Department of Policy Studies

Nominee from employer/industrialist

(u) Mr. Prateek Sengupta, Sustainability and Climate Change

Coordinator

(v) Dr. Nandan Nawn, Associate Professor, Department of Policy Studies

The guidelines with respect to the objective and functions of the IQAC is enclosed herewith.

This notification supersedes all other notifications issued earlier on the subject.

Capt. Pradeep Kr. Padhy (Retd.)
Registrar

Encl: as above

teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.20 of 2019-20

Ref.: NOT/R35

January 28, 2020

Sub: Student Grievance Redressal Committee

Refer to Notification No.01 of 2019-20 dated July 12, 2019.

Ms Ashmeet Kaur (Reg No.1540RPB) will act as Student Nominee (special invitee) in the Student Grievance Redressal Committee with immediate effect.

This issues with the approval of the competent authority.

Pradeep Kr Padhy
Registrar

Copy to:

Vice Chancellor
Dean (Academic)
Chairperson, Student Grievance Redressal Committee
Registrar
Ms Ashmeet Kaur (Reg No.1540RPB)
Notification file

teri school of advanced studies
10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 71800222

NOTIFICATION
No.01 of 2019-20

Ref.: NOT/R35

July 12, 2019

1. Refer to TERI School of Advanced Studies notification No.21 dated February 26, 2019. The composition of Student Grievance Redressal Committee is hereby amended and re-issued as under:-

(a)	Dr Anandita Singh	-	Chairperson
(b)	Dr Shaleen Singhal	-	Member
(c)	Dr Naqui Anwer	-	Member
(d)	Dr Vishnu Konoorayar	-	Member
(e)	Mr Shri Prakash	-	Member
(f)	Student Nominee (based on academic merit to be provided by Registrar office)	-	Special invitee
(g)	Mr Kamal Sharma	-	Secretary

Pradeep Kr Padhy
Registrar

Distribution:
Notification file

teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.21 of 2018-19

No : TS/100/VC/Policy

Date:- 26 February 2019

In accordance with, the regulations specified by Statutory bodies and rules in the Compendium of Policies, Guidelines Part I & II, the following committees have been constituted in the TERI School of Advanced Studies. All the committees are required to act in their respective areas as per the roles and responsibilities laid down in the above guidelines.

All Chairpersons/Convenors are requested to take over from the former Chairpersons/Convenors the previous minutes and get briefed about the progress of the committees(wherever applicable).

1. Alumni Committee
(a) Dr Manipadma Datta
(b) Dr Shaleen Singhal
(c) Dr Bhawna Bali
(d) Ms Ranjana Ray Chaudhuri (Convenor)
(e) Dr Soumendu Sarkar
(f) Ms Sonika Goyal

2. Library Committee
(a) Dr Naqui Anwer
(b) Dr Shaleen Singhal
(c) Dr Chander K Singh (Convenor)
(d) Dr Shantanu De Roy
(e) Dr L.N. Venkataraman
(f) Mr Ratan Kumar Jha

3. Hostel, Canteen and Security Committee
(a) Dr Arun Kansal
(b) Dr Nandan Nawn
(c) Dr Sudipta Chatterjee
(d) Dr Kavita Sardana, Warden (Convenor)
(e) Ms Preeti Dogra
(f) Mr Sandeep Arora
(g) One Day Scholar & One Hosteller for representing students' problems.(As on required basis to be nominated by Registrar)

14. Institutional Academic Integrity Panel (IAIP)
(a) Dr S Ramakrishnan, Chairman
(b) Dr Atul Kumar, Member
(c) Dr Vivek Suneja, External member
(d) Dr Jaya Vasudevan, Member
(e) Assistant Registrar

15. Faculty Conduct Committee
(a) Vice Chancellor
(b) All Deans
(c) Registrar

16. Staff Disciplinary Committee	
(a) Presiding Officer	To be nominated by Registrar
(b) Two Members (section Incharge – 1; Admin section – 1)	
(c) Two nominated members (in case complainant is lady there will be minimum of two lady members)	

17. Student Disciplinary Committee
Nominee of VC – Chairperson
Deans – Member
Concerned Head of Department – Member
Registrar – Secretary

Other important Committees

18. Institutional Biosafety Committee
(a) Prof S Ramakrishnan, Chairman
(b) Dr.Chaithanya Madhurantakam, Member Secretary
(c) Dr. Baibaswata Nayak, AIIMS, New Delhi – DBT Nominee
(d) Prof. Anandita Singh, Member
(e) Dr.Pallavi Somvanshi, Member
(f) Dr.Udit Soni, Member
(g) Dr. Shashi Bhushan Tripathi, Member
(h) Prof.Indranil Das Gupta, Dept. of Plant Molecular Biology, Delhi University - outside expert
(i) Dr.Tapan Kumar Mondal, Scientist, NRCPB, New Delhi – outside expert
(j) Dr.Ritabh Kumar, Indian Spinal Injuries Centre, New Delhi – Medical/Biosafety officer

19. Diversity, Equality and Ethics Committee
(a) Dr Prateek Sharma, Presiding Officer
(b) Dr Chubamenla Jamir
(c) Dr A Saravanan
(d) Mr Kamal Sharma
(e) Mr Saurabh Nepal (Int Student)
(f) Ms Harshita Sharma (Student)
(g) Member from SC/ST/OBC etc.

20. Internal Complaints Committee to inquire into the complaint of Sexual Harassment
(a) Dr Fawzia Tarannum, Presiding Officer
(b) Dr Jaya Vasudevan
(c) Dr Sukanya Das
(d) Mr Shri Prakash
(e) Mr Kamal Sharma
(f) Ms Ratna Sudarshan, External member
(g) Students (03)

21. Grievance Redressal for Academic & non-academic staff
(b) Dean (Academic)
(c) Dean (Research & Relationships)
(d) Registrar
(e) One professor
(f) Deputy Registrar

22. Internal Quality Assurance Cell (i-QAC)
(a) Dr Leena Srivastava, Chairperson
(b) Capt. Pradeep Kr. Padhy (Retd.)
(c) Dr Anandita Singh
(d) Dr Sudipta Chatterjee
(e) Dr Vinay S Prasad Sinha
(f) Dr Kamna Sachdeva
(g) Dr Vishnu Konoorayar
(h) Dr L.N. Venkataraman
(i) Dr S. Ramakrishnan
(j) Mr Romit Sen, Nominee from Alumni
(k) Mr Rohit Sharma, Student nominee
(l) Mr Anil Kumar Gupta, Nominee from employer/industrialist
(m) Mr. Surender Kumar Singh, Nominee from employer/industrialist
(n) Mr Dhanraj Singh
(o) Mr Kamal Sharma
(p) Mr Ratan Kumar Jha
(q) Dr Nandan Nawn. Coordinator

23. Anti Ragging Committee
(a) Dr Leena Srivastava
(b) Dr Manipadma Datta
(c) Dr Anu Rani Sharma
(d) Dr Gopal Sarangi
(e) Dr Swarup Dutta
(f) Mr Sandeep Arora (Convenor)
(g) Student (To be nominated by Deputy Registrar)
(h) Parent (To be nominated by Deputy Registrar)
(i) NGO (To be nominated by Placement & External Relations Officer)
(j) Ms Garima Chhibber

24. IPR Committee
(a) Dr Arun Kansal, Chairman
(b) Head of the concerned Department - Member
(c) Faculty In-charge of Laboratory - Member
(d) Representative of Finance Officer – Convenor
(e) Assistant Registrar, Secretary

25. Student Grievance Redressal Committee
(a) Mr Shri Prakash - Chairperson
(b) Dr Anandita Singh
(c) Dr Naqui Anwer
(d) Dr Vishnu Konoorayar
(e) Student Nominee(based on academic merit to be provided by Registrar office) - Special invitee
(f) Mr Kamal Sharma – Secretary

2. This notification supersedes all other notifications issued earlier on the subject.

Capt. Bradeep Kr. Padhy (Retd.)
Registrar

teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.09 of 2018-19

Ref.: NOT/R35

November 30, 2018

The Internal Quality Assurance Cell (i-QAC) of the TERI School of Advanced Studies is reconstituted as follows:-

Chairperson

(i) Dr Leena Srivastava

Senior Administrative Officer

(ii) Capt Pradeep Kr Padhy (Retd.)

Three to eight teachers

(iii) Dr Anandita Singh
(iv) Dr Sudipta Chatterjee
(v) Dr Vinay S Prasad Sinha
(vi) Dr Kamna Sachdeva
(vii) Dr Vishnu Konoorayar
(viii) Dr L.N. Venkataraman

One member from the Management

(ix) Dr Sitaraman Ramakrishnan

One/two nominees from local society, Students and Alumni

(x) Mr Romit Sen (Associate Director, WWF), Nominee from Alumni
(xi) Mr Rohit Sharma, Nominee from student

One/two nominees from Employers/Industrialists/stakeholders

(xii) Mr Anil Kumar Gupta, Nominee from Employer/Industrialist
(xiii) Mr Surender Kumar Singh, Nominee from Employer/Industrialist

One senior teacher as the Coordinator of the IQAC

(xiv) Dr Nandan Nawn

The IQAC will be guided by guidelines issued by NAAC from time to time. (http://www.naac.gov.in/).

This supersedes all other notifications issued on this matter.

Pradeep Kr Padhy
Registrar

Distribution:
Notification file

teri school of advanced studies
10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.04 of 2018-19

Ref.: NOT/R35

October 1, 2018

The Internal Quality Assurance Cell (i-QAC) of the TERI School of Advanced Studies is reconstituted as follows:-

(i) Dr Leena Srivastava
(ii) Dr Rajiv Seth
(iii) Capt Pradeep Padhy (Retd.)
(iv) Dr Prateek Sharma
(v) Dr Arun Kansal
(vi) Dr Anandita Singh (Convenor)
(vii) Dr Nandan Nawn
(viii) Dr Sapna Narula
(ix) Dr Sitaraman Ramakrishnan
(x) Dr L.N. Venkataraman
(xi) Mr Romit Sen (Associate Director, WWF), Nominee from Alumni
(xii) Mr Anil Kumar Gupta, Nominee from Employer/Industrialist
(xiii) Mr Surender Kumar Singh, Nominee from Employer/Industrialist
(xiv) Mr Rohit Sharma, Nominee from student

This supersedes all other notifications issued on this matter.

Rajiv Seth
Pro Vice-Chancellor

Distribution:
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teri school of advanced studies

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.12 of 2017-18

No : TS/100/VC/Policy

Date:- 23 March, 2018

In accordance with, the Chapter II of the Compendium of Policies, Guidelines Part II, the following committees have been constituted in the TERI School of Advanced Studies. All the committees are required to act in their respective areas as per the roles and responsibilities laid down in the above guidelines.

All Convenors are requested to take over from the former Convenors the previous minutes and get briefed about the progress of the committees.

1. Alumni Committee
(a) Dr Suresh Jain
(b) Dr Manipadma Datta
(c) Dr Shaleen Singhal
(d) Ms Ranjana Ray Chaudhuri (Convenor)
(e) Dr Vinay P. Sinha
(f) Dr Prashant Kumar Singh
(g) Ms Sonika Goyal

2. Internal Quality Assurance Cell (i-QAC)
(a) Dr Leena Srivastava
(b) Dr Rajiv Seth
(c) Capt Pradeep Padhy (Retd.)
(d) Dr Arun Kansal (Convenor)
(e) Dr Prateek Sharma
(f) Dr Suresh Jain
(g) Dr Nandan Nawn
(h) Dr Sapna Narula
(i) Dr Sitaraman Ramakrishnan
(j) Dr M.V. Shiju
(k) Mr Romit Sen (Associate Director, WWF), Nominee from Alumni
(l) Mr Anil Kumar Gupta, Nominee from Employer/Industrialist
(m) Mr Surender Kumar Singh, Nominee from Employer/Industrialist
(n) Mr Rohit Sharma, Nominee from student

23/3/18

3. Internal Complaints Committee to inquire into the complaint of Sexual Harassment

(a) Dr Smriti Das, Presiding Officer (Convenor)
(b) Dr Kamna Sachdeva , Faculty Member
(c) Dr Neeti, Faculty Member
(d) Prof Shri Prakash, Member
(e) Mr Kamal Sharma, Member
(f) Ms Ratna Sudarshan
(g) Student members (04)

4. Library Committee

(a) Dr. Naqui Anwer
(b) Dr S. Ramakrishnan
(c) Dr Chander K Singh (Convenor)
(d) Dr. Shantanu De Roy
(e) Dr Neeti
(f) Mr Ratan Kumar Jha

5. Student Engagement, Sports and Clubs Committee

(a) Mr Abhijit Datey (Convenor)
(b) Dr Soumendu Sarkar
(c) Dr Swarup Dutta
(d) Dr Bhawna Bali
(e) Ms. Supriya Gulati
(f) Ms. Kaavya Singh

6. Hostel, Canteen, Hygiene, Safety and Security Committee

(a) Dr Arun Kansal
(b) Dr Anandita Singh
(c) Dr Rinki Deo, Warden (Convenor)
(d) Dr Gaurav
(e) Dr. Gopal Sarangi
(f) Mr Sapan Thapar
(g) Ms Preeti Dogra
(h) Mr Sandeep Arora
(i) Mr R.K. Sharma
(j) Mr Shyam Dogra
(k) Asst Warden
(l) One Day Scholar & One Hosteller for representing students' problems.(As on required basis

7. Admissions and Scholarships Committee

(a) Capt Pradeep Padhy (Retd.)
(b) Dr Sudipto Chatterjee
(c) Dr Chaithanya Madhurantakam
(d) Dr Pallavi Somvanshi
(e) Dr Seema Sangita (Convenor)
(f) Dr Montu Bose
(g) Dr Atul Kumar
(h) Mr Kamal Sharma
(i) Mr Devinder Kumar

23/3/18

8. Institute/Faculty Seminars Committee
(a) Dr L.N. Venkataraman
(b) Dr Sukanya Das
(c) Ms Deepty Jain (Convenor)
(d) Ms Preeti Dogra

9. Outreach, IT & Website Committee
(a) Capt Pradeep Padhy
(b) Dr Nirupam Datta
(c) Dr Nithiyanandam Yogeswaran
(d) Dr Shashi Bhushan Tripathi
(e) Dr Som Mondal (Convenor)
(f) Dr Prashant Kumar Singh
(g) Dr Ritika Mahajan
(h) Dr Vishnu Konoorayar
(i) Mr V Ganesh
(j) Ms Sonika Goyal
(k) Mr Shobhit Mehra
(l) Ms Supriya Gulati
(m) Ms Garima Chhibber
(n) Ms Kaavya Singh

10. Diversity, Equality and Ethics Committee
(a) Dr Prateek Sharma, Presiding Officer
(b) Ms Fawzia Tarannum
(c) Dr M V Shiju
(d) Dr Kavita Sardana
(e) Dr Chubamenla Jamir
(f) Dr Priyanka Kaushal (Convenor)
(g) Mr Kamal Sharma
(h) Ms Hone Paing (Int Student)
(i) Ms Bahaar Pandey (Student)

11. Internal Grants Committee
(a) Dr Manipadma Datta
(b) Dr Prateek Sharma
(c) Dr Arun Kansal
(d) Dr Udit Soni
(e) Dr Anu Rani Sharma (Convenor)
(f) Mr Dhanraj Singh

12. Student Grievance Redressal Committee
(a) Prof Shri Prakash - Chairperson
(b) Dr Anandita Singh
(c) Dr Naqui Anwer
(d) Dr Vishnu Konoorayar
(e) Student Nominee (based on academic merit) – Special invitee
(f) Mr Kamal Sharma – Secretary

23/3/18

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.14 of 2016-17

Ref.: NOT/R35

April 07, 2017

Composition & Roles of the Internal Quality Assurance Cell

Please refer to TU notification no. TU/100/VC/Policy/Com dated 15 February 2017. The Internal Quality Assurance Cell has been reconstituted as follows:

Dr Leena Srivastava, VC	Chairperson
Dr Rajiv Seth, Pro VC	Member
Capt. Pradeep Kumar Padhy (Retd.), Registrar	Member
Dr Arun Kansal, Dean (Research and Relationships) Director, (IQUAC)	Member (Convener)
Dr Prateek Sharma, Dean (Academic)	Member
Dr Suresh Jain, HOD	Member
Dr Nandan Nawn, HOD	Member
Dr Sapna Narula, HOD	Member
Dr Sitaraman Ramakrishnan, Faculty	Member
Dr, M V Shiju, Faculty	Member
Mr Romit Sen (Associate Director, WWF), Nominee from Alumni	Member
Mr Anil Kumar Gupta, Nominee from Employer/Industrialist	Member
Mr Surender Kumar Singh, Nominee from Employer/Industrialist	Member
Mr Rohit Sharma, Nominee from Student	Member

IQUAC will facilitate the following:

- Ensure heightened level of clarity and focus in University's functioning towards quality enhancement;
- Ensure internalization of the quality culture;
- Ensure enhancement and coordination among various activities of the University and institutionalize all good practices;
- Provide a sound basis for decision-making to improve institutional functioning;
- Act as a dynamic system for quality changes in the University;
- Compile Self Study Report (SSR) and Annual Quality Assurance Reports (AQAR) for NAAC.

Rajiv Seth
Pro Vice-Chancellor

Distribution:
Notification file

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.14 of 2016-17

Ref.: NOT/R35 April 07, 2017

Composition & Roles of the Internal Quality Assurance Cell

Please refer to TU notification no. TU/100/VC/Policy/Com dated 15 February 2017. The Internal Quality Assurance Cell has been reconstituted as follows:

Dr Leena Srivastava, VC	Chairperson
Dr Rajiv Seth, Pro VC	Member
Capt. Pradeep Kumar Padhy (Retd.), Registrar	Member
Dr Arun Kansal, Dean (Research and Relationships) Director, (IQUAC)	Member (Convener)
Dr Prateek Sharma, Dean (Academic)	Member
Dr Suresh Jain, HOD	Member
Dr Nandan Nawn, HOD	Member
Dr Sapna Narula, HOD	Member
Dr Sitaraman Ramakrishnan, Faculty	Member
Dr, M V Shiju, Faculty	Member
Mr Romit Sen (Associate Director, WWF), Nominee from Alumni	Member
Mr Anil Kumar Gupta, Nominee from Employer/Industrialist	Member
Mr Surender Kumar Singh, Nominee from Employer/Industrialist	Member
Mr Rohit Sharma, Nominee from Student	

IQUAC will facilitate the following:

. Ensure heightened level of clarity and focus in University's functioning towards quality enhancement;
. Ensure internalization of the quality culture;
. Ensure enhancement and coordination among various activities of the University and institutionalize all good practices;
. Provide a sound basis for decision-making to improve institutional functioning;
. Act as a dynamic system for quality changes in the University;
. Compile Self Study Report (SSR) and Annual Quality Assurance Reports (AQAR) for NAAC.

Rajiv Seth
Pro Vice-Chancellor

Distribution:
Notification file

No : TU/100/VC/Policy/Com

Date:- 15 February, 2017

Constitution of TU Committees

In accordance with, the TU Notification no. No.TU/100/VC/Policy/Com dated 04 February, 2016, the following committees have been constituted in the TERI University. All the committees are required to act in their respective areas as per the roles and responsibilities laid down in the notification ibid w.e.f. February 01, 2017.

All Convenors are requested to take over from the former Convenors previous minutes and briefed about the progress of the committees.

1. Alumni Committee
(a) Dr Suresh Jain
(b) Dr Manipadma Datta
(c) Dr Shaleen Singhal
(d) Ms Ranjana Ray Chaudhuri (Convenor)
(e) Dr Vinay P. Sinha
(f) Dr Prashant Kumar Singh
(g) Ms Sonika Goyal

2. Internal Quality Assurance Cell (i-QAC)
(a) Capt Pradeep Padhy (Retd.)
(b) Dr Suresh Jain
(c) Dr Nandan Nawn
(d) Dr Shaleen Singhal
(e) Dr Arun Kansal (Convenor)
(f) Dr Prateek Sharma
(g) Dr Sapna Narula

3. Internal Complaints Committee to inquire into the complaint of Sexual Harassment
(a) Dr Smriti Das, Presiding Officer (Convenor)
(b) Dr Kamna Sachdeva , Faculty Member
(c) Dr Neeti, Faculty Member
(d) Prof S.Sundar, Member
(e) Mr Kamal Sharma, Member
(f) Ms Ratna Sudarshan
(g) Student members (04)

4. Library Committee
(a) Dr. Naqui Anwer
(b) Dr S. Ramakrishnan
(c) Dr Chander K Singh (Convenor)
(d) Dr. Shantanu De Roy
(e) Dr Rinki Deo
(f) Mr Ratan Kumar Jha

5. Student Engagement, Sports and Clubs Committee

(a) Mr Amrithnath S Babu (Convenor)
(b) Dr Soumendu Sarkar
(c) Dr Swarup Dutta
(d) Mr Vikas Bhati
(e) Ms Mangala Dubey

6. Hostel, Canteen, Hygiene, Safety and Security Committee

(a) Dr Arun Kansal
(b) Dr Anandita Singh
(c) Dr Kavita Sardana, Warden (Convenor)
(d) Dr Gaurav
(e) Dr. Gopal Sarangi
(f) Mr Dhanraj Singh
(g) Mr Sapan Thapar
(h) Mr Vikas Bhati
(i) Mr Sandeep Arora
(j) Mr R.K. Sharma
(k) Mr Shyam Dogra
(l) Asst Warden (one)
(m) One Day Scholar & One Hosteller for representing students' problems.(As on required

7. Admissions and Scholarships Committee

(a) Capt Pradeep Padhy (Retd.)
(b) Dr Sudipto Chatterjee
(c) Dr Chaithanya Madhurantakam
(d) Dr Pallavi Somvanshi
(e) Dr Seema Sangita (Convenor)
(f) Dr Montu Bose
(g) Dr Atul Kumar
(h) Mr Kamal Sharma
(i) Mr Devinder Kumar

8. Institute/Faculty Seminars Committee

(a) Dr L.N. Venkataraman (Convenor)
(b) Dr Sukanya Das
(c) Ms Deepty Jain
(d) Mr Vikas Bhati

9. Outreach, IT & Website Committee

(a) Capt Pradeep Padhy
(b) Dr Nirupam Datta
(c) Dr Nithiyanandam Yogeswaran (Convenor)
(d) Dr Sonika Gupta
(e) Dr Som Mondal
(f) Dr Bhawna Bali
(g) Mr V Ganesh
(h) Ms Sonika Goyal
(i) Ms Pooja Choudhary

10. Diversity, Equality and Ethics Committee
(a) Dr Prateek Sharma, President
(b) Ms Fawzia Tarannum
(c) Dr M V Shiju
(d) Dr Basudev Prasad
(e) Dr Ritika Mahajan
(f) Dr Chubamenla Jamir (Convenor)
(g) Dr Priyanka Kaushal
(h) Mr Kamal Sharma
(i) Ms Kiden Gladys Robert (Int Student)
(j) Ms Sabnam Kalita (Student)

11. Internal Grants Committee
(a) Dr Manipadma Datta
(b) Dr Prateek Sharma
(c) Dr Arun Kansal
(d) Dr Udit Soni
(e) Dr Anu Rani Sharma (Convenor)
(f) Dr Neeti
(g) Mr Dhanraj Singh

12. Student Disciplinary Committee
TERI University policy TU/BM 20.4.1 dated 30 May 2016 is relevant

2. This notification supersedes all other notifications issued earlier on the subject.

Dr. Rajiv Seth
Pro Vice Chancellor

15 Feb 2017

10, Institutional Area, Vasant Kunj, New Delhi - 110 070
Phone: 26122222

NOTIFICATION
No.3 of 2016-17

Ref.: NOT/R35

14 September 2016

The Internal Complaints Committee to inquire into the complaint of Sexual Harassment for 2016-17 will be as follows:

(a) Dr. Smriti Das, Presiding Officer (Convenor)
(b) Dr. Kamna Sachdeva , Faculty Member
(c) Dr Neeti, Faculty Member
(d) Prof. S.Sundar, Member
(e) Mr Kamal Sharma, Member
(f) Ms. Ratna Sudarshan
(g) 03 Students if the matter involves students

Rajiv Seth
Pro Vice-Chancellor

Distribution:
ML-Faculty
Notification file

No : TU/100/VC/Policy/Com

Date:- 8 February, 2016

Constitution of TU Committees

In accordance with, the TU Notification no. No.TU/100/VC/Policy/Com dated 04 February,2016, the following committees have been constituted in the TERI University. All the committees are required to act in their respective areas as per the roles and responsibilities laid down in the notification ibid.

1. Alumni Committee
(a) Dr. Manipadma Datta
(b) Dr.Ranjana Roy Chodhury (Convenor)
(c) Dr.Vinay P. Sinha
(d) Ms.Sonika Goyal

2.Internal Quality Assurance Team (i-QAT)
(a) Capt Pradeep Padhy (Retd.)
(b) Dr. Suresh Jain
(c) Dr. Sapna A Narula (Convenor)
(d) Dr. S.Ramakrishnan

3.Ethics Committee
(a) Dr. Basudev Prasad
(b) Dr. M P Ram Mohan (Convenor)
(c) Dr. LN Venkataraman
(d) Dr. Ritika Mahajan
(e) Mr. Sandeep Arora

4. Sexual Harassment Committee
(a) Dr. Kamna Sachdeva, Presiding Officer (Convenor)
(b) Dr. Smriti Das
(c) Dr. Neeti
(d) Prof.S.Sunder
(e) Ms. Ratna Sudarshan

5. Phd Programme Review Committee
(a) Dr. Prateek Sharma
(b) Dr. Shaleen Singhal
(c) Dr. Anu Rani Sharma (Convenor)
(d) Mr. Prem Suresh

(g) Dr.Bhawna Bali
(h) Mr.Sandeep Arora
(i) Ms.Sonika Goyal
(j) Mr.Ganesh
(k) Ms Pooja Choudhary (TERI)

13. Equality Committee
(a) Dr.Prateek Sharma
(b) Dr. Chubamenla Jamir (convenor)
(c) Mr.Sandeep Arora
(d) Ms.Sabrin Jahan (Int Student)
(e) Md.Shahbaz Khan (Int Student)

14. Scholarships Committee
(a) Dr.Pallavi Somvanshi
(b) Dr.Seema Sangita (Convenor)
(c) Dr.Sudipto Chatterjee
(d) Mr.Prem Suresh

15. Internal Grants Committee
(a) Dr.Prateek Sharma (Convenor)
(b) Dr.Manipadma Datta
(c) Dr.Udit Soni
(d) Mr.M.V.Shiju
(e) Mr.Dhanraj Singh

16. Distance Learning
(a) Mr.Amit Kumar
(b) Dr.B.Prasad
(c) Dr.Priyanka Kaushal (Convenor)
(d) Ms.Pooja Choudhary (TERI)
(e) Mr.Kamal Sharma

17. Fund Raising Committee
(a) Dr.Rajiv Seth (Convenor)
(b) Mr.Amit Kumar
(c) Dr.Shaleen Singhal
(d) Dr.Suresh Jain
(e) Mr.Dhanraj Singh

Dr.Rajiv Seth
Acting Vice Chancellor

Annexure 5.3.3 DNR participation in sports activity

TERI SPORTS CHAMPIONSHIP-2019

For many years, it has been a tradition to organize TERI's annual sports event "TERI SPORTS CHAMPIONSHIP. This year, the same has been organized from 3rd Oct. 2019 to 12th Oct 2019 at TERI SAS Campus, Vasant Kunj and TERI GRAM, GWAL PAHARI. The TSC-2019 was inaugurated by Registrar **Capt. Pradeep Kumar Padhy (Retd.), Dr. Vinay Sinha and Dr. Atul Kumar**. In this sports event, teams had participated in sports events like, Cricket, Football, tug of war, Athletics, table tennis, Volleyball, Badminton. In order to manage such big events, considerable finance is required and we got "Canara Bank" on board as sponsor for the TERI SPORTS CHAMPIONSHIP-2019 event.
The event witnessed huge participation in almost all games. Students as well as faculties along with administrative staffs too participated in games. Two-week long sports event was conducted smoothly.
On behalf of TERI Sports Committee and students, I would like to thank Pro Vice-Chancellor Sir, Registrar Sir and Administration department for their support throughout the event.

The list of members in the Organizing Committee/Sports Club:

Name of Student	Sports
Palash Raghava (**Student Secretary**) Apoorva Nandawana Akash Gaur	Cricket
Raj	Football
Adeel Swati	Table Tennis
Aishwarya Shrish	Badminton
Anand	Volleyball
Ritwik Aditya Dikshita	Basketball

Sponsors: **Canara Bank**
Sponsorship amount: **Rs 15000/-**



Dates	Venue	Event	Duration

3rd October, Thursday	TERI SAS	1. Inauguration 2. Badminton: Women's Singles & Doubles 3. Men's Table Tennis 4. Football	1700 hrs. Events From 1730-2000 hrs.
4th October, Friday	TERI SAS	1. Badminton: Men's Singles & Doubles 2. Football	1700-2030 hrs.
5th October, Saturday	TERI SAS	1. Table Tennis 2. Badminton Singles 3. Badminton Doubles 4. Badminton Mixed Doubles 5. Football	1700-2030 hrs.
7th October, Monday	TERI SAS	1. Badminton Mixed Doubles 2. Basketball	1700-2030 hrs.
9th October, Wednesday	TERI Gwalpahadi	1. Cricket 2. Athletics	1000-1600 hrs.
10th October, Thursday	TERI Gwalpahadi	1. Cricket 2. 100 m race 3. 200 m Race 4. 400 m Race 1. Shot Put	1000-1600 hrs.
11th October, Friday	TERI Gwalpahadi	1. Cricket 2. 100 m race 3. 200 m Race 4. 400 m Race 5. Shot Put	1000-1600 hrs.
12th October, Saturday	TERI SAS	Semi Finals and Finals of all events held from 3rd-7th October 2019.	1000-1700 hrs.

Schedule: Sports Championship – 2019

TSC tournament

Winner list

Football
Sarthak's team which includes Raj (ESRM SEM III), Sarthak (Alumni), Mike (PhD Scholar) and Harsh (Alumni) for winning the

Table Tennis

Men's Singles	Rakesh (Admin.)
Men's Doubles	Gaurav (MBA) & Anand (PhD)
Women's Singles	Swati (ESRM)
Women's Doubles	Swati(ESRM) & Harsha (ESRM)
Mixed Doubles	Raj (ESRM) & Malavika(ESRM)

Badminton

Men's Doubles	Yuvraj and Akshay Gupta
Mixed Doubles	Shirish Bhardwaj and Aishwarya Kulkarni
Women's Singles	Aishwarya Kulkarni
Women's Doubles	Anmol Sehgal and Aishwarya Kulkarni

Cricket
Winner– Team Muneer
Runners Up – Team Dhanraj
3rd- Team Palash

100 m (Men)
1st - Shubhendra Singh
2nd - Chetan Gusain
3rd - Nimish Kumar

200 m (Men)
1st - Shubhendra Singh
2nd - Nimish Kumar
3rd - Chetan Gusain

100 m (Women)
1st - Alankrita Mallick
2nd - Anuja
3rd - Sayantani Majumder

200 m (Women)
1st - Anuja
2nd - Alankrita Mallick

Relay - 4x100 (Mixed)
1st - Hardik, Haripriya, Dhananjay, Anandita

2nd - Satvik, Anuja, Chetan, Pooja

Shot Put (Men)
1st - Chetan Gusain
2nd - Abhinav
3rd - Akshat Shrivastava

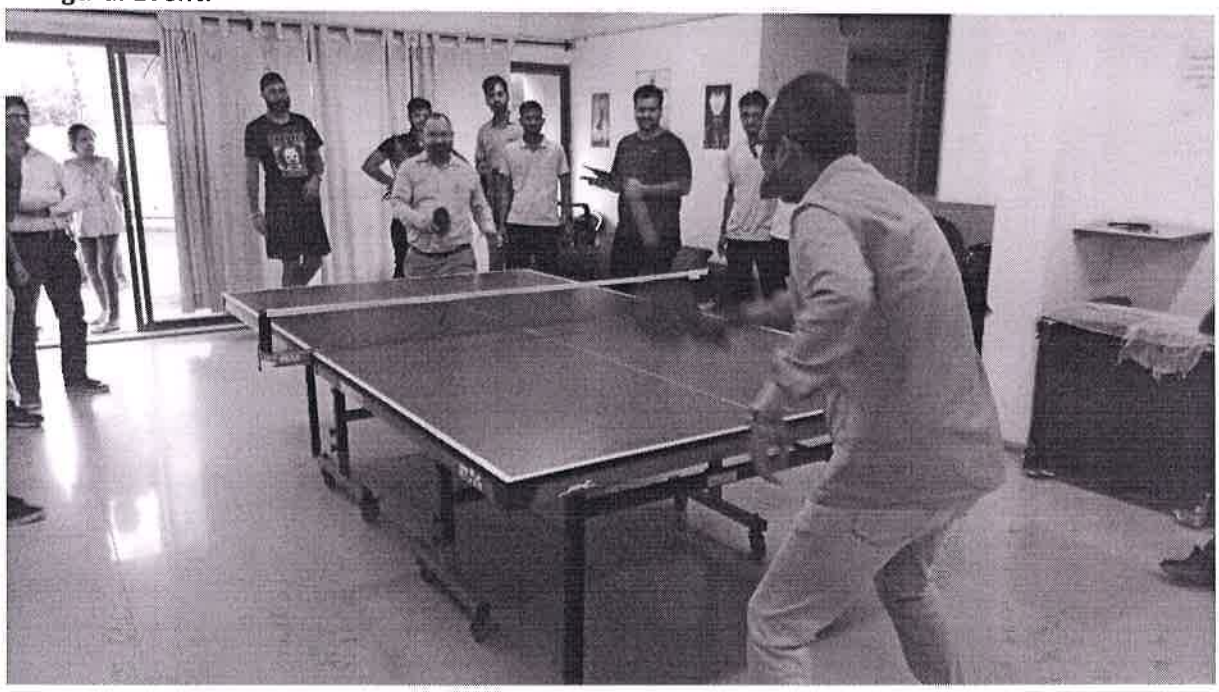
Shot Put (Women)
1st - Anuja
2nd - Shravani
3rd - Pooja Choudhary

Tug of War (Men)
Winner - Team Akash (Akash, Palash, Apoorva, Chetan, Nitish, Naveen, Satvik, Dhananjay)

Tug of War (Mixed)
Winner - Team Naveen (Naveen, Chetan, Satvik, Nimish, Alankrita, Anuja, Shiren)

Photographs:

Inaugural Event:



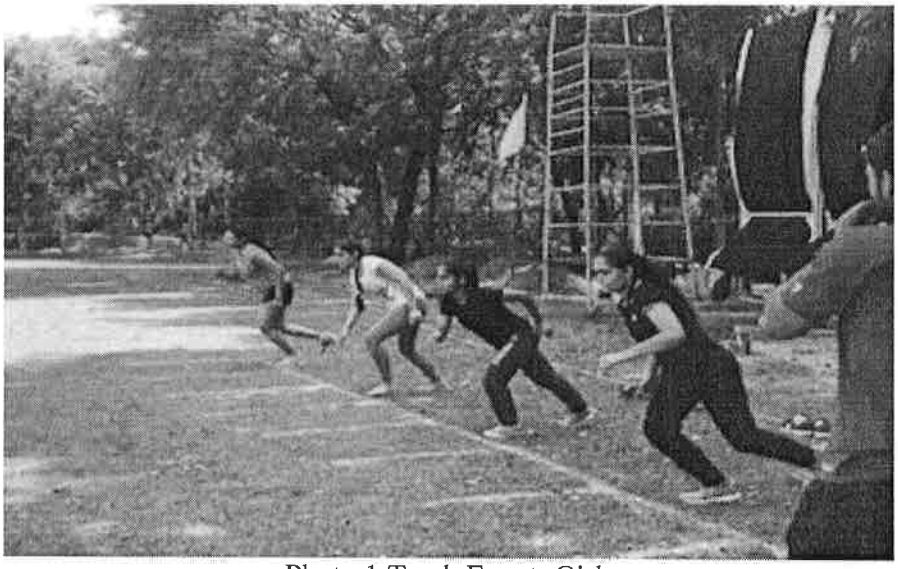


Photo.1 Track Event: Girls

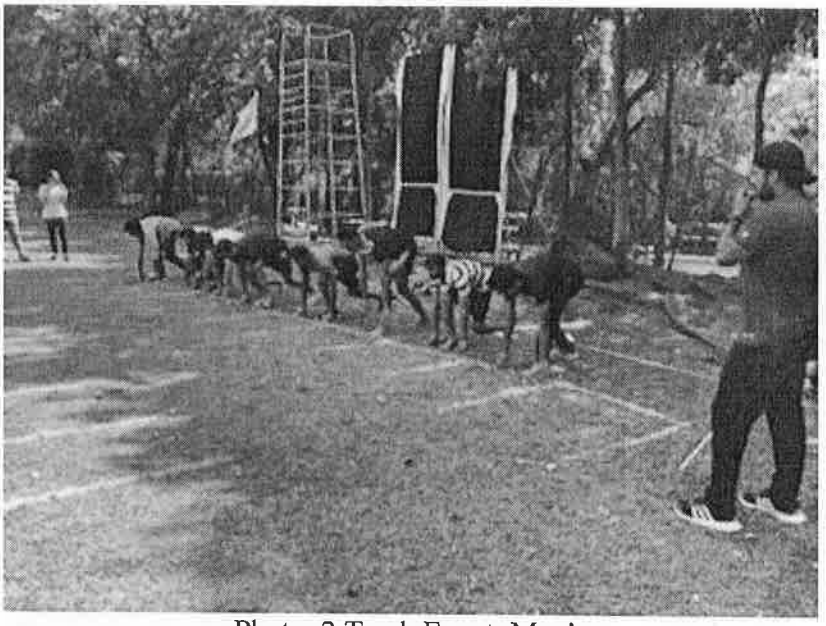


Photo. 2 Track Event: Men's



Photo. 3.1 Sports: Tug of War



Photo. 3.2: Sports: Tug of War

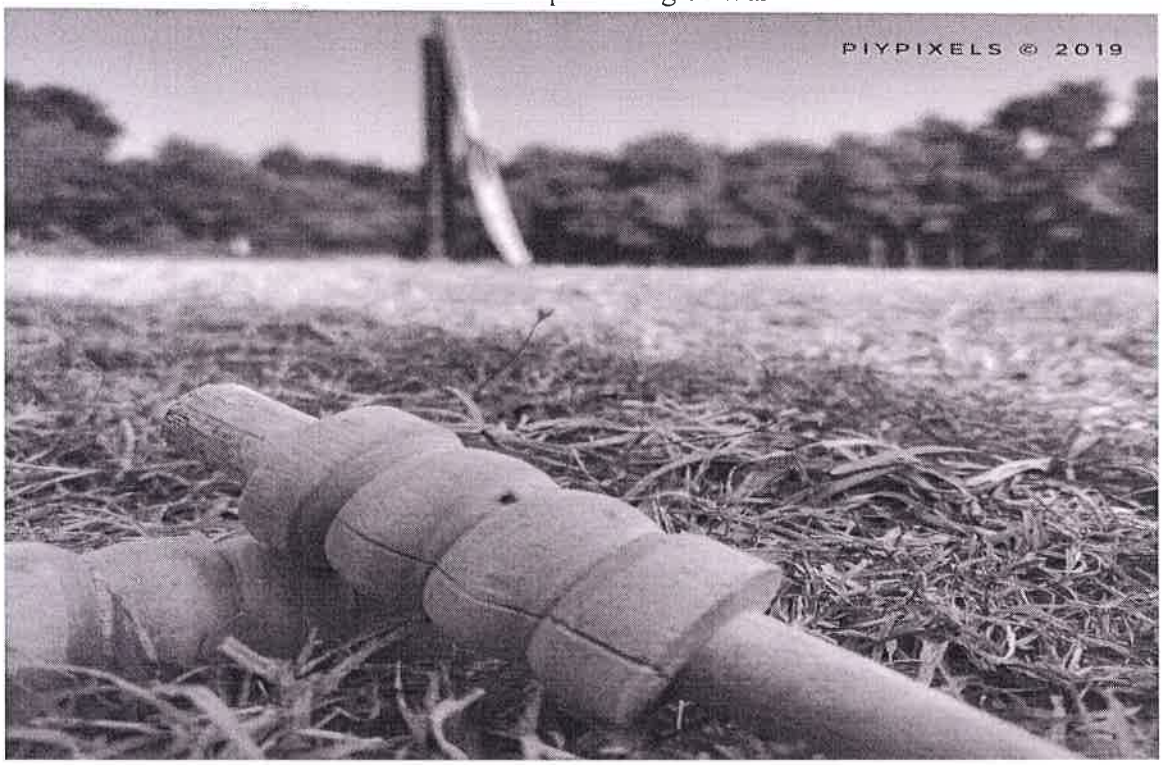


Photo.4 Sports: Cricket



Photo. 5. Table Tennis Match