teri school of advanced studies
10, Institutional Area, Vasant Kunj,
New Delhi 110070

MINUTES OF THE 48th MEETING ACADEMIC COUNCIL HELD ON 16 JULY 2020 AT 11:00 A.M.

The 48TH meeting of Academic Council was held on 16 July 2020 at 11:00 hours on Microsoft Team Platform.

The following were present:

Members

Professor Manipadma Datta, Chairperson
Professor T C Kandpal
Professor Vivek Suneja
Professor Arun Kharat
Ms Ranu K Bhogal
Professor Atul Kumar
Professor Shaleen Singhal
Professor Arun Kansal
Professor Prateek Sharma
Professor Anandita Singh
Professor Ramakrishnan Sitaraman
Dr Shashi Bhushan Tripathi
Dr Vishnu Konoorayar
Dr Sudipta Chatterjee
Dr Kamna Sachdeva
Dr Sukanya Das
Dr Nandan Nawn
Dr Vinay Shankar P Sinha
Dr Nithiyanandam Yogeswaran
Dr Akash Sondhi
Dr Seema Sangita, Controller of Examination
Capt Pradeep Kr Padhy , Secretary

Special Invitees

Dr Jaya Vasudevan
Dr Chander Kumar Singh
Dr Gopal Sarangi
Dr Montu Bose
Dr Swarup Dutta
Dr Manish Kumar Shrivastava
Dr Chubamenla Jamir
Dr Anu Rani Sharma
Dr L N Venkataraman
Dr Udit Soni
Dr Neeti
Dr Shantanu De Roy
Dr Fawzia Tarannum
Mr Kamal Sharma
Mr V Ganesh

Item No.1: **To confirm the minutes of the Forty Seventh Meeting of the Academic Council held on 20 Dec, 2019**. The Registrar informed that minutes of the Forty Seventh Meeting of the Academic Council, held on 20 Dec 2019, were circulated

to the members and no comments have been received so far hence the council might confirm the minutes.

TS/AC/48.1.1 The Council resolved that the minutes of the 47th Academic Council Meeting held on 20th, December 2019 be confirmed.

Item No 2: Matters for Information: AICTE Extension of Approval for AY 2020-21. The Registrar informed that the Extension of Approval (EoA) for all five technical programmes offered by TERI School of Advanced Studies had been received for AY 2020-21 from AICTE on dated 09 June 2020. He state that despite TERI School of Advanced Studies (TERI SAS) recommendations, the AICTE had changed the nomenclature of the following two programmes and have stipulated provisioning of additional facilities such as drawing hall and workshop within two years :-

(a) MBA (Infrastructure) to MBA (Infrastructure Management).
(b) MBA (Business Sustainability) to MBA (Sustainability Management).

On the queries of the members the Chair confirmed that as approved by AICTE, the two MBA Programmes will be offered under the new nomenclature w.e.f. AY 2020-21 and there was a compatibility in the courses offered as per the names of the programme and a presentation to this effect would be made to the Council in the next meeting.

The Academic Council noted the matter.

Item No 3: To discuss and approve the list of experts for Selection Committee for interview of faculty position. The Registrar presented the revised list of experts to the Council for consideration. Members suggested that the latest designation and affiliation details of the experts be updated periodically to reflect their credentials and contact details correctly.

TS/AC/48.3.1 The Academic Council resolved to approve:-

(a) The list of experts placed at **Enclosure 1**.
(b) The details of experts are to be updated by Department/Centre every six month reflecting latest affiliations.

Item No. 4: To discuss and approve co-opted members of the Academic Council. The Registrar informed that as per UGC Deemed University Regulations 2019 & MoA, three co-opted members were required to be nominated by the Council for their specialized knowledge and two of these had fallen vacant. He informed that Chairperson, Academic Council, had formed a Committee under the Chair of Prof Singhal to present its recommendations. Prof Singhal intimated that the Committee after due deliberations shortlisted names of Mr Manoj Chugh, President Group Public Affairs, Mahindra and Mahindra Limited and Mr Rajesh Ayapilla, Director, Corporate Social Responsibility and Sustainability for South West Asia, The Coca Cola Company and presented their names for consideration of the Council.

TS/AC/48.4.1 The Academic Council resolved to approve the following for the co-opted member positions for a period of two years w.e.f. date of issuance of the letter by Chairperson AC:-

(a) Mr Manoj Chugh, President Group Public Affairs, Mahindra and Mahindra Limited, New Delhi.
(b) Mr Rajesh Ayapilla Director, Corporate Social Responsibility and Sustainability for South West Asia, The Coca Cola Company

Item No. 5: To discuss and concur decisions taken by competent authority regarding the following during last four months of lockdown period. Prof Atul Kumar, Dean (Academic) presented the decisions taken with respect to academic and examination activities during the period of lockdown:-

(a) **Methods of instruction**. Due to the situation arising out of the COVID-19 pandemic, all regular classes were suspended w.e.f. 13 March 2020. In order to maintain continuity in teaching and learning during the period of suspension of regular classes, modalities for online delivery of lectures through Microsoft Teams platform were put in place swiftly and this resulted in a seamless transition from face-to-face classes to online mode within one working day itself, i.e. from Monday 16 March 2020 onwards. The online mode had ensured near-zero loss of teaching days. In addition the following specific measures were taken to ensure smooth conduct of the activities:-

(i) Major Projects / Dissertation. The Microsoft Teams platform was used by the faculty member of TERI SAS for mentoring their respective students pursuing their major project and dissertation. It was also recognized that in such extraordinary circumstances it would have been impossible to carry out field work/laboratory work, supervisors were therefore advised to assist their respective students to make adjustments to their initial proposal with respect to the project scope and objectives. Extension of timeline was also granted on case to case basis.

(ii) Minor Projects / Internship. For all the programmes, a greater flexibility were allowed to students for conducting 6-8 weeks long Minor Project/Internship preferable at external organization. Regular internship duration were reduced to 4 weeks in a stretch with external organization, in work-from-home mode, and advised to complete remaining 2-4 weeks during semester under the guidance of an internal supervisor from TERI SAS. Due to prevailing situation, several students were unable to secure internship at external organization and these students were assigned to work with faculty members of their respective departments.

(iii) Laboratory courses. Some experiment courses could not be completed due to suspension of regular classes. Teaching-learning process, could not be continued in these courses due to unavailability of

laboratories. It was decided to complete these unfinished experiments and remaining evaluation in the next semester when regular classes would be conducted at campus.

(iv) Online admission test. It had been decided to conduct admission test (written exam and interview) for Masters and Ph.D. programmes through online mode from locations chosen by the candidates. Provision for security, surveillance and monitoring system were being made available to maintain fairness of examination.

(b) **Conduct of examinations and evaluation**. All examinations and assessments were being held on online mode. There were two main mechanisms of conduct of exams - submission of assessments via email and use of online testing tools of MS Teams.

(i) For Masters programmes, the last date of completion of examinations was made as 17 July, 2020 and the results would be declared by 30 July, 2020. In order to ensure smooth conduct of examinations, several rounds of MS Teams interface training were held for faculty and students. The schedule of the examinations has been designed in a way that each student had adequate access to assistance from IT team if required. Following guidelines were designed to support students who might face unexpected problems with respect to software, hardware, internet connectivity, access to power, etc. during the online examinations being held for the current academic year. Instructor/invigilator were authorized to use his or her own discretion and give some extra time to the student in cases involving minor problems. In case of major issues where the student were unable to take the entire or a major portion of the examination, provision made to enable students to send a written undertaking of the IT related problems faced and request for a re-examination to the instructor. Following provisions made to address the issue:-

(aa) Case 1: If the IT issue could be resolved prior to scheduled MPEC: An alternate examination/evaluation to be arranged prior to the scheduled MPEC meeting. Subsequently, a copy of the student's request and the alternate date in which examination was held is to be recorded in the MPEC minutes.

(ab) Case 2: The IT issue could not be resolved prior to scheduled MPEC: If the IT issues continued to persist, the student would be advised to raise a request for I (incomplete) grade. This examination/evaluation would then be held as and when the IT issues get resolved or via classroom mode in the next semester. The MPEC would record a copy of the student's request and award an I grade to the student. MPEC would also record the timeframe by which this examination to be planned and completed in the next semester and ensure that the examination conducted as per schedule.

(ii) For Doctoral programme. Online process provisioned for Ph.D. viva-voce, SRC meeting and DRC presentations:-

(aa) In the case, whose maximum period for submission of Ph.D. thesis had expired/is expiring during the closure of TERI SAS campus due to COVID-19 pandemic, six months extension from the date of expiry of regular prescribed period was permitted. The extension of six months would also be provided for those students for whom the maximum period for Ph.D. thesis submission expired in this semester.

(ab) An extension of maximum time equal to the duration of closure of the TERI SAS being provided to Ph.D. students whose maximum for DRC presentation, synopsis submission and comprehensive examinations etc. is expiring during the closure of Campus on case to case basis by recommendation of supervisor.

(iii) The below mentioned students who had scored a CGPA of less than 6.0 at the end of their third semester during July-December 2019 had been provided provisional registration to fourth semester as special cases due to COVID-19 pandemic. The matter was informed to Academic Council for its concurrence.

Ser	Name of the student	Registration No.	Programme	CGPA obtained against qualifying CGPA of 6.0
(aa)	Ms. A V Malavika	1800001MSE	M.Sc. (Environmental Studies and Resource Management)	5.58
(ab)	Ms. Sumedha Singh	1800225MSE	M.Sc. (Environmental Studies and Resource Management)	5.57
(ac)	Mr. Vivek Bhardwaj	1800248MSE	M.Sc. (Environmental Studies and Resource Management)	5.60
(ad)	Ms. Daksha Goel	1800091MSG	M.Sc. (Geoinformatics)	5.61

Professor Kandpal stated that COVID-19 should not be the basis for providing re-registration to students of earlier semester as COVID-19 was declared in March 2020 and the results of these students had already been announced in December 2019. Prof Ramakrishnan concurred with Prof Kandpal. Dean(Academic) informed that given the challenging times and to follow the Government's directives that students' grievances to be given soft corner, based on the recommendation of the respective Departments, these students were given registration in the coming academic session commencing in August 2020 to continue academic activities as special cases. These special cases are not required to repeat the third semester CGPA if they achieve the required CGPA of 6.0 at the end of their fourth semester and will be conferred their degrees.

TS/AC/48.5.1 The Academic Council resolved to concur the decisions taken by Chairperson, Academic Council with respect to the methods of instruction, examination & evaluation process and provisional promotion/registration norms adopted as presented at Item 5.

Item No. 6: **To recommend institution of teaching posts (Professors, Associate Professors and Assistant Professors) to the Academic Council.** The Chair informed that TERI SAS had been recruiting teaching posts on need-based requirement and no norms of creation of sanctioned posts as followed in central universities were being practiced. He stated that statutory bodies had been requesting information on sanctioned posts of the institution on various occasions hence, based on the relevant UGC and AICTE norms a comprehensive policy is being developed for creation of new teaching posts at TERI SAS in future. He suggested that in the interim, the Academic Council might ratify the total number of recruited posts (as shown in AQARs) in past as against number of sanctioned posts in those years so that the same numbers could be reflected in the official documents as sanctioned posts in past.

TS/AC/48.6.1 The Academic Council resolved to ratify the teaching positions placed at **Enclosure 2.**

Item No. 7: **To discuss and frame rules covering the academic functioning of the institution with respect to admissions**: **Admission Policy**. Dr Gopal Sarangi, Convener, Admission & Scholarship Committee presented the Admission Policy. Members suggested that the section in the admission policy dealing with pandemic scenario be made general purpose and could be made applicable to all disaster related scenarios.

TS/AC/48.7.1 The Academic Council resolved to approve the Admission Policy as amended and placed at **Enclosure 3**.

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Item No. 8: **To discuss and frame rules with respect to conduct of Examination and Evaluation**: **Examination Policy**. Dr Seema Sangita, Controller of Examination, presented the Examination Policy and explained in detail its various features. Prof Kandpal while opining that a student should be passionate about his/her project

work hence, suggested to increase the qualifying grade for the same to be a grade higher than D.

TS/AC/48.8.1 The Academic Council resolved to approve the Examination Policy as amended and placed in **Enclosure 4.**

Item No. 9: To discuss and review a policy on Grade Improvement Examination. Dr Seema Sangita, Controller of Examination (CoE) presented the contours of the proposed policy on Grade Improvement. The Council deliberated various characteristics of the policy. The CoE explained that the student who failed as well as who would like to improve in grade, would be eligible to appear in the Grade Improvement Examination. The Council members agreed that policy framed is at evolving stage and the points raised should be taken in consideration to revise the policy.

TS/AC/48.9.1 The Academic Council resolved to approve the Grade Improvement Policy as amended and placed in **Enclosure 5**.

Item No. 10: To review and concur recommendation of Student Grievance Redressal Committee. Prof Anandita Singh, Chair, Student Grievance Redressal Committee (SGRC), informed that while resolving grievance of a Ph.D. student, the Committee took cognizance of the rules of TERI SAS where, courses undertaken by scholars were deemed to be valid for a period up to 5 years and accordingly had recommended that in case the complainant is re-admitted to TERI SAS doctoral programme (July 2020), she could be allowed to retain credits earned in courses successfully cleared by her. She stated that this clause had been subsequently withdrawn in the new rules..

TS/AC/48.10.1 The Council resolve to approve that a Ph.D. scholar be permitted to retain credits earned in courses already taken up by them during their earlier candidature as Ph.D. scholar at TERI SAS.

Item No . 11: To discuss a grievance related to Ph.D. supervision and examine and approve the amendments to Ph.D. regulations. Prof Atul Kumar, Dean (Academic) apprised the members that the Council approved the TERI SAS Ph.D. Rules 2019 vide resolution TS/AC/47.6.1 dated 20 December 2019. He informed that while examining a case related to supervision, in respect of Reg Nos 1229REB and 1212REA, the Council while accepting the fact that there could have been a few erroneous decisions in the past had resolved to approve that the concerned faculty could only be provided status of Co-supervisor in respect of the above students (resolution TS/AC/47.7.1. dated 20 Dec 2019 refers). The Dean(Academic) stated that consequent to Council's decision former faculty members had approached the Chancellor and the UGC seeking continuation of primary Supervision rights in respect of their erstwhile Ph.D. students. He informed that while Jt Secy UGC had referred one such case, the Chancellor had advised that ethical gaps in deciding the matter needed to be examined and corrected and therefore the issue was again reviewed by an internal Committee chaired by the Vice Chancellor; which had proposed a detailed process to deal with all such past and future cases. Dr Gopal

Sarangi, presented the proposed amendments and solicited the comments and inputs from the Council Members.

TS/AC/48.11.1 The Council resolved to approve the following:-

(a) Amendments to the TERI SAS Ph.D. Rules 2019 placed at **Enclosure 6.**

(b) The cases of co-supervision status of former faculty approved with respect to Reg Nos 1229REB and 1212REA stands revoked and the former faculty be provided Supervisor status.

(c) Since Reg No 1229 REB had already been awarded the Ph.D. on 14th Nov 2019 in the Convocation and all approval documents and the thesis submitted by the student recorded the name of another internal faculty as the Supervisor, all the records be amended reinstating the former faculty member as Supervisor and the internal faculty members as Co-supervisor.

Item No.12: To prescribe courses /programmes of study leading to degree and diploma of the Institution Deemed to be University. The Registrar informed that based on the relevant statutory approvals the list of the programmes as offered by TERI School of Advanced Studies had been updated and placed at **Enclosure 7**.

TS/AC/48.12.1 The Academic Council resolved to recommend the list of Programmes of TERI School of Advanced Studies placed at **Enclosure 7** for Board's consideration.

Item No 13: To consider and approve outline of Ph.D. programme offered by Department of Energy and Environment. Dr Chander Kumar Singh presented the recommendation of the Board of Studies (BoS) of the Department of Energy and Environment held on 26 June 2020 with regard to Ph.D. programme outline offered by the Department. Dean (Academic) informed that Ph.D. programme outline of all other Departments/Centre were also prepared in similar lines and approved by respective BoS of the Departments/Centre, however, due to paucity of time Ph.D. programme outline of only one Department is being presented in this meeting,

TS/AC/48.13.1 The Academic Council resolved to approve the programme outline of Ph.D. programme of the Department of Energy and Environment as placed at **Enclosure 8.**

Item No.14: To consider and approve outline of following mandatory Courses for all Ph.D. programmes:-

(a) *Research Methodology* Course offered by Department of Policy Studies. Dr Swarup Dutta presented the recommendation of the Board of Studies of the Department of Policy Studies held on 17 June 2020 with regard to the Research Methodology course offered for all Ph.D. programmes. The following suggestions were received:-

(i) Name of Dr Montu Bose to be incorporated in the "prepared by" List

(ii) On a query from member whether there should be practical hours for qualitative and quantitative data analysis (Module 5 and 6) it was informed that as it was a generic course on research methodology, separate practical hours might be avoided. Further it was brought out by Dr Datta that there were several other courses which substantially covered both qualitative and quantitative data analysis with a considerable number of practical hours.

(iii) In response to a query with respect to incorporation of impact evaluation tools into the Module-5 of the course outline it was clarified that the same is being repeated in other existing courses on quantitative research methods hence not considered.

(b) *Research and Publication Ethics* offered by Centre for Post Graduate Legal Studies. A presentation was made by Dr Jaya Vasudevan and Members suggested that evaluation criteria be improved.

TS/AC/48.14 The Academic Council resolved to approve the following: -

(a) Course outlines of *Research Methodology* as amended and placed at **Enclosure 9**.

(b) Course outlines of *Research and Publication Ethics* as amended and placed at **Enclosure 10.**

Item No 15: To consider and review the outline of the Programme M.Sc. (Climate Science and Policy). Dr. Manish Shrivastava presented the revised structure of the M.Sc. Climate Science and Policy (CSP) programme as approved by the Board of Studies (Department of Energy and Environment) held on 28 May 2020. The following suggestions and clarifications were discussed:-

(i) Lab component for Earth System Sciences: It was informed that the Earth System Sciences course did not require lab as such.

(ii) Considering the increasing importance of geo-sciences it would be useful to include a lab component as well : A full review of the CSP programme would be due by the year 2022 and these inputs be taken into account in that process, which involved wider stakeholder and industry consultation.

(iii) Need to introduce a separate course on globalization and policy assessment : The course on Climate Change and Law exclusively covers the global institutional developments that are relevant to climate change. It is also discussed in the courses on the governance of climate change and

the Seminar Course. Also, the aspects of policy analysis are covered in the courses on the Governance of Climate Change and Economics of Climate Change.

(iv) It would be better if the requirement of passing the bridge courses is made clear upfront, instead of saying just "0 credit".

(v) How the policy bouquet and science bouquet of courses are related to the award of degree, particularly when the students take courses from both the bouquets. - These groupings are only to inform students what courses they can choose from if they want to have more focus on the policy or science aspect of the programme.

TS/AC/48.15.1 The Academic Council resolved to approve the revised programme outline of M.Sc. (Climate Science and Policy) as amended and placed at **Enclosure 11**.

Item No.16: To consider and review the outline of M.Sc. (Environmental Studies and Resource Management) programme. Dr Chubamenla Jamir presented the recommendation of the Board of Studies of the Department of Energy and Environment held on 19 June 2020 with regard to revised programme outline of M.Sc. (Environmental Studies and Resource Management). It was suggested that ESRM and CSP students could opt for elective courses from each other.

TS/AC/48.16.1 The Academic Council resolved to approve the revised programme outline of M.Sc. (Environmental Studies and Resource Management) placed at **Enclosure 12**.

Item No 17: To consider and review the outline of courses of M.Sc. (Environmental Studies and Resource Management) programme. Dr Chubamenla Jamir presented the recommendation of the Board of Studies of the Department of Energy and Environment held on 19 June 2020 with regard to revised course outlines of M.Sc. (Environmental Studies and Resource Management) with respect to NRE 121 Ecology, NRE 139 Environmental Geo-sciences.

TS/AC/48.17.1 The Academic Council resolved to approve the revised outlines of following courses placed at **Enclosure 13**.

(a) NRE 121 Ecology.
(b) NRE 139 Environmental Geo-sciences.

Item No 18: To consider and review the course outline of the following course offered by Department of Energy and Environment. Prof Prateek Sharma presented the recommendation of the Board of Studies of the Department of Energy and Environment held on 19 June 2020 with regard to revised course outlines of NRE 111 – Environmental Statistics. It was informed that the course was offered in multiple programmes and the amendment would apply to all related programmes. Following were the comments/suggestions received from the AC members with regard to course NRE111 - Environmental Statistics:

(a) Course content should reflect explicitly the environmental part by adding some case studies etc.
(b) Objectives of the course should justify the environmental statistics nomenclature else it should be called as Just "Statistics"
(c) Members also raised concern on offering core credit course at masters level.

It was presented that the course content would be completely contextualized with respect to the environment with relevant concepts, case studies and applications explicitly specified in the course outline. It was also clarified that the course objectives and learning outcomes duly justified environmental statistics nomenclature and the special character of Environmental Statistics had been duly emphasized and widely covered in all the six modules.

TS/AC/48.18.1 The Academic Council resolved to approve the revised outlines of Course NRE111 -Environmental Statistics as amended and placed at **Enclosure 14.**

Item No. 19: To consider and review outline of the Programmes; M.Sc. (Water Science and Governance) and M.Tech. (Water Resource Engineering and Management) offered by the Department of Regional Water Studies. Dr Arun Kansal presented the recommendation of the Board of Studies of the Department of Regional Water Studies held on 01 July 2020. There was a suggestion that as PG Diploma and PG Certificate programme follows MSc (WSG) programme, the same should be mentioned both in the programme outline and in the eligibility criteria. Hence it was decided that PG Diploma and PG Certificate be included in the final document.

TS/AC/48.19.1 The Council resolved to approve the revised outline of the following Programmes offered by the Department of Regional Water Studies as placed at **Enclosure 15**.

(a) M.Sc. (Water Science and Governance).
(b) M.Tech. (Water Resource Engineering and Management).
(c) PG Diploma in Water Science and Governance.
(d) Certificate in Water Science and Governance.

Item No.20: To consider and review outline of M.Sc. (Geoinformatics) programme. Dr Anu Rani Sharma presented the recommendation of the Board of Studies of the Department of Natural Resources with respect to revised outline of M.S. (Geoinformatics) programme. She informed that MSc (ESRM) programme offered by Department of Energy and Environment offered NRE111 Environmental statistics course in the first semester which was a core course for MSc Geoinformatics programme. She mentioned that the course had now been changed from 3 credits to 4 credits with due amendments in course outline and due to this, MSc Geoinformatics first semester credits were increased from 15 to 16 and total credits had gone up to 71.

TS/AC/48.20.1 The Academic Council resolved to approve the revised outline of M.Sc. (Geoinformatics) programme as placed at **Enclosure 16**.

Item No 21: To review and include degree in *Bachelor of Vocation* (B.Voc.) as an eligibility criterion for admission to M.Sc. (Water Science and Governance), PG Diploma (Water Science and Governance) and PG Certificate Course in Water Science and Governance offered by Department of Regional Water Studies. Dr Arun Kansal presented the recommendation of the Board of Studies (**Enclosure 17**) of the Department of Regional Water Studies held on 01 July 2020 with regard to inclusion of B.Voc. as an eligibility criteria for admission to M.Sc. (Water Science and Governance) programme.

TS/AC/48.21.1 The Academic Council resolved to approve the inclusion of the following degrees in the eligibility criteria for M.Sc. (Water Science and Governance), PG Diploma (Water Science and Governance) and PG Certificate Course in Water Science and Governance :-

3 year B.Voc in Industrial Waste Management, Soil and Water Conservation, Industrial Chemistry, Industrial Waste Treatment Technology, Sustainable Agriculture.

Item No 22: To consider and review the outline of the Programme M.A. (Public Policy and Sustainable Development) offered by Department of Policy Studies. Dr L.N. Venkataraman presented the recommendation of the Board of Studies of the Department of Policy Studies held on 17 June 2020 with regard to amendments to the M.A. (Public Policy and Sustainable Development) programme.

TS/AC/48.22.1 The Academic Council resolved to approve the revised programme outline as placed at **Enclosure 18**.

Item No.23: To consider and review outline M.Sc. (Plant Biotechnology) programme. Dr Udit Soni presented the recommendation of the Board of Studies of the Department of Biotechnology held on 4 March 2020 and 4 July 2020 with regard to amendments to the M.Sc. (Plant Biotechnology) programme. The following suggestions were made by the members:-

(a) The programme to be aligned with the Choice Based Credit System of UGC.
(b) The feasibility of diversifying into other streams of Biotechnology was discussed and suggested.
(c) It was discussed that one such diversification could be Microbial Biotechnology considering the facilities and expertise at TERI SAS and TERI. In that case, the existing MSc programme will be renamed as "M.Sc. Biotechnology," with specialisations offered in two streams namely, Plant Biotechnology and Microbial Biotechnology. More streams may be added in future.
(d) Therefore, two streams, namely Plant Biotechnology and Microbial Technology would be offered under the M.Sc. Biotechnology Programme.

The two streams shall share a number of core courses and common electives with stream-specific core courses for each specialisation.

TS/AC/48.23.1 The Academic Council recommended that the Programme Outline to be revised with stakeholders inputs and be placed at the next meeting of the Academic Council for review.

There being no other items for discussion, the meeting was adjourned with a vote of thanks to the Chair.

Sd/
Capt Pradeep Kumar Padhy (Retd.)
Registrar

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

Printed Copy: Registrar Office

Enclosure 1

LIST OF EXPERTS FOR SELECTION COMMITTEES

Department of Energy and Environment							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Phone/Mobile No
1.	Dr. Himanshu Pathak	Director	Agriculture Science; Climate change, Soil science	ICAR-National Rice Research Institute	ICAR-National Rice Research Institute, Cuttack, Odisha	hpathak.iari@gmail.com	0671 236 7757, 9899247590
2.	Prof. Santosh Kumar	Professor	Climate Change	National Institute of Disaster Management	National Institute of Disaster Management, Ministry of Home Affairs, A-wing, 4th floor, NDCC-II Building, Jai Singh Road, New Delhi – 110011	santosh.nidm@nic.in	011-23438296
3.	Dr. J. R. Bhatt	Advisor (Climate Change)	Climate Change	Ministry of Environment	Ministry of Environment, Forest and Climate Change, Indira Paryavaran Bhavan, Jorbagh Road, New Delhi - 110 003	jrbhatt@nic.in	011-24695293
4.	Dr. Nisha Mendiratta	Associate Head / Scientist G	Climate Change	Department of Science & Technology	Technology Bhavan, New Mehrauli Road, New Delhi - 110016	nisha67@nic.in	011-26590497

Department of Energy and Environment							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Phone/Mobile No
5.	Prof. S. C. Mullick	Former Professor	Energy and Environment, Solar Energy, Applied Heat Transfer and Energy Conservation	Centre for Energy Studies, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi - 110016	subhash_cmullick@yahoo.com	9717502835
6.	Prof. T. C. Kandpal	Professor	Energy and Environment, Solar Energy, Heat Transfer, Energy Policy	Centre for Energy Studies, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Haus Khas, New Delhi - 110016	tarak@ces.iitd.ac.in	011-26591262
7.	Prof. S. G. Deshmukh	Professor	Energy and Environment, Mechanical Engineering	Mechanical Engineering Department, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	deshmukh@mech.iitd.ac.in	011-26591056
8.	Prof. K. K. Pant	Professor and Head	Energy and Environment, Chemical Engineering, Biomass energy.	Department of Chemical Engineering, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	dr.kkpant@gmail.com; kkpant@chemical.iitd.ac.in	011-26596172/26596177
9.	Prof. Ratan Mohan	Former Professor	Energy and Environment, Chemical Engineering	Department of Chemical Engineering, Indian Institute of	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	ratan@chemical.iitd.ac.in	011 2659 1033

Department of Energy and Environment							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Phone/Mobile No
				Technology, Delhi			
10.	Prof. Sukumar Mishra	Professor	Energy and Environment, Power System Engineering, Renewable Energy.	Department of Electrical Engineering, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	sukumar@ee.iitd.ac.in	011-2659-1074
11.	Prof. G. Bhuvaneshwari	Professor	Energy and Environment, Power Electronics, Electrical Machines and Drives	Department of Electrical Engineering, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	bhuvan@ee.iitd.ac.in	011- 2659 1092
12.	Prof. P. R. Bijwe	Professor	Energy and Environment, Power Systems Analysis and Optimization,	Department of Electrical Engineering, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	prbijwe@ee.iitd.ac.in	011- 2659 1046
13.	Prof. Vamsi Krishna Komarala	Professor	Energy and Environment, Renewable Energy	Centre for Energy Studies, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	vamsi@ces.iitd.ac.in	011-26591255
14.	Prof. K. A. Subramanian	Professor	Energy and Environment,	Centre for Energy Studies, Indian	Indian Institute of Technology Delhi,	subra@ces.iitd.ac.in	011-26591247

Department of Energy and Environment							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Phone/Mobile No
			Study on performance, combustion, emission characteristics of automotive Internal Combustion engines	Institute of Technology, Delhi	Hauz Khas, New Delhi 110 016		
15.	Prof. Avinash Kumar Agarwal	Professor	Energy and Environment, IC engine combustion,	Department of Mechanical Engineering, Indian Institute of Technology, Kanpur	Indian Institute of Technology Kanpur, Kanpur - 208016	akag@iitk.ac.in	0512-259 7982
16.	Dr. P. C. Maithani	Scientist-G & Advisor	Energy and Environment, Energy policy and planning	Ministry of New and Renewable Energy	Ministry of New and Renewable Energy, Block-14, CGO Complex, Lodhi Road, New Delhi-110 003	pcmaithani@nic.in	011-24361830, 26265299
17.	Dr. O. S. Sastry	Former Director General	Energy and Environment, Solar Energy, Photovoltaics, Solar Cells	Former Director General , National Institute of Solar Energy (NISE)	National Institute of Solar Energy (NISE), Ministry of New & Renewable Energy	sastry284@gmail.com	
18.	Dr. Anwar Shahzad	Professor	Energy and Environment	Department of Electrical	Jamia Millia Islamia, New Delhi-110025	assiddiqui@jmi.ac.in ;	011-26981717,

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	Siddiqui		Power Systems Analysis Power Systems Simulation Power	Engineering & Technology, Jamia Millia Islamia		anshsi@yahoo.co.in	9990505825
19.	Prof. Majid Jamil	Professor	Energy and Environment, Electrical Power Systems, Power Systems Protection, Renewable Energy Sources	Department of Electrical Engineering & Technology, Jamia Millia Islamia	Faculty of Engineering & Technology, Jamia Millia Islamia, New Delhi - 110025	mjamil@jmi.ac.in ; majidjamil@hotmail.com	9313462108
20.	Dr. Naveen Kumar	Professor	Energy and Environment, Internal Combustion Engines, Alternative fuels with special emphasis on biofuels	Department of Mechanical Engineering, Delhi Technological University	Delhi Technological University, Shahbad Daulatpur, Main Bawana Road, Delhi – 110042	naveenkumar@dce.ac.in; naveenkumardce@gmail.com	9891963530
21.	Prof. Subhasis Maji	Professor	Energy and Environment, Fluid Mechanics Thermodynamics,	Indira Gandhi National Open University	School of Engineering and Technology, Indira Gandhi National Open University Maidan Garhi, New	subhasis@ignou.ac.in	011-29534808, 29572926

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22.	Prof. Rakhi Sharma	Associate Professor	Energy and Environment, Renewable energy technology	Indira Gandhi National Open University	School of Engineering and Technology, Indira Gandhi National Open University, Maidan Garhi, New Delhi - 110068	rakhisharma@ignou.ac.in; rakhis_ignou@rediffmail.com	011-29572916, 29532863; 9868548535
23.	Prof. Saumyen Guha	Professor	Hydraulics and Water Resources Engineering	Department of Civil Engineering, Indian Institute of Technology Kanpur	Indian Institute of Technology Kanpur, Kanpur - 208016	sguha@iitk.ac.in	0512-259-7917
24.	Prof. Sachchida Nand Tripathi	Professor & Head	Environmental Engineering, Aerosol Science and Technology, Air Quality Monitoring,	Department of Civil Engineering, Indian Institute of Technology Kanpur	Indian Institute of Technology Kanpur, Kanpur – 208016	snt@iitk.ac.in;sachchida.tripathi@gmail.com	0512-259-7845
25.	Prof. A.K. Nema	Professor	Environmental Engineering, Environmental Management, Environmental Impact Assessment	Department of Civil Engineering, Indian Institute of Technology Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi - 110016	aknema@civil.iitd.ac.in	011-2659 1241
26.	Prof. R. B.	Professor and	Environment and	Department of	Delhi School of	geographydse201	011-

Department of Energy and Environment							
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	Singh	Head	Disaster Management, Urban Environment, Remote Sensing & GIS, Climate Change	Geography, Delhi School of Economics	Economics, University of Delhi, Delhi-110 007	2@gmail.com, rbsgeo@hotmail.com	27666491, 27667725
27.	Prof. C. K. Varshney	Emeritus Professor	Environmental Science	former Dean and Professor of Ecology, JNU	88, Vaishali, Pitampura, Delhi – 110 034	ckvarshney@hotmail.com	011-42455366
28.	Dr. C. R. Babu	Professor Emeritus	Environmental Science, Taxonomy and Ecology, Systematics	Taxonomy and Ecology, Systematics, Genetics, Conservation and Sustainable Utilization of Biodiversity, Ecosystem Dynamics and Function	CEMDE, Department of Environmental Studies, University of Delhi, Delhi – 110007	crb26@hotmail.com, crbabu26@gmail.com	011-27666237; 9810586709
29.	Prof. V. K. Jain	Vice-Chancellor			Tezpur University, Tezpur - 784028, Assam	vc@tezu.ernet.in	91-3712-267003
30.	Dr. Pramod Kumar Aggarwal	Regional Program Leader	Environmental Science	CGIAR Research Program on Climate Change Agriculture &	CGIAR Research Program on Climate Change Agriculture & Food Security,	p.k.aggarwal@cgiar.org	011-25842940

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				Food Security	BISA, CIMMYT India Office, NASC Complex, DPS Marg, New Delhi 110012; E-13/12, Vasant Vihar, New Delhi 110057		
31.	Dr. Saumitra Mukherjee	Professor	Geology, Remote sensing, Space Sciences & GIS applications in Environmental Geosciences		School of Environmental Sciences, Jawaharlal Nehru University, New Delhi - 110067	saumitra@mail.jnu.ac.in; saumitramukherjee3@gmail.com; dr.saumitramukherjee@usa.net	011-26704312, 9313908512
32.	Prof. Dr. P.S.N. Rao	Head of the Department, Professor of Housing and Director	Urban Development	School of Planning and Architecture	School of Planning and Architecture, 4-Block-B, Indraprastha Estate, New Delhi - 110002	drpsnrao@hotmail.com; hodhousing@spa.ac.in	011 - 2370 2375, 2370 2376
33.	Prof. Shrawan Kumar Acharya	Professor	Urban and Regional Planning; Urban Governance; Poverty, Climate Change, Disaster and Urban Vulnerabilities	Centre for the Study of Regional Development, Jawaharlal Nehru University	Centre for the Study of Regional Development, School of Social Sciences, Jawaharlal Nehru University, New Delhi - 110067	skacharya@mail.jnu.ac.in; shrawan.acharya@gmail.com	011-26704090
34.	Prof. Geetam Tiwari	Professor	Transport Planning and	Department of Civil	Transportation Engineering	geetamt@civil.iitd.ac.in	+91 11 2659 6265, 91 11

Department of Energy and Environment							
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			policy, Traffic Safety, Public Transport and NMV Planning	Engineering, Indian Institute of Technology Delhi	Laboratories, Department of Civil Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016		2659 6402
35.	Prof. Hina Zia	Professor	Urban Development	Faculty of Architecture and Ekistics, Jamia Millia Islamia	Department of Architecture, Faculty of Architecture and Ekistics, Jamia Nagar New Delhi-110025	hzia@jmi.ac.in	011-26981717, 26984617
36.	Dr. Om Prakash Mathur	Senior Fellow	Urban Development	Institute of Social Sciences	Institute of Social Sciences 8, Nelson Mandela Road, Vasant Kunj New Delhi-110070	opmathur@issin.org; om_mathur@yahoo.com	011-43158800, 43158801
37.	Prof. Milap Punia	Professor	Geographic information science and spatial analysis; with applications in Regional Development, urban studies, spatial planning,	Centre for the Study of Regional Development, Jawaharlal Nehru University	Centre for the Study of Regional Development, School of Social Sciences, Jawaharlal Nehru University, New Delhi - 110067	punia@mail.jnu.ac.in; milap.jnu@gmail.com	011-26704196

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38.	Prof. Anu Kapur	Professor	Urban Development, Geography in India and Geography of India	Delhi School of Economics, University of Delhi	Department of Geography, Delhi School of Economics, University of Delhi Delhi-110007	anu_iias@yahoo.com	11-27666491, 9871453503
39.	Prof. Manju Mohan	Professor & Head	Impacts of Urbanization on Weather, Climate and Air Pollution/ Air Quality Measurements and Modeling for Regulatory Applications	Centre for Atmospheric Sciences, Indian Institute of Technology Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi – 110016	mmohan6@hotmail.com, mmanju@cas.iitd.ernet.in, mmohan66@gmail.com	11-26591313/ 26591301
40.	Prof. Sangeeta Kohli	Professor	Heat Transfer, Fluid Mechanics, Renewable Energy Technology	Mechanical Engineering Department, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi - 110 016	skohli@mech.iitd.ac.in	011-2659 1243
41.	Prof. Ambuj Sagar	Professor	Energy and Environment, Energy Policy	Humanities & Social Sciences, Indian Institute of Technology, Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016	asagar@hss.iitd.ac.in	011-2659 7135
42.	Prof. S. K. Singh	Professor & Dean (AA)	Environmental Engineering,	Delhi Technological	Department of Civil and Environmental	sksinghdce@gmail.com,	011-27871061

Department of Energy and Environment							
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			Solid waste processing, Wastewater treatment designs	University	Engineering, Delhi Technological University, Bawana Road, New Delhi-110042	sksingh@dce.ac.in	
43.	Dr. Anubha Kaushik	Professor	Environmental pollution, Bioremediation, Bioenergy, Ecosystems approach and EIA	Guru Gobind Singh Indraprastha University	University School of Environment Management, Guru Gobind Singh Indraprastha University, Sector - 16C, Dwarka, New Delhi - 110078	aks.es.10@gmail.com	011-25302170, 9654947305
44.	Prof. Dinesh Mohan	Professor	Environmental/Analytical/Aquatic/Surface Chemistry, Remediation and Encapsulation of Priority Pollutants from water	School of Environmental Sciences, Jawaharlal Nehru University	School of Environmental Sciences, Jawaharlal Nehru University, New Delhi – 110067	dmohan@mail.jnu.ac.in, dm_1967@hotmail.com	011-26704616, 09717196214
45.	Dr. Mukesh Sharma	Professor	Environmental Engineering, Air Quality Modelling and Management, Fate Processes of Organic Pollutants and	Department of Civil Engineering, Indian Institute of Technology Kanpur	Indian Institute of Technology Kanpur, Kanpur – 208016	mukesh@iitk.ac.in	0512-2597759

Department of Energy and Environment							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Phone/Mobile No
			Parameter Estimation				
46.	Dr. V. K. Minocha	Professor	Water Resources	Delhi Technological University	Department of Civil Engineering, Delhi Technological University, Bawana Road, New Delhi-110042	vkminocha@dce.ac.in	011-27871061
47.	Dr. Niraj Sharma	Senior Principal Scientist	Environmental Science, EIA & Environmental Clearance of Infrastructure Projects, Vehicular Pollution Modelling	CSIR-Central Road Research Institute (CRRI)	Environmental Science Division, CSIR-Central Road Research Institute (CRRI), P.O. CRRI, Mathura Road, New Delhi – 110025	sharmaniraj1990@rediffmail.com; neeraj.crri@nic.in	9810283013
48.	Prof (Dr) Sanjukkta Bhaduri	Dean (Research)			Faculty of the Department of Urban Planning, School of Planning and Architecture, New Delhi 4-Block-B, Indraprastha Estate, New Delhi 110002	s.bhaduri@spa.ac.in	11 - 2370 2375 , 2370 2376
49.	Prof Bhim Singh	Professor		Electrical Engineering	Electrical Engineering	bsingh@ee.iitd.ac.in	011-26591071

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				Department, Indian Institute of Technology, New Delhi	Department, Indian Institute of Technology, Hauz Khas, New Delhi-110016		9811502125

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2	Prof. Vijay Kaul	Professor	Marketing	University of Delhi South Campus	University of Delhi South Campus	kaulvijay@yahoo.com	9810715407
3	Prof N. Ravichandran	Professor	Management	Dean, Jamia Hamdard University	Dean, Jamia Hamdard University	ravi@jamiahamdard.ac.in	9718491102, 8800460620
4	Prof. Vivek Suneja	Professor	Strategy	FMS, University of Delhi	FMS, University of Delhi	suneja_v@yahoo.com	01127666382
5	Prof. Asif Zameer	Professor	Marketing	Fore School of Management	Fore School of Management	asifzameer@yahoo.com	9871053303
6	Prof Devi Singh	Former Director		IIM Lucknow	841 Nava Sansad Vihar, Opp, Hotel Taj Vivanta, Sector	dsingh@iiml.ac.in	9818623000

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7	Prof B Banerjee	Former Dean	Finance & Accounting	Faculty of Commerce & Management, University of Calcutta	C 10, Sandhead Apartments, 164/78, Lake Gardens, Kolkata-700045	bhabatosh.commerce@gmail.com	9432350127
8	Prof Dwarika Prasad Unniyal	Dean - Faculty of Business	Marketing	Faculty of Management, Flame University, Pune	FLAME University 401, Phoenix Complex, Bund Garden Road, Opp. Residency Club, Pune - 411001, Maharashtra	uniyal.dwarika@gmail.com	9761741180
9	Prof Sunita Singh Sengupta	Dean, Faculty of Management Studies	General Management, OB, ethics	University of Delhi	University of Delhi, Delhi 110007	sunita.singhsengupta@gmail.com	011-27667877
10	Prof Arunava Sen	Professor	game theory, social choice theory, mechanism design	Indian Statistical Institute, Delhi	Indian Statistical Institute 7, S.J.S. Sansanwal Marg New Delhi - 110 016, India	asen@isid.ac.in	+91-11-4149 3945
11	Prof. CP Gupta	Department of Financial Studies. DU	Finance	University of Delhi	Benito Juarez Marg, South Campus, South Moti Bagh, New Delhi, Delhi 110021	guptacp@gmail.com	9818041308
12	Prof. Pinaki Dasgupta	IMI, Delhi	Marketing	IMI	B 10, Tara Crescent, Block B, Qutab Institutional Area, New Delhi, Delhi 110016	pinaki@imi.edu	47194337

Centre for Post Graduate Legal Studies							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Mobile No
1	Prof. Manoj Kumar Sinha,	Director/Vice Chancellor	International Law/Human Rights Law/Human Rights Law/Environmental Law	The Indian Law Institute New Delhi	Bhagwandass Road, New Delhi-01	manoj_kumarsinha@yahoo.com	9433602546
2	Prof B S Chimni	Former Professor , JNU Professor Emeritus, OP Jindal Global Law School	International Law	OP Jindal Global Law School, Sonipat, Haryana	O.P. Jindal Global University Sonipat, Narela Road Near Jagdishpur village Sonipat, Haryana-131001, NCR of Delhi, India	bschimni@hotmail.com	9871622809/ 011-26704349
3	Prof Kamala Sankaran	Professor	Constitutional Law, Law and Development	Faculty of Law, University of Delhi	University of Delhi, Chhatra Marg, Delhi	kamala_sankaran@hotmail.com	9810512637
4	Prof. M P Singh	Professor Emiritus, Faculty of Law, University of Delhi	Constitutional Law/Jurisprudence	Faculty of Law, University of Delhi	Sector-14, Dwarka, New Delhi-110078	mpjitholi@gmail.com	9711921492/ 28034991
6	Mr. Raghavendra GR	Joint Secretary	Intellectual Property Law/ Judicial Reforms	Department of Justice, Government of India	Shastri Bhawan, New Delhi-01	raghavender.gra@nic.in	9811415790

7	Prof. VG Hegde,	Professor, JNU	International Law	Centre for International Legal Studies, JNU	New Mehrauli Road, New Delhi 110067	vghegde@mail.jnu.ac.in , vghegde@gmail.com	9312712476
8	Prof. GS Bajpai	Professor/Registrar	Research Methods	Registrar, National Law University Delhi	Sector-14, Dwarka, New Delhi-110078	registrar@nludelhi.ac.in	9718225340
9	Dr. Anirudha Rajput	Member, International Law Commission	International Law	Member, International Law Commission	International Law Commission, Geneva	adrajput@gmail.com	9810704531
10	Dr. Amar Pal Singh	Professor and Dean	Environmental Law	University School of Law and Legal Studies	Sector - 16C, Dwarka, New Delhi – 110078	amarpalsingh@ipu.ac.in	8860303226
11	Dr. Kanwal D.P.Singh	Professor and former Dean	Environmental Law, Research Methods	University School of Law and Legal Studies	Sector - 16C, Dwarka, New Delhi – 110078	kdps@ipu.ac.in	9910003228
13	Prof. Nuzhat Parveen Khan	Professor and Dean	Environmental Law, Research Methods	Faculty of Law	Jamia Millia Islamia, Jamia Nagar, New Delhi- 110025	npkhan@jmi.ac.in ; nuzhat.law@gmail.com	9910603938
14	Prof VK Ahuja	Professor	IPR, Human Rights	Faculty of Law, DU	University of Delhi, Chatra Marg, Delhi	vkahuja2002@yahoo.co.in	9868482282
15	Prof. Raman Mittal	Professor	IPR, Constitutional Law	Faculty of Law, DU	University of Delhi, Chatra Marg, Delhi	mittalraman@gmail.com	9650476202

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1	Prof. Indira Rajaraman	Former Reserve Bank Chair Professor/NIPFP	Economics (Public Finance)	Reserve Bank Chair Professor/NIPFP	B-2 /2395, Greenglade Apartments Vasant Kunj. New Delhi-110070	indira_raja@yahoo.com	Mobile: 9818938846
2	Prof Shubashish Gangopadhyay	Research Director/Dean	Economics (Public Finance)	India Development Foundation/ Indian School of Public Policy	4101, DLF, Phase IV Gurgaon 122 015, Haryana, India	sg@idfresearch.org	Off – 0124-4381691 M - 9910991221
3	Prof. Surender Kumar	Professor	Economics (Environmental Economics)	Delhi School of Economics	Department of Economics, Delhi University New Delhi- 110 007	surenderkumarbansal@hotmail.com, skumar@econdse.org	9871283064
4	Dr B.N. Goldar	Former Professor	Economics (General)	Institute of Economic Growth	Delhi University Enclave New Delhi – 110007	b_goldar77@yahoo.com	9811443161
5	Prof. Ashwini Deshpande	Professor	Gender/Economics	Ashoka University	Plot No. 2, Rajiv Gandhi Education City, National Capital Region P.O.Rai, Sonepat Haryana-131029	ashwini.deshpande@ashoka.edu.in	130-2300000

6	Prof. T.C.A. Anant	Member, UPSC	Economics (Indian Economy)	UPSC	UPSC Bhavan, Shahjahan Rd, UPSC, Man Singh Road Area, New Delhi-110069	tca.anant@nic.in; tca.anant@gmail.com	011-23742150; 9717118585
7	Prof. Bharat Ramaswamy	Professor	Economics	Ashoka University	Plot No 2, Rajiv Gandhi Education City, Sonepat, Haryana- 131029	isid.bharat@gmail.com; bharat.ramaswami@ashoka.edu.in	9811340848
8	Dr. Krishnendu Ghosh Dastidar	Professor	Environmental Economics	Jawaharlal Nehru University	Centre for Economic Studies and Planning School of Social Sciences JNU, New Delhi – 110067	krishnendu.dastidar@gmail.com, kgd0302@mail.jnu.ac.in, kgd12@yahoo.com	011-26704448
9	Prof M N Murty	Adjunct Professor	Environmental Economics	Amrita Center for Economics & Governance (ACEG), Amritapuri	72, Sakshara Aptts. Block A-3, Paschim Vihar, Delhi 110 063	mn.murty71@gmail.com	011-25275873, Mobile: 9891288806
10	Prof Tulsi Patel	Professor	Sociology	Delhi University	Department of Sociology Faculty of Social Sciences University of Delhi New Delhi -110 007	sociology_dse@yahoo.com	011-22727687
11	Prof V K Srivastava	Retired Professor/Presently Director	Anthropology	University of Delhi/ Anthropological Survey of India	B-349, CR Park, New Delhi-110019	vks1@ymail.com	9810454641

12	Prof. Avanish Kumar	Professor, Public Policy & Governance	Anthropology	Management Development Institute	Management Development Institute, Mehrauli Road, Shukrali Gurgaon – 122007	avanish@mdi.ac.in	9871687668
13	Prof Meeta Mehra	Chairperson and Professor of Economics	Macroeconomics, International Trade,Climate Change Economics, Environmental Economics, Energy and Resource Economics,	Centre for International Trade and Development, Jawaharlal Nehru University	Centre for International Trade and Development (CITD), Room No. 209, School of International Studies (SIS) II, JNU, New Delhi- 110067	meetakm@mail.jnu.ac.in; meetakm@gmail.com; meetakm@jnu.ac.in	011-26704353 (Office), 9811660905 (Mobile)
14	Prof Prabhat Patnaik	Professor Emeritus	Macroeconomics and Political economy	Centre for Economic Studies and Planning, Jawaharlal Nehru University	JNU, New Delhi-110 067	prabhatptnk@yahoo.co.in	0124-2350 544 (R)
15	Prof Biswajit Dhar	Professor	Trade and development issues; International finance; Intellectual property rights; Trade and environment; Agriculture	Centre for Economic Studies and Planning, Jawaharlal Nehru University	Centre/School/Special Centre: School of Social Sciences Room No: 336 JNU, New Delhi-110 067	biswajit@mail.jnu.ac.in, bisjit@gmail.com	011-26704462
16	Mr Nitin Desai	Distinguished Fellow, Earth	Economics/Public Policy	TERI	5th Floor, B-63, Defence Colony,	nitin.desai@teri.res.in	9871386586

		Science and Climate Change			New Delhi- 110024		
17	Prof Aditya Bhattacharya	Professor	Economics	Delhi School of Economics	University of Delhi New Delhi- 110007	aditya@econdse.org	011-27008112, 27008129
18	Prof JV Meenakshi	Professor	Agricultural Economics, Health Economics	Delhi School of Economics,	University of Delhi New Delhi- 110007	meena@econdse.org	011-27008127
19	Prof Abhijit Sen	Professor (Retd.)	Monetary Economics, International Finance and Open Economy Macroeconomics	Centre for Economic Studies and Planning, Jawaharlal Nehru University	G-1255 Chittaranjan Park New Delhi - 110019	abhijitsenjnu@gmail.com	011-26272749 (R) 9818260887
20	Prof Pulin Nayak	Professor	Public Economics, Economic Theory	Ashoka University	Plot No. 2, Rajiv Gandhi Education City, National Capital Region P.O.Rai, Sonepat Haryana-131029	pulin.nayak@ashoka.edu.in, pulin.nayak@gmail.com	130-2300000
21	Prof Rohini Somanathan	Professor	Economic Development, Political Economy, Public Economics	Delhi School of Economics	Room no 202, University of Delhi New Delhi- 110007	rohini@econdse.org	011-27008147

22	Prof E Somanathan	Professor, Economics and Planning Unit, Indian Statistical Institute	Environment and development	Indian Statistical Institute	7 Shaheed Jeet Singh Marg, New Delhi 110016	som@isid.ac.in	011-4149 3939
23	Prof Arup Mitra	Professor & Dean	Development economics	South Asian University	Faculty of Economics (FE), Akbar Bhawan, Room No. 231, Chankyapuri, New Delhi- 110021	arupmitra@sau.int	9818948470 Phone: 011-27783468
24	Prof Bina Agarwal	Former Director and Professor	Gender inequality, environment and development; land, property and livelihoods; and agriculture and food security	Institute of Economic Growth (Currently Professor of Development Economics and Environment University of Manchester)	Delhi University Enclave, Delhi - 110 007	bina.india@gmail.com; bina.agarwal@manchester.ac.uk	(off) 011-27666364 ext 258. (home) 011-24350077
25	Prof Sanjay Srivastava	Professor	Urbanism, urban cultures and technologies of planning; gender and globalization; Social theory	Institute of Economic Growth	Institute of Economic Growth, Delhi University Enclave, New Delhi - 110007	sanjaysri@iegindia.org	011-27666364/6367, 27667101/7288/7365/7424

26	Prof Satish Deshpande	Professor, Sociology	Caste and Class Inequalities, Contemporary Social Theory, Politics and History of the Social Sciences and South-South Interactions	Delhi School of Economics, Delhi University	A I/6, Maurice Nagar, Delhi University, New Delhi- 110007	sdeshpande@sociology.du.ac.in	011-27667858
27	Prof Amita Baviskar	Professor	Citizenship, war and counterinsurgency in South Asia, indigenous identity and politics in India, the sociology of law and inequality	Sociology Unit, Institute of Economic Growth	Institute of Economic Growth, Delhi University Enclave, Delhi 110007	amita.baviskar@gmail.com	011-2766-7101 extn. 256 (office) and 9811874547 (mobile)
28	Dr. Shalini Singh (MD, Ph.D.)	Scientist G & Director	Public Health	Indian Council of Medical Research (ICMR)	National Institute of Cancer Prevention & Research (NICPR) Indian Council of Medical Research (ICMR), Dept. of Health Research Ministry of Health & Family Welfare, Govt. of India, I-7, Sector – 39, Noida, Uttar Pradesh – 201301	shalinisingh.icmr@gmail.com; director.nicpr@icmr.gov.in	011-26589438/120-02578837

29	Prof Rama Baru	Professor	Centre of Social Medicine and Community Health	Jawaharlal Nehru University	Centre of Social Medicine and Community Health, School of Social Sciences, Room No 213, JNU, New Delhi -110067	ramabaru@mail.jnu.ac.in, rama.v.baru@gmail.com	011-26704489
30	Prof Rajeshwari Raina	Professor	School of Humanities and Social Sciences	Shiv Nadar University	Department of International Relations and Governance Studies, School of Humanities and Social Sciences, Block E, Shiv Nadar University, Greater Noida, Uttar Pradesh	rajeswari.raina@snu.edu.in	
31	Prof Debasis Mishra	Professor	Microeconomics	Indian Statistical Institute	7, SJS Sansanwal Marg New Delhi - 110 016	dmishra @isid.ac.in	011-4149 3948
32	Prof Abhiroop Mukhopadhyay	Professor	Econometrics/Development	Indian Statistical Institute	7 SJS Sansanwal Marg New Delhi-110016	abhiroop @isid.ac.in	011-4149 3925
33	Prof Saudamini Das	Professor	Environment/Energy	Institute of Economic Growth	University of Delhi (North Campus), Delhi 110 007	saudamini@iegindia.org	9899066456

34	Dr Pronab Sen	Professor/Director	Economics	International Growth Centre	Indian School of Public Policy, B-35, 3rd and 4th Floor, Qutub Institutional Area, New Delhi – 110016	pronab.sen@theigc.org	9811297371
35	Prof. Kanchan Chopra	Professor and Director (Former)	Environmental Economics, Agricultural Economics	Institute of Economic Growth	University of Delhi (North Campus), New Delhi- 110 007	choprakanchan14@gmail.com	9599240783; 0124 4389569
36	Prof. Shreekant Gupta	Professor	Public Economics, Environmental Economics	Delhi School of Economics	University of Delhi New Delhi- 110007	sgupta@econdse.org	9810296214
37	Prof. Vishal Narain	Professor	Public Policy and Governance	MDI, Gurgaon	Management Development Institute Mehrauli Road Sukhrali, Gurgaon - 122 007	vishalnarain@mdi.ac.in	98994 05779
38	Prof. Dipankar Gupta	Professor	Sociology	ISPP (formerly at CSSS, JNU)	Indian School of Public Policy B-35, 3rd and 4th Floor, Qutub Institutional Area New Delhi – 110016	dipankargupta@hotmail.com	98711 71987
39	Prof. JBG Tilak	Professor	Economics (Education)	Council for Social Development	Sangha Rachna 53, Lodi Estate New Delhi – 110003	jtilak@csdindia.org; jtilak2017@gmail.com	98686 46919

40	Prof. Neera Chandhoke	Professor	Political Science	Delhi University	Social Science Building, University of Delhi, New Delhi 110007	neera.chandhoke@gmail.com	9811191919
41	Prof. Rajni Palriwala	Professor	Sociology	Delhi University	Department of Sociology, University of Delhi, New Delhi 110007	rajnip@gmail.com; rpalriwala@sociology.du.ac.in	011 27667858
42	Prof. Neera Agnimitra	Professor	Social Work (Community Practice; Ecology and Social Work; Rural and Urban Community Development; Gender Studies)	Delhi University	Department of Social Work, Delhi University 3, University Road, Delhi-110007	neeraagnimitra@gmail.com	9810460055
43	Prof. Rima Dada	Professor	Anatomy (Health)	All India Institute of Medical Sciences	Ansari Nagar, New Delhi - 110029	rima_dada@rediffmail.com	011-26588500; 9811783318
44	Prof. Vatsla Dadhwal	Professor	Gynecology (Health)	All India Institute of Medical Sciences	Ansari Nagar, New Delhi - 110029	vatslad@hotmail.com	011-26588500; 9811015979
45	Prof. Soumendra Mohan Patnaik	Professor	Anthropology	University of Delhi	Department of Anthropology, University of Delhi, New Delhi - 110007	smp_du@yahoo.com	9891333637
46	Prof. PC Joshi	Professor	Anthropology	University of Delhi	Room No. 22 Department of Anthropology University of Delhi, New Delhi – 110007	pcjoshi@anthro.du.ac.in	9871222692 (mob) 011-27667329 (Office)
47	Prof. Pamela Singla	Professor	Social Work (Gender	University of Delhi	23/4 Cavalry Lines Delhi University	pamelasingla@gmail.com	011-27667147 (Office)

			studies/Social Development; Social Policy)		Campus Delhi-110007		9811328666
48	Prof Asmita Kabra	Professor	Economics/Human Ecology	School of Human Ecology, Ambedkar University	2711, Lothian Rd, Chabi Ganj, Kashmere Gate, New Delhi, Delhi 110006	asmita@aud.ac.in	
49	Prof. Sanghamitra Sheel Acharya	Professor	Social Medicine and Community Health	Centre of Social Medicine and Community Health	Centre of Social Medicine and Community Health, School of Social Sciences JNU, New Delhi-110067	sanghamitra@mail.jnu.ac.in; sanghmitra.acharya@gmail.com	9810547096
50	Prof Sangeeta Bansal	Professor	Environmental Economics	Centre for International Trade and Development, Jawaharlal Nehru University	211, Centre for International Trade and Development, School of International Studies-II, Jawaharlal Nehru University, New Delhi-110067	sangeeta.bansal7@gmail.com	011-26704357
51	Prof. Ritu Priya Mehrotra	Professor	Social Medicine and Community Health	Centre of Social Medicine and Community Health	Centre of Social Medicine and Community Health, School of Social Sciences, JNU. New Delhi-110067	ritupriya@mail.jnu.ac.in; ritu_priya_jnu@yahoo.com	Off. 011-26704615 Residence: 011-26742752 Mobile: 9313350186

Department of Regional Water Studies							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialization	Affiliation	Full Address	Email id	Mobile No
1.	Prof Garg N. K.	Professor & Head	Water Sector Expert	Department of Civil Engineering, Indian Institute of Technology Delhi	Indian Institute of Technology Delhi Hauz Khas, New Delhi - 11 00 16	nkgarg@civil.iitd.ac.in	011 - 2659 1210
2.	Prof Chahar B.R.	Professor	Water Sector Expert	Department of Civil Engineering, Indian Institute of Technology Delhi	Indian Institute of Technology Delhi Hauz Khas, New Delhi - 11 00 16	chahar@civil.iitd.ac.in;	011 - 2659 1187
3.	Prof Kaushal D. R.	Professor	Water Sector Expert	Department of Civil Engineering, Indian Institute of Technology Delhi	Indian Institute of Technology Delhi Hauz Khas, New Delhi - 11 00 16	kaushal@civil.iitd.ac.in;	011 - 26591216
4.	Prof S. K. Singh	Professor & Dean (AA)	Water Sector Expert	Department of Civil and Environmental Engineering, Delhi Technological University	Delhi Technological University (formerly Delhi College of Engineering) Bawana Road , Delhi-42	sksinghdce@gmail.com;	011 - 27871061
5.	Prof V. K. Minocha	Professor	Water Sector Expert	Department of Civil and Environmental Engineering,	Delhi Technological University (formerly Delhi College of	vkminocha@dce.ac.in;	

				Delhi Technological University	Engineering) Bawana Road , Delhi-42		
6.	Prof Sirajuddin Ahmed	Professor	Water Sector Expert	Department of Civil Engineering, Jamia Millia Islamia	Jamia Millia Islamia, Jamia Nagar, New Delhi-110025	suahmed@jmi.ac.in;	011 - 2698 5227
7.	Prof Shamshad Ahmad	Professor	Water Sector Expert	Department of Civil Engineering, Jamia Millia Islamia	Jamia Millia Islamia, Jamia Nagar, New Delhi-110025	sahmad8@jmi.ac.in;	011 - 2698 5227
8.	Prof Quamrul Hassan	Professor	Water Sector Expert	Department of Civil Engineering, Jamia Millia Islamia	Jamia Millia Islamia, Jamia Nagar, New Delhi-110025	qhassan@jmi.ac.in;	9868856198
9.	Prof Mohammed Sharif	Professor	Water Sector Expert	Department of Civil Engineering, Jamia Millia Islamia	Jamia Millia Islamia, Jamia Nagar, New Delhi-110025	msharif@jmi.ac.in;	9810116472
10.	Prof Vishal Narain	Professor & Chairperson - FPM & EFPM	Water Sector Expert	Management Development Institute	Management Development Institute Mehrauli Road Sukhrali, Gurgaon - 122 007	vishalnarain@mdi.ac.in;	124-5013050

Department of Natural Resources							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Mobile No
1	Prof. CK Varshney	Professor Emeritus (JNU) and Distinguished Adjunct Professor (AIT, Bangkok)	Environmental Science, Ecology, Wetlands, EIA	School of Environmental Sciences, JNU	88, Vaishali, Pitampura, Delhi 110034	ckvarshney@hotmail.com	9818547904
2	Prof. K.G. Saxena	Professor	Ecology, Natural Resource Management and Sustainable Development	School of Environmental Sciences	Jawaharlal Nehru University, New Delhi- 110067	kgsaxena@mail.jnu.ac.in kgsaxena@gmail.com	9971461199
3	Prof. KS Rao	Professor & Head	Ecosystem analysis; Adaptation to climate change; Ecosystem redevelopment; Agroforestry; Land use/cover dynamics; Reserve people conflict mitigation, Sustainable rural development models/approaches.	Department of Botany	University of Delhi, Delhi - 110007	srkottapalli@botany.du.ac.in,srkottapalli@yahoo.com	9313294607
4	Prof. Nilanchal Patel	Professor	Remote sensing, GIS, Geoinformatics	Department of Remote Sensing	Birla Institute of Technology Mesra, (A Deemed	npatel@bitmesra.ac.in	9431100357

			applications		University) Ranchi, Jharkhand, PIN: 835215		
5	Prof. V.K.Sehgal	Professor	Geoinformatics, drought management, crop management, Drone applications in agriculture	Dept. of Agriculture Physics	Indian Institute of Agricultural Research Pusa Road, New Delhi – 110012	vksehgal@gmail.com	9899034144
6	Prof. MS Nathawat	Professor	Remote Sensing and GIS, Desertification, Natural Resources Management, Physical Geography, Regional & Urban Planning, Climate Change and Disaster Management	IGNOU	Room no.2,Block 15, Section J School of Science Indira Gandhi National Open University Maidan Garhi New Delhi-110068	msnathawat@ignou.ac.in	7678596317, 9868289803
7	Dr. PLN Raju	Director	Geoinformatics	NESAC	North-East Space Applications Centre (NESAC), Umiam - 793103, RI Bhoi district, Meghalaya	director@nesac.gov.in	9436160902
8	Prof.Kusum Arunachalam	Professor	Forest Ecology & Biodiversity, Conservation,	Department of Environment and Natural Resources	School of Environment & Natural Resources,	kusumdoon@gmail.com	9411113894

			Climate Resilient Ecosystems, Traditional Knowledge		Doon University, Dehra Dun 248001.		
9	Dr. V.M. Chowdary	Scientist/Engineer SG	GIS, Remote sensing, water resource management	Department of Space	Regional Remote Sensing Centre (RRSC) -North Indian Space Research Organisation Dept. of Space, Govt. Of India Antariksh Bhavan, Plot No.7, Planning Area Center, Beside IOCL Office, Sadiq Nagar, New Delhi 110 049	chowdary_isro@yahoo.com	9434754217

Department of Biotechnology							
Ser No	Name	Designation (Professor/Equivalent designation)	Specialisation	Affiliation	Full Address	Email id	Mobile No
1	Dr K R Koundal	Professor and Emeritus Scientist	Plant Molecular Biology, Biotechnology, Isolation & cloning of plant	National Research Centre on Plant Biotechnology Indian Agricultural	National Research Centre on Plant Biotechnology Indian Agricultural Research institute	kirparamkoundal@gmail.com.	Phone : 011-25841787 Ext 244

			genes	Research institute	Pusa Campus, New Delhi 110 012		
2	Dr. A. K. Singh	Director (Additional Charge)	Genetics and Plant Breeding	Indian Agricultural Research Institute	Indian Agricultural Research Institute, Pusa, New Delhi-110012	director@iari.res.in	91-11-25842367
3	Dr. Anil K Malik	Professor	Nanotechnology	Department of Physics Ch Charan Singh University Meerut	Department of Physics Ch Charan Singh University Meerut, UP-250004, India	anilkmalik@gmail.com	+919654557573
4	Dr. Sabhyata Bhatia	Staff Scientist VII	Plant Molecular Biology	National Institute of Plant Genome Research	NIPGR, Aruna Asaf Ali Marg, New Delhi, Delhi 110067	sabhyatabhatia@nipgr.ac.in	91-11-26735159
5	Dr. S.R. Rao	Adviser	Biotechnology development, regulation, safety, Mycology, Plant pathology	Department of Biotechnology Minister of Science & Technology Government of India	Department of Biotechnology Minister of Science & Technology Government of India Block-2, CGO Complex, Lodi Road, New Delhi	srrao.dbt@nic.in	Telefax:011-24360295 Fax: 011-24362884
6	Prof Akhilesh K Tyagi	Head	Plant Genomics and Biotechnology	University of Delhi, South Campus	University of Delhi, South Campus Department of Plant Molecular Biology Benito Juarez Marg New Delhi	akhilesh@genomeindia.org	(M) 9871277558
7	Professor P S Srivastava,	Head, Centre for Biotechnology	Botany, Genetics, & Plant	Hamdard University	Hamdard University, Hamdard Nagar	root@hamduni.ren.nic.in	Phone: 91-11-608 9309

		Dean, Faculty of Science	Biotechnology		New Delhi 110062		Fax:: 91-11-608 8874
8	Dr Renu Swarup	Secretary, DBT	Genetics and Plant Engineering	Department of Biotechnology	Department of Biotechnology Block 2, 7th Floor C G O Complex, Lodhi Road New Delhi 110 003	swarup@dbt.nic.in	Phone: 91-11-24360064 24362950. 24362881. 24360747
9	Dr. Niranjan Chakraborty	FNA, FNASc, FNAAS Professor of Eminence	Plant Molecular Biology	NIPGR	NIPGR, Aruna Asaf Ali Marg, New Delhi, Delhi 110067	nchakraborty@nipgr.ac.in, nchakraborty@hotmail.com	91-11-26735178 91-11-26742658
10	Dr Paramjit Khurana	Head & Professor DPMB	Plant Biotechnology and Genomics	Department of Plant Molecular Biology South Campus	Department of Plant Molecular Biology South Campus New Delhi - 110021	param@genomeindia.org; paramjitkhurana@hotmail.com	Mobile: 9711006512
11	N. Raghuram	Professor and Former Dean	Functional Genomics & molecular biology	School of biotechnology, GGS IP University,	School of biotechnology, GGS IP University, Secor 16C, Dwarka New Delhi-110075	raghuram98@hotmail.com	Phone (Office): 91-11-25302308 Mobile: 9891252943
12	Dr. Debasisa Mohanty	Staff Scientist, NII	Bioinformatics & Computational Biophysics; Prediction of structure and	NII	National Institute of Immunology Aruna Asaf Ali Marg, New Delhi - 110067,	deb@nii.res.in	91-11-26717121

			function of proteins; In silico analysis of genomes; Computer simulation of biomolecular systems		India		

Enclosure 2

Ratification of Teaching Posts at TERI School of Advanced Studies

Year	Lecturer/Assistant Professor	Associate Professor	Professor	Total
2015-16	34	9	7	50
2016-17	38	8	8	54
2017-18	34	15	6	55
2018-19	29	15	9	53
2019-20	29	15	7	51

Compiled by : Mr Kamal Sharma Dy Registrar (Acad Admin)
Mr V Ganesh, Asst Registrar (Acad Admin)

Enclosure 3

Admission Policy

These rules shall be applicable to all candidates applying for admission to any programme approved by the Academic Council of the TERI School of Advanced Studies (TERI SAS). TERI School of Advanced Studies shall admit students to its approved academic programmes, under its enrolment, only from the academic session that follows the notification issued by it.

A. Submission of Documents

All selected candidates are required to submit a copy of their mark sheets and certificates of the 10^{th}, 10+2, and the qualifying examination as well as the original migration certificate from the College/University last attended.

Foreign students are required to furnish all above documents along with a copy of their valid passport.

B. Admission Records

The Office of the Registrar, TERI SAS shall –

(a) Maintain the records of the entire process of selection of candidates, and preserve such records for a minimum period of five years,

(b) Be liable to produce such record, whenever called upon to do so by any statutory authority or by the government under any law for the time being in force.

C. Admission Publicity & Outreach

(i) TERI SAS shall publish, before expiry of sixty days prior to the date of the commencement of admission to any of its courses or programmes of study, in electronic form, on its website, the following for the purposes of informing those persons intending to seek admission in TERI SAS and the general public, namely :

(a) Each component of the fee, deposits and other charges payable by the students admitted to the TERI SAS for pursuing a course or a programme of study, and the other terms and conditions of such payment.

(b) The percentage of tuition fee and other charges refundable to a student admitted in the TERI SAS in case such student withdraws before or after completion of course or programme of study and the time within, and the manner in which such refund shall be made to the student;

(c) The number of seats approved in respect of each course or programme of study for the academic year for which admission is proposed to be made.

(d) The conditions of eligibility including the minimum and maximum age limit of persons for admission as a student in a particular course or programme of study, where so specified by the TERI SAS.

(e) The educational qualifications specified by the relevant statutory authority / body, or by the TERI SAS, where no such qualifying standards have been specified by any statutory authority.

(f) The process of admission and selection of eligible candidates applying for such admission, including all relevant information in regard to the details of test or

examination for selecting such candidates for admission to each course or programme of study and the amount of fee to be paid for the admission test;

(g) Details of the teaching faculty, including therein the educational qualifications and teaching experience of every member of its teaching faculty and also indicating therein whether such member is on regular basis or visiting basis.

(h) Information in regard to physical and academic infrastructure and other facilities including hostel accommodation, library, hospital or industry wherein the practice training to be imparted to the students and in particular the facilities accessible by students on being admitted to the TERI SAS;

(i) Information related to various scholarships offered to both Maters and Ph.D. students.

(j) Broad outline of the syllabus specified by the Academic Council, for every course or programme of study, including the teaching hours, practical sessions and other assignments.

(k) All relevant instructions in regard to maintaining the discipline by students within or outside the campus of the TERI SAS, and, in particular, such discipline relating to prohibition of ragging of any student or students and the consequences thereof and for violating the provisions of any regulation in this behalf made under the UGC Act, 1956 or other law for the time being in force.

(ii) An Outreach Committee set up by the Vice Chancellor shall advise the Registrar about various modes of conducting admission outreach/marketing for national and international students. The targeted admission marketing process should commence at least 3 months in advance of the date of opening of registration portal.

D. Admission Session

The admission calendar shall be discussed at the admission committee before being promulgated at least 75 days before the admission date.

(a) The regular Programmes of the TERI SAS shall commence from the last week of July every calendar year.

(b) Ph.D. admissions are open throughout the year. However, the Ph.D. course work shall commence in July and January every year as per academic calendar.

E. Counselling

Counselling of prospective students will be conducted by the Programme Coordinators at TERI SAS. Open house may be conducted to familiarise students with the various programmes. In addition, social media may be used for chatting or video sessions to provide necessary counselling to interested candidates.

F. Eligibility

The admission committee from time to time shall verify the eligibility criteria for specific programmes with the HoDs of the concerned Department and inform the Registrar Office for obtaining necessary approval of Competent Authority for the same, where required. This process should be completed at least 75 days before the commencement of the admission session. The list of approved eligibility conditions is placed at annexure.

G. Admission/Selection Procedure

1. Masters Programmes

Admissions to various regular Masters programmes are to be made based on merit in common entrance test and/or interview. Application forms will be processed at TERI SAS / agency designated by TERI SAS. Entrance Test will be conducted by TERI SAS /a designated agency and results will be processed by Admission office. A subject wise merit list will be prepared by admission office.

Entrance examination

(i) The eligible candidates shall be required to appear for an on-line all India Entrance Test comprising of 100 multiple choice questions (MCQ) carrying a total of 400 marks covering the following: -
   (a) Proficiency in English,
   (b) Analytical reasoning and
   (c) Quantitative ability.

(ii) An incorrect answer will attract a penalty of 1 mark

Apart from the above, some other programmes such as M.Sc. (Economics), LLM programme conduct an additional subject specific tests for the eligible candidates for their programmes.

Candidates clearing national level tests

Eligible Candidates clearing National examinations like CSIR /UGC NET/ GATE/CAT/MAT/CLAT etc. recognized by approved bodies of Govt of India be exempted from appearing in the TERI SAS entrance examinations for eligibility purpose to various programmes and be allowed to directly appear in the interview.

Sponsored seats

Two seats may be earmarked for sponsored category students in each programme.

Preparation of selection list

(i) The Admission Committee of TERI SAS is required to finalise the number of seats out of the total approved seats that can be released for the admission for the particular academic session. A proposal containing number of seats to be released and number of waitlisted candidates to be put up for programme is to be put up to the VC for approval. Post approval, the plan is to be communicated to the Office of the Registrar for compliance.

(ii) The dates for interview, as mentioned in the Academic Calendar of TERI SAS, are to be intimated to the HoD by admission office who in turn shall constitute a panel of experts for interviews. The marks of the written exam, along with past academic background of the candidates are to be shared with the HoDs. The HoD and the panel are required to finalise a methodology and guidelines to be followed for interviewing the candidates. The method so adopted shall not be changed for the entire admission session to ensure that the method applies to all candidates uniformly. The interview can also be permitted through video conferencing/ telephone. Post interview sessions the panel is required to forward the interview marks to Admission Office within 48hrs for feeding the same into University Management System. Based on the marks of the written exam and the interview a stream wise merit list is to be generated.

(iii) The Registrar office will prepare a final list as per merit and host the same at the TERI SAS web site. The wait list, if required will be activated after the last date of payment of fee which is already mentioned on the web site. Depending on the number of seats left in each programme, the wait list is to be activated.

(iv) The wait listed candidates are to be requested to be physically present/ represented at the time of activation of the wait list otherwise the seat will be offered to the next candidate in order of merit who is present. The wait listed candidates are required to pay an amount of Rs. 25000/- once their admission is confirmed and the remaining amount be paid within the next two days. The second wait-list will also be activated, if required.

2. Ph.D. Programmes

Applications to the Ph.D. programmes must be necessarily made on TERI SAS prescribed form. Admission will be made on the basis of a written test followed by an interview conducted by TERI SAS. Though, Ph.D. applications are normally processed in two cycles for semesters commencing in July and January months each year, candidates may however apply at any time throughout the year.

A committee consisting of one member each from departments shall screen applications with respect to eligibility criteria , identify missing documents in the application form(if any), seek clarification from the candidate and prepare a list of key words of research interest of students from the narrations in the application form. The list so prepared to be circulated to all faculty members for seeking their interest for a student. Faculty members will be required to send feedback to the committee about their interest to supervise a student. Based on the feedback, the committee will prepare interview panels- grouping students and potential supervisors and conduct written entrance examination comprising (i) Research Aptitude Test (RAT), and (ii) subject specific test. The respective panels shall conduct the interview on a date promulgated in advance. Selected students are to be intimated through a letter from Registrar's Office.

Eligible candidates who may have qualified the national level tests including UGC-CSIR NET (JRF), and candidates with valid GATE score, etc., can appear directly in the interview. For such candidates their merit score will be based on 100 % weightage assigned to interview marks. Admission is subject to vacancies as available in the relevant areas of specializations. Available vacancies are declared from time to time in the website. After the selection, the candidates will be formally admitted to the Ph.D. programme. The date of admission will be considered as the corresponding date of registration.

H. Collaborative Arrangement

This shall follow UGC norms and conditions.

I. International Students

Foreign students should be encouraged to take admission at TERI SAS. The applications received are to be sent to TERI SAS admission committee for scrutiny and evaluation. A personal online or telephonic interview may be conducted, and an offer of admission is made.

J. Scholarships

The Admission & Scholarship Committee is to shortlist the candidates for scholarships available at TERI SAS. If a candidate is not shortlisted for scholarship, he/she may be encouraged to take admission in an individual capacity.

K. Closure of admission

A notice of at least one week shall be given for the closure of admission, to provide sufficient time to all concerned to fill up all the available seats.

L. Procedure to handle Complaints regarding selection/admission

If a student has a complaint or any other issue to report in connection with the on line entrance test/admission process, they have to make a formal request to the Registrar, TERI SAS. If the matter is not resolved at the Registrar's Office it shall be referred to a three member redressal Committee set up by the Vice Chancellor who shall look into the magnitude of the problem and take necessary action. Any mal-practice or use of unfair mean may lead to the cancellation of the admission.

M. In the event of any disaster and nation-wide lock-down

In the event of any disaster and nation-wide lock down situation, the on-line entrance examination may be conducted, and candidates can attempt from any place of their choice with image proctoring. An online survey shall be conducted by sending few questions to the registered candidates and the computer readiness of the candidates in terms of web cam availability, internet connectivity etc. and to understand the examination process shall be ascertained. Depending on the situation candidates who qualify the written on-line exam will be called for the next phase of the selection process. This may comprise an online subject specific test, wherever needed, followed by online interview.

N. Admission Fees and other fees

(i) The admission fee and other fees shall not be accepted: -

(a) Other than such fee or charges for such admission as fixed in accordance with the Fee Regulations framed by the TERI SAS Fee Committee from time to time, which shall be declared in the prospectus for admission against any such seat, and on the website,

(b) Without a proper receipt in writing issued for such payment to the concerned student admitted; and

(c) Other than the approved amount.

(ii) In case a student, after having been admitted to the TERI SAS, for pursuing any course or programme of study, subsequently withdraws, the fee/other charges deposited by the students against the first semester programme fee will be refundable after deduction of Rs. 1000/- if the student applies for cancellation of his/her allotted seat on or before 15 days of the commencement of the respective programme. No request for the refund of fees will be entertained after the commencement of the respective programme except refund pertaining to security deposit.

(iii) Fee for an admission test other than an amount representing the reasonable cost incurred by it in conducting such test shall be fixed by the admission committee.

(iv) No capitation fee or donation to be charged or accepted by way of consideration for admission to any seat or seats in a course or programme of study conducted.

(v) Documents i.e. certificates of degree, diploma or any other award or other document deposited by a person for the purpose of seeking admission shall be returned and not used for compelling any person to pay any fee or fees in respect of any course or programme of study which such person does not intend to pursue or avail.

O. General Rules

(a) The candidates who are offered admission are required to deposit the programme fee. Admission shall be confirmed only after verification of original documents and receipt of admission Fee.

(b) Candidates are to be advised to mention their email ID and mobile phone number in the application form. Otherwise it will be their responsibility to collect updated information related to counselling.

(c) TERI SAS will not be responsible for non-receipt of information in time.

(d) All the communication with candidates will be made only through the email and TERI SAS website.

(e) Programme once allotted will not be changed.

Annexure

Eligibility criteria for masters programmes

M.Sc. (Environmental Studies and Resource Management)

A Bachelor's degree in Science/Engineering/Economics/Mathematics/Statistics/Geology/Geography with a minimum cumulative grade point average of 6.75 on a 10 point scale or equivalent, as determined by TERI SAS, wherever letter grades are awarded, or 60% marks in aggregate, wherever marks are awarded. For candidates with bachelor's degree in Humanities (e.g. Economics/Geography), a relaxation of 5%/0.75 Cumulative Grade Point Average could be allowed.

M.Sc. (Climate Science and Policy)

A Bachelor's degree in Science/Engineering/Economics/Mathematics/Statistics/Geology/Geography with a minimum cumulative grade point average of 6.2 on a 10 point scale or equivalent, as determined by TERI SAS, wherever letter grades are awarded, or 55% marks in aggregate, wherever marks are awarded. For candidates with bachelor's degree in Humanities (e.g. Economics/Geography), a relaxation of 5%/0.75 Cumulative Grade Point Average could be allowed.

M.Sc. (Economics)

B.A. (Hons.) / B.Sc. (Hons.) in Economics with 50 % or more marks in aggregate. (CGPA of 5.65)

OR

Bachelor degree in any other discipline with at least 60% marks in aggregate (CGPA of 6.75). The applicant must have studied mathematics either at 10+2 level or at Bachelor's level, either as subsidiary or as honours.

M.Sc. (Plant Biotechnology)
A Bachelor's degree in Sciences/Engineering/Technology.

M.Sc. (Geoinformatics)
A Bachelor's degree in Science/Engineering/B. Arch/ Economics/Mathematics/Statistics/ Geology/Geography.

M.Sc. (Water Science and Governance)
Graduate (B.Sc/B.A) or equivalent from any branch of Engineering, Environmental Science, Physics, Mathematics, Statistics, Chemistry, Geology, Atmospheric Science, Economics, Geography, Zoology, Botany, Anthropology, Agricultural Science. *B.Voc in Industrial Waste Management, Soil and Water Conservation, Industrial Chemistry, Industrial Waste Treatment Technology, Sustainable Agriculture.*

M.Tech. (Renewable Energy Engineering and Management)
A Bachelor's degree in any branch of engineering or M.Sc. with a minimum cumulative grade point average of 6.2 on a 10 point scale or equivalent or 55% marks in aggregate

M.Tech. (Urban Development and Management)
A Bachelor's degree B.E./B. Tech in any branch/discipline, B. Arch., B. Planning, OR Masters or equivalent degree in Science.

M.Tech. (Water Resources Engineering and Management)
Graduate or equivalent from any branch of Engineering or Postgraduate or equivalent in Environmental Science, Physics, Mathematics, Statistics, Chemistry, Geology, Atmospheric Science, Economics, Geography, Agricultural Science with mathematics at 10+2 level.

M.A. (Sustainable Development and Practice)
To enter the programme, students must meet the following prerequisites.
An undergraduate degree in any discipline, from a recognized institution / Deemed to be University.
Candidates with prior experience in development sector would be preferred, although it is not mandatory.

M.A. (Public Policy and Sustainable Development)
DoPT sponsored Government candidates
The programme is open to officers of All India Services, Central Services (organized & non-organized, technical & non-technical), faculty members of State Administrative Training Institutes and also officers of the State Civil Services (SCS) & Non-State Civil Services (Non-SCS) subject to the following eligibility conditions:

- Length of service :
  Officers should have completed 5 years of Group ?A? service as on commencement of the programme
- Age:
  The officers should have at least three years remaining service after completion of the programme
- Earlier Training:
  The officers should not have undergone a training Programme of 12 weeks or more duration in India during a period of 5 years preceding the date of commencement of this programme. Further the officer should not have undergone a Programme of training abroad of more than 2-weeks in preceding 2-years, more than one month in preceding 3-years or more than six months in the preceding 5-years.
- Other Candidates:
  Graduates with a minimum experience of five years in any of the following sectors: government, regulatory bodies, industry, research/academic institutions, NGOs and donor/consultant organizations.

MBA (Business Sustainability)/MBA (Sustainability Management)

- Bachelor's degree in any discipline with English at 10+2 level
- The candidate will be shortlisted based on CAT/MAT/GMAT/CMAT/XAT scores. Candidates who have not appeared for the above exams can take the TERI SAS common entrance test.
- Candidates with more than 2 years of relevant work experience may be exempted from requirement (2) above depending on the discretion of the selection committee.

MBA (Infrastructure)/MBA(Infrastructure Management)

- Bachelor's degree in any discipline with English at 10+2 level
- The candidate will be shortlisted based on CAT/MAT/GMAT/CMAT/XAT scores. Candidates who have not appeared for the above exams can take the TERI SAS common entrance test.
- Candidates with more than 2 years of relevant work experience may be exempted from requirement (2) above depending on the discretion of the selection committee.

LLM

A candidate having an LL.B. / B.L. Degree from a recognized Deemed to be University / Institution.

PG Diploma (Water Science and Governance)

Graduate (B.Sc/B.A) or equivalent from any branch of Engineering, Environmental Science, Physics, Mathematics, Statistics, Chemistry, Geology, Atmospheric Science, Economics, Geography, Zoology, Botany, Anthropology, Agricultural Science. *B.Voc in Industrial Waste Management, Soil and Water Conservation, Industrial Chemistry, Industrial Waste Treatment Technology, Sustainable Agriculture.*

Certificate (Water Science and Governance)

Graduate (B.Sc/B.A) or equivalent from any branch of Engineering, Environmental Science, Physics, Mathematics, Statistics, Chemistry, Geology, Atmospheric Science, Economics, Geography, Zoology, Botany, Anthropology, Agricultural Science. *B.Voc in Industrial Waste Management, Soil and Water Conservation, Industrial Chemistry, Industrial Waste Treatment Technology, Sustainable Agriculture.*

PG Diploma (Public Policy and Sustainable Development)

DoPT sponsored Government candidates

The programme is open to officers of All India Services, Central Services (organized & non-organized, technical & non-technical), faculty members of State Administrative Training Institutes and also officers of the State Civil Services (SCS) & Non-State Civil Services (Non-SCS) subject to the following eligibility conditions:

- Length of service :
  Officers should have completed 5 years of Group ?A? service as on commencement of the programme
- Age:
  The officers should have at least three years remaining service after completion of the programme
- Earlier Training:
  The officers should not have undergone a training Programme of 12 weeks or more duration in India during a period of 5 years preceding the date of commencement of this programme. Further the officer should not have undergone a Programme of training abroad of more than 2-weeks in preceding 2-years, more than one month in preceding 3-years or more than six months in the preceding 5-years.
- Other Candidates:
  Graduates with a minimum experience of five years in any of the following sectors: government, regulatory bodies, industry, research/academic institutions, NGOs and donor/consultant organizations.

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Enclosure 4

Evaluation and Examination Policy

1. Evaluation policy of TERI School of Advanced Studies

Against the backdrop of a choice-based credit system, the evaluation process in each semester at TERI School of Advanced Studies (TERI SAS) is based on the following principles:

- Decentralized evaluation system
- Continuous evaluation system
- Intensive review of evaluation plans
- Performance in evaluation process is indicated by Cumulative Grade Point Average (CGPA)
- Relative grading system for courses
- Absolute grading system for projects/dissertations
- Five stage moderation and review of the grades

A flow chart of the evaluation process is presented in Annexure 1.

2. Decentralized evaluation system

In general, TERI SAS follows a system of internal examination process following the principle of "those who teach, evaluate" for all the courses at the Masters' and Ph.D. programmes. External examiners may be invited at the discretion of the course instructor.

3. Continuous evaluation system

TERI SAS follows a continuous evaluation consisting of various types of assessments that include, but are not limited to:

- Closed book written examinations
- Open book examinations
- Assignments
- Quizzes
- Presentations
- Field work based assessments
- Lab based assessments
- Viva/Oral examinations
- Group based activities
- Research based term papers
- Reviews of literature

- Projects
- Dissertation

Many of the assessments in each programme, including the projects and dissertations, focus on developing the higher stages of Blooms' Taxonomy of Educational Objectives such as applying, analyzing and generating creative ideas or perspectives.[1]

4. Intensive review of the evaluation plan.

The evaluation plan is a part of the syllabi of each course. It includes the components of assessments and their weightages. These are reviewed in at least four stages: the Masters' Programme Executive Committee (MPEC), external experts, Board of Studies and the Academic Council. Once finalised, these are incorporated into the University Management System (UMS). Instructors cannot change this evaluation plan.

5. Grading system

a. The evaluation of courses generally follows relative grading system. In this system, the performance of a student is based on the rank in the class.

b. The evaluation of projects and dissertation generally follows an absolute grading system. Grades may be awarded on the discretion of the project/dissertation advisor(s) based on continuous evaluation during the semester, a final report/dissertation/thesis, and a final presentation to experts, including, wherever possible, an outside expert. The weightage given to performance and regularity in meetings and mid-term evaluation/presentation will be restricted to 40%. The grades may be based on the rubric provided in Annexure 2.

c. The grades that can be awarded along with their equivalent numerical points are given below.

Letter grade	Grade point	Performance
A+	10	Outstanding
A	9	Excellent
B+	8	Very Good
B	7	Good
C+	6	Average
C	5	Below average
D	4	Marginal
F	0	Very poor
I	-	Incomplete
W	-	Withdrawn

[1] Bloom, B. S., Englehart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *The Taxonomy of educational objectives, handbook I: The Cognitive domain*. New York: David McKay Co., Inc.

Ab.	-	Absent
NC (Pass)	0	Audit course pass
NC (Fail)	0	Audit course fail

d. The minimum passing grade is D. A student does not earn any credits in courses where s/he gets F grade. S/he has to repeat all such courses until a passing grade is obtained. Thus, F grade may result in an increased period of stay in order to complete the requirements for the degree. All other letter grades represent earned credits. The credits for the courses in which a student has obtained a D or higher grade will be considered as credits earned by the student.

e. A student is required to meet the minimum attendance requirement of 75% in all courses registered. In case he/she does not, he/she will not be permitted to sit for the final examination and will be awarded an Ab. Grade.

f. An I grade will be awarded to a student if s/he has not fulfilled all the requirements for the course on account of extraordinary circumstances, subject to having 75% attendance in lectures, tutorials and/or laboratory classes.

g. The concerned course coordinator should be convinced about the extraordinary circumstances and should verify the attendance from the record before recommending this rarely used option to award an I grade. The I grade awarded will be notified by the Department to which the student belongs, and copies of the notification will be sent to the Academic Section and to the course coordinator concerned.

h. The I grade will be converted into a proper grade and sent to the Academic Section within 10 days from the date on which all the assessments/evaluation processes are completed.

i. In special situations arising due to extraordinary circumstances, the period of conversion of I grade may be extended to the first week of the next semester, with the approval of Dean on the recommendation of the Course Coordinator and the Head of the Department to which the student belongs. The request has to be made sufficiently in advance.

j. ‘NC (Pass)’/‘NC (Fail)’ grades are awarded in an audit course. Students do not earn credits in audit courses; they are only awarded a “pass” or “fail” grade, which a student may register for on a pass/fail basis. These grades are not considered in the calculation of SGPA (Semester Grade Point Average) or CGPA (Cumulative Grade Point Average).

6. Calculation of SGPA and CGPA

The performance of a student will be represented by two indices: SGPA and CGPA.
CGPA is the grade point average for all the completed semesters.
SGPA = Total of (course credits × grade points)/Total of (course credits)

CGPA = Total of (course credits in passed courses × grade point)/Total of (course credits in passed courses)

While computing SGPA, all the registered credits are taken into account, whereas for computing CGPA, only the earned credits are considered. The following example illustrates how this is done.

First semester

Course No.	Course credits	Grade awarded	Earned credits	Points secured
1	5	C+	5	30
2	4	C	4	20
3	4	A+	4	40
4	1.5	B+	1.5	12
5	4	B	4	28

Credits registered = 18.5 Earned credits = 18.5

SGPA = (Points secured in the semester)/(Credits registered) = 138/22.5 = 6.13
CGPA: Not applicable

Second semester

Course No.	Course credits	Grade awarded	Earned credits	Points secured
1	5	D	5	20
2	5	F	0	00
3	4	B	4	28
4	1.5	C+	1.5	09
5	4	A	4	36

Credits registered in this semester = 19.5
Earned credits in this semester = 14.5
Cumulative earned credits = 33.0 (first + second semester)

SGPA= (Points secured in the semester)/(Credits registered) = 93/19.5 = 4.75

CGPA = (Points secured in passed courses)/(Cumulative earned credits) = (130 + 93)/(18.5 + 14.5) = 223/33 = 6.75

7. Terminal Assessment

Every Head of Department/Programme Coordinator is required to give the date sheet of terminal assessments of all courses in their department/programme to the exam section at least ten days before the start of examinations as per the academic schedule of TERI SAS. The terminal assessment may include written examinations or any other form of assessment.

8. Guidelines for Conduct of Terminal Written Examinations

a. In case of written examinations, every Head of Department/Programme Coordinator is required to give the list of invigilators and backup invigilator for any emergency for all the examinations of their programme to the examination branch. This is to be submitted along with the examination date sheet. They also have to provide information about any extra logistical help they may require, (for example lab or power cords, etc). This is to be submitted along with the examination date sheet at least ten days before the start of the examinations.
b. Any change in the name of invigilator(s) is to be brought to the notice of examination branch at least two days before the examination date of that course.
c. 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
    i. Whether it is an open-book or closed book exam;
    ii. Which teaching notes and materials a candidate can carry;
    iii. Any other relevant instruction she/he intends to share.
d. 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 MPEC 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.
e. Answer sheets are stored for a period of 5 years as per UGC regulations.

9. Eligibility & Responsibility of Invigilator for Examination

a. 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/research scholar from her/his department to perform the duty of invigilation.

b. The course coordinator may be assisted by other faculty members or research scholars or teaching assistants but the responsibility of smooth conduct of the examination would remain with the course coordinator.
c. Invigilators should adhere to the starting time of the exam. In case the duration of an exam is less than 3 hours duration, then be completed earlier than the designated end time, but the exams have to begin on time.
d. 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 against the students. In case of serious breach of the code of conduct, the invigilator may report the event to Controller of Examination/Deputy Controller of Examination immediately.

10. General instructions for the students regarding written examinations[2]

(a) The students shall occupy the seats allotted to them by the concerned Invigilator. If no such allotment is made, there shall not be in any circumstances more than two on a desk.
(b) Any student arriving more than 30 minutes late shall not be generally allowed to sit for the examination. However, the concerned invigilator(s) shall decide on the merit of a particular case.
(c) Students are not permitted to leave the examination hall during the examination period. However, in a very exceptional case, if the faculty invigilator allows such leave; a candidate not returning within 3 minutes shall be liable to cancellation of her/his paper.
(d) In case of a closed-book exam, there shall not be anything other than pens, pencils, eraser, and a scientific or normal calculator, ruler in an examinee's possession. It is to be noted that all books and notes and electronic gadgets including cell-phones, i-pads, i-pods, tablets, laptop and the like are to be deposited in an earmarked space.
(e) If calculators are permitted, only one calculating device that is not a part of any other gadget shall be allowed.
(f) If calculators are permitted, students shall use only her/his own device. No sharing shall be allowed.
(g) In case of an open-book test, in addition, a candidate shall be allowed only the books and notes the faculty would have specified for the purpose.
(h) Every candidate shall observe silence, decorum and abide by the instructions given by the faculty on invigilation during the examination.
(i) Talking or discussing among themselves or sharing answers/hints in any form shall be punishable and will lead to disciplinary action.
(j) Mobile phones are not allowed in the examination hall. Students have to switch off the mobile and submit it to the invigilator or put in the bags. Mobile phones should not be available with students or on their respective desk.
(k) Internet access is not allowed during examination time.

[2] These instructions are subject to change at the discretion of the course coordinator or Controller of Examinations.

(l) Anything in the candidate's possession other than that allowed, or violation of any of these instructions, might lead to cancellation of the paper. In such cases, the invigilators' report shall constitute the exclusive evidence for judgment.

11. Moderation of grades and declaration of results

a. The results of the students go through five stages of scrutiny before they are published – MPEC, the Dean (Academic), the Examination Cell, the Controller of Examination and the Registrar.
b. After the assessment outcomes and feedback is shared with the students, the marks are uploaded by instructors to the TERI SAS portal for grade moderation and review process.
c. Moderation of grades takes place at two levels – the MPEC (programme level) and the Dean (Academic) (TERI SAS level).
d. The entire process of submission of grades by the faculty and moderation takes place online via the UMS and portal systems and then the grades are submitted to the examination cell.
e. The examination cell checks for any inconsistencies/errors forwards the grades for review and approval by the Controller of Examination and Registrar.
f. The results are then released to the students via the portal.

12. Policy and Procedure for Student Appeal of the Final Course and Project Grade

a. **Purpose and scope of the final grade appeal policy**

The purpose of the final grade appeal policy is to establish a fair procedure for settling cases involving contested final grades assigned in the courses or projects. However, this applies only to the final grade of a course or project, and does NOT apply to the marks/grades assigned for specific components of the courses or projects (i.e. assignments, presentations, tests etc). This also does NOT apply to any grade changes done as a result of disciplinary action against the student.
Appeals for review of more than one grade must be applied for on separate applications. Each application would need to be accompanied by the requisite fee.

b. **Time-frame for grade appeal**

All final grade appeals must be initiated by the student within 3 working days of the grade display.

c. **Procedure for grade appeal for a course**

The award of a grade for the performance of a student in a course is the prerogative of the course faculty-in-charge. A grade given by the faculty member may be changed only by that faculty member. In exceptional cases, it may be changed by the Dean (Academic), on the recommendation of the MPEC.

The student should contact the Registrar office to ensure that there is no input error.
In case no input error is found, the student may meet the concerned faculty-in-charge to initiate the informal procedure.

Informal process:
The student who believes that s/he was given an improper grade, must meet the concerned faculty member, within 3 working days of the grade display, to review her/his grade if s/he believes that there was an error while totalling marks of various components (e.g. tests, assignment, field reports etc.) of the course.
The informal process must be carried out face-to-face. However, if the faculty member is not available in the office, the discussion between the student and faculty may take place through email or phone, if suggested by the faculty member.

Formal process
Application to Dean (Academic)
If the student is still dissatisfied over her/his final grade, s/he may apply for a formal procedure of grade review to the Dean (Academic). This must be done within 5 working days of the grade display.
The formal application for final grade review must be done as a signed written request and must include a statement from the student providing evidence that supports the argument that a fair evaluation method has not been used while assigning the final grade to her/him.
The Dean (Academic) will review the matter by holding meetings with the student and concerned faculty member individually, and will:
Communicate the decision to the student within 7 working days, OR
Refer the matter to the MPEC for a review, and thereafter take a decision based on the recommendation, within 7 working days.

Review by the MPEC
When the Dean (Academic) refers the matter to the MPEC for a review, s/he would pass-on on the points relevant to the case, to the chairperson of the MPEC, who in turn, after the meeting, would communicate the recommendation of the MPEC, in writing, to the Dean(Academic).
In normal circumstances, the faculty-in-charge of the course must attend the MPEC meeting.

Decision of the Dean (Academic)
The final decision of the Dean (Academic) will be communicated to the faculty-in-charge for retention/change of grade. This will then be communicated to the Registrar's office.

d. **Procedure for grade appeal for a project/thesis/dissertation**
The awarding of grade for the performance of a student in a project***/thesis/dissertation*** is the prerogative of the Master's Programme Executive Committee (MPEC). A grade given by the MPEC may be changed only by the committee.

If the student is dissatisfied over her/his final grade in a project (Minor or Major) or thesis or dissertation, the student should contact the Registrar office to ensure that there is no input error.

In case no input error is found, the student may meet the Project Coordinator /HoD to initiate the informal procedure.

Informal process

The student who believes that s/he was given an improper grade, must meet the concerned faculty in-charge, that is, the project coordinator or thesis coordinator or programme coordinator or Head of the Department, within 3 working days of the grade display, to review her/his grade and to find out if there was any error while calculating marks of various components (e.g. presentation, written report etc.) of the project.

The informal process must be carried out face-to-face. However, if the concerned faculty in-charge is not available in the office, the discussion between the student and faculty in-charge may take place through email or phone.

After hearing the case of the student, the faculty in-charge will discuss the issue with the concerned evaluation committee and the supervisor. The faculty in-charge will communicate the decision to the student within 3 working days.

Formal process

Application to Dean (Academic)

If the student is not satisfied with the outcome of the informal procedure, s/he may appeal for a formal review of the final grade to the Dean (Academic).

The formal application for final project/thesis/dissertation grade review must be done as a signed written request and must include a written statement from the student providing evidence that supports the argument that a fair evaluation method has not been used while assigning the final grade to her/him. This must be done within 5 working days of the grade display.

The Dean (Academic) will review the matter by holding meetings with the student and faculty in-charge/Programme Coordinator/HoD, and will: -

Communicate the decision to the student within 7 working days, OR

Set up an *ad-hoc* grade review committee, to review the grade.

e. **Ad hoc Final (project) grade review committee**

The review committee will consist of:

(i) Dean (Academic) - Chair

(ii) Two faculty members from the same discipline*

(iii) One faculty member from another discipline*

(*These faculty members will be other than those who evaluated the project or were associated with the project in any way)

The committee will review the documents and evidence provided by the student and the faculty in-charge. The committee may request the student, supervisor or any of the evaluation committee members to present their case in front of the committee, if required. The committee will give its decision within 7 working days of the appeal.

f. **Decision of the review committee**

The decision of the Review Committee will be communicated by the Dean (Academic), to the Chairperson of the MPEC, who may, if required, call a meeting of the MPEC and retain/change the grade. This will then be communicated to the Registrar's office.

g. **Final grade after review**

The grade awarded after the review process will be taken as final, and cannot be appealed against. This would include situations where grades may be lowered as a result of the review.

h. **Fee for review**

Students applying for the formal procedure for review of a grade awarded must submit a fee of Rs 1000/- along with the application. For appeals against more than one grade, each appeal is to be applied for separately, each accompanied by a fee of Rs 1000/-.

13. Malpractices during examinations and assessments

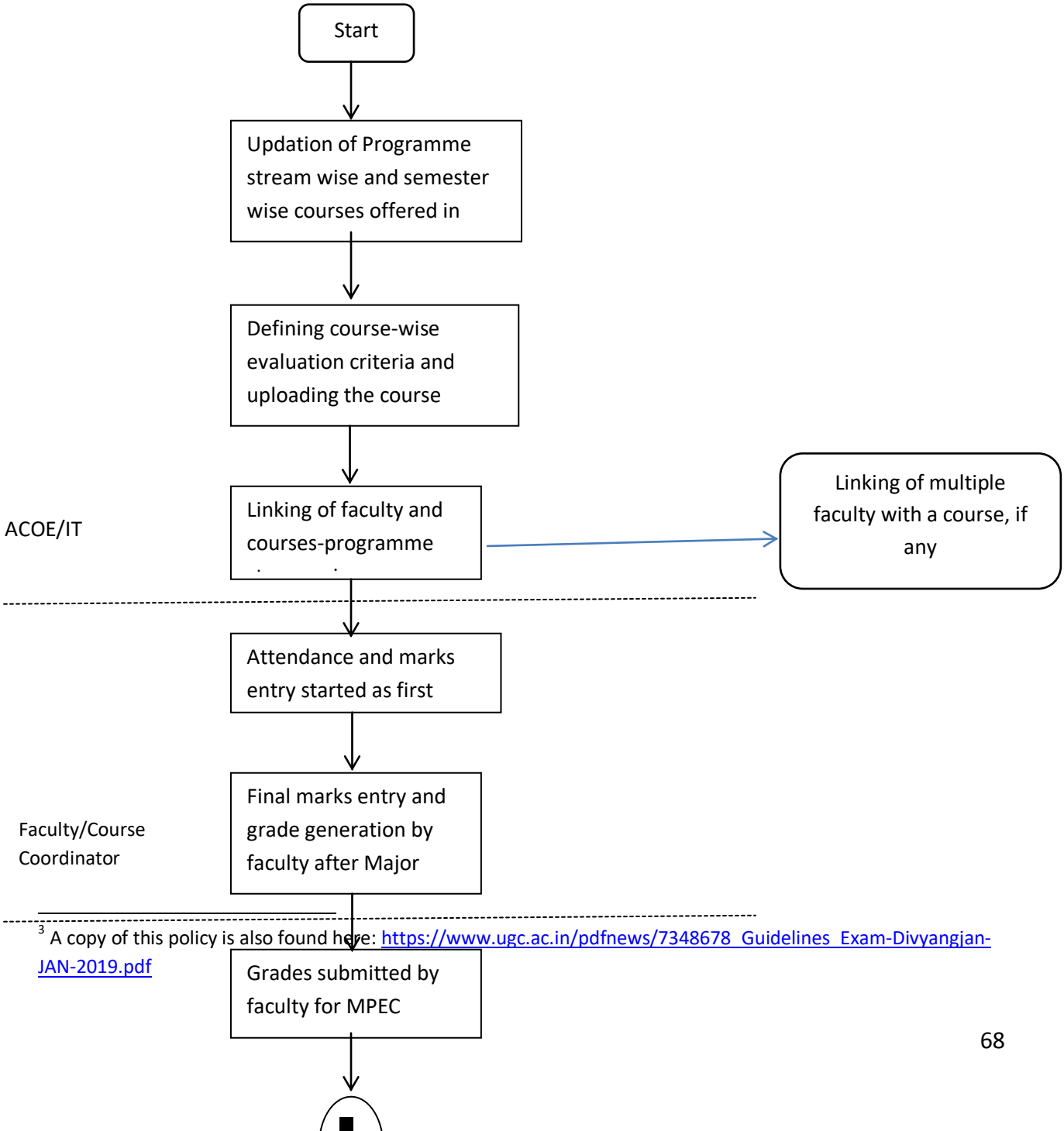
a. Several measures are undertaken to prevent malpractices during examinations and assessments, including but not limited to, stringent rules and regulations during conduct of examinations, CCTV monitoring, surprise inspections and plagiarism checking, as applicable.
b. The invigilator is responsible for the conduct of the examination. In case of any proven academic or behavioural misconduct during the examination, s/he is authorized to take strict action against the students. All such actions may be noted in the MPEC meeting and a copy shared with the Controller of Examinations, Deputy Controller of Examination and Dean (Academic) for records.
c. In case of serious breach of the code of conduct, the invigilator or any faculty member (including guest faculties) may formally report the event to Dean (Academic) with a copy to Controller of Examination/Deputy Controller of Examination immediately.
d. The complaint will be heard and adjudicated on the basis of the rules and regulations of the TERI SAS Student Disciplinary Committee except for cases of suspected plagiarism, which will be adjudicated on the basis of UGC notification No. F. 1-18/2010(CPP-II) dated July 23, 2018 by the appropriate Institutional Academic Integrity panel in accordance with the guiding principles of the TERI SAS Institutional Academic Integrity Panel(IAIP).

14. Examinations for persons with benchmark difficulties

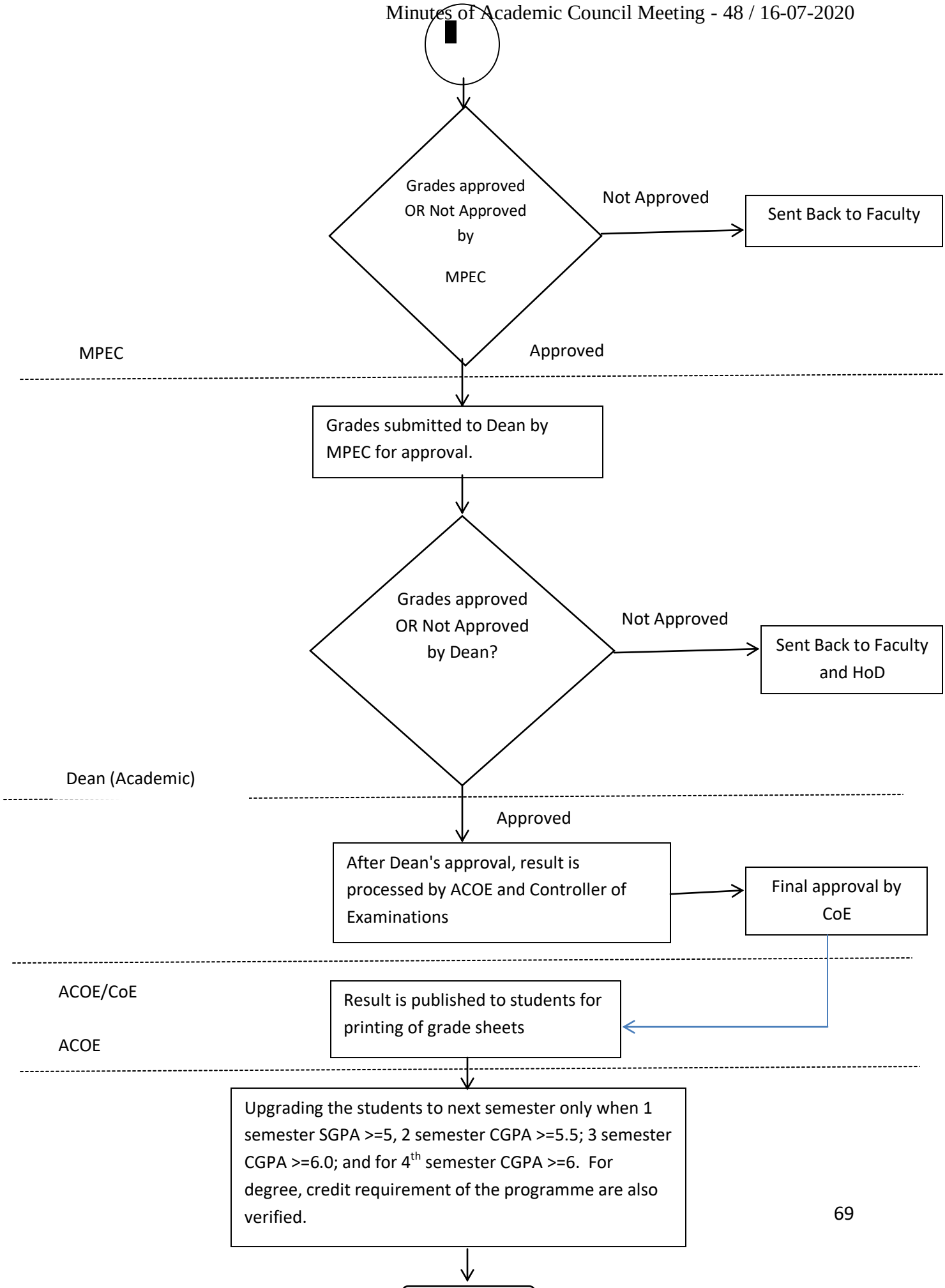
Any such examinations will be conducted in compliance with the "Guidelines for Conducing Written Examinations for Persons with Benchmark Difficulties" as outlined in O.M.No.34021201s-DD-lll dated 29.8.2018 of Ministry of Social Justice & Empowerment, Department of Empowerment of Persons with Disabilities. The details are in Annexure 3. [3]

Annexure 1

Flow Chart of Evaluation Process



[3] A copy of this policy is also found here: https://www.ugc.ac.in/pdfnews/7348678_Guidelines_Exam-Divyangjan-JAN-2019.pdf


Grades approved OR Not Approved by MPEC
Not Approved
Sent Back to Faculty
MPEC
Approved
Grades submitted to Dean by MPEC for approval.
Grades approved OR Not Approved by Dean?
Not Approved
Sent Back to Faculty and HoD
Dean (Academic)
Approved
After Dean's approval, result is processed by ACOE and Controller of Examinations
Final approval by CoE
ACOE/CoE
Result is published to students for printing of grade sheets
ACOE
Upgrading the students to next semester only when 1 semester SGPA >=5, 2 semester CGPA >=5.5; 3 semester CGPA >=6.0; and for 4th semester CGPA >=6. For degree, credit requirement of the programme are also verified.

Annexure 2

Grading Rubric for Projects and Dissertations.

The following grading rubric is to be used for evaluation of Minor/Major Projects and Dissertations. This rubric may also be adapted for any other assessments if applicable.

A+/A

- The project shows creativity and substantial effort. Either good results have been achieved or there is an explanation and analysis of what went wrong and suggestions for improvements.
- The project report is well written and easy to understand. The technical descriptions are accurate and complete. (Definitions may be given to clarify ambiguities.) Data is presented in an easy-to-understand format (tables and/or graphs). Diagrams are labelled and clear. Grammar, typing, and spelling errors have been corrected.
- The oral presentation is done in a professional and organized manner, describing the main highlights and contributions of the project.

B+/B

- The project shows good effort. Acceptable results have been achieved or there is an explanation of what went wrong.
- The project report is reasonably well written. The technical descriptions are accurate and complete, although there may be some ambiguities. Data is presented in an easy-to-understand format (tables and/or graphs). Diagrams are included. Most of the grammar, typing, and spelling errors have been corrected.
- The oral presentation is done in a professional manner, describing the main highlights of the project.

C+/C

- The project shows reasonable effort but produces limited results.
- The project report is submitted but parts of it are not easy to understand. The technical descriptions may be inaccurate or incomplete. Some data or diagrams may be missing. The report includes grammar, typing, or spelling errors.
- The oral presentation is done in a professional manner, but is difficult to follow or does not include significant details.

D

- The project shows a lack of effort and produces poor results.
- The project report is submitted but is difficult to understand. The technical descriptions may be inaccurate or incomplete. Data or diagrams may be missing. The report includes numerous grammar, typing, or spelling errors.
- The oral presentation is done in an unprofessional manner.

F

- The project shows a lack of effort and produces poor results.
- The project report is not submitted.
- The oral presentation is done in an unprofessional manner.

Annexure 3

Refer to University Grants Commission letter No. F.No.6-2/2013tSCT) dated January 2019 on the subject Guidelines for conducting written examination for Persons with Benchmark Disabilities.

Enclosure 5

Grade Improvement Exam Policy

A: Grade Improvement Policy (Long-term)

1. Those students who have obtained a grade F or are unable to meeting the requirements for promotion to the next semester are eligible for improvement exam.
2. The grades that are obtained in the improvement exam will be considered final.
3. The exam would be held within one month of the declaration of results.
    - Students may apply for the exam within one week of declaration of results.
    - Results are to be declared within two weeks of conduct of improvement exams
4. While it would be attempted to complete this process before the registration of the next semester, it may not be possible in all cases. Hence, a student who does not qualify for promotion to the next semester on the basis of the regular exams and is awaiting results of improvement exam may be allowed to register and then withdraw with refund of fees in case he or she fails to qualify even after the improvement exam. The improvement exam form may have a declaration by the student that he or she understands that the registration would be terminated if she does not qualify for promotion after the improvement exam.
5. The eligible students should have the opportunity to take improvement examination for at least one assessment of a significant weightage in every course. In general, this would be the terminal assessment of a course. However, the decision regarding the specific assessment(s) that are eligible for improvement examination lies with the course coordinator. The course coordinator may inform the students about the improvement examination options at the beginning of each semester.
6. Improvement examination is not permitted in group activity or field work based assessments.
7. The students may opt for improvement examination for up to a maximum of two courses in each semester.
8. Students who opt for improvement exams will not be eligible for awards and ranks.
9. This policy may be merged with the existing policy of re-examination for students who miss examinations due to medical or other extraordinary circumstances (supported by documentary evidence). Such students would take the exam which will be scheduled as improvement exam as per bullet point 3 above. However, they would be eligible for awards and ranks.
10. The grade distribution of the original examination would be used as the benchmark for finalizing the new grades.
11. The final transcript will not indicate whether a student opted for improvement exam or not.

B. Improvement Exam Policy for exams held between April 2020 and July 2020 during the COVID-19 Pandemic.

1. The existing policy of re-examination is limited to students who miss exam due to medical emergencies or extraordinary circumstances (including technical glitches during online examination)
2. Given the current uncertainties regarding the timeline for resuming the normal campus activities, it is not feasible to hold improvement examinations for all the students.
3. However, in the prevailing circumstances, additional opportunities may be given to students in the following circumstances
    a. Students who get an F grade
    b. Students who are unable to fulfil the required CGPA for promotion into the next semester may be permitted to take improvement the exam on a case by case basis.
4. The announcement for application for improvement exams could be made after all the results are declared by 31st July 2020.
5. These exams could be scheduled latest by end of August 2020 and results may be declared by 15th September 2020.
6. Applicants for improvement exam may be permitted to register for the next session pending the results of the improvement exam.
7. If the need arises, improvement exam would also be conducted for students on the basis of recommendation of the grievance committee which has been set up for COVID related issues. (Details of the grievance committee is available here: https://www.terisas.ac.in/committee-for-grievance-redressal.php#covid_GRC)

Enclosure 6

Amendment to Ph.D. Rules 2019

Present Rules in Circulation with respect to the Supervisor	Amendments approved by AC members
8.2 Only a full-time regular faculty member of the University can act as a Supervisor. The external members cannot be allowed as Supervisors. However, Co-Supervisor can be allowed in inter-disciplinary areas and/or as warranted by the research area from other departments of the University or from other related institutions with due approval of the SRC.	8.2 Only a full-time regular faculty member of the TERI SAS can act as a Supervisor subject to conditions laid down at Para 9.0 . The external members cannot be allowed as Supervisors. However, Co-Supervisor can be allowed in inter-disciplinary areas and/or as warranted by the research area from other departments of TERI SAS or from other related institutions with due approval of the SRC.
9. Re-allocation of Research Supervisor.	9. Re-allocation of Research Supervisor.
9.1. In case a Research Supervisor leaves TERI SAS before successful oral defence of Ph.D., he/she may continue to supervise the scholar(s) in TERI SAS as external Co-Supervisor only. However, the out-going supervisor will be considered as Co-supervisor, only if S/he wishes so and upon approval from DRC/CRC and only if the student has cleared the 'Research Proposal Defense'. The outgoing Supervisor may recommend a new Supervisor in proper consultation with the SRC and the scholar for due approval from the DRC/CRC. If, this process has not been completed before leaving of the faculty, then the DRC/CRC Chairperson shall initiate the process of change of Supervisor in consultation with erstwhile SRC members and the scholar. The erstwhile SRC members	9.1a to be replaced with In case a Research Supervisor leaves or retires TERI SAS before the student clears in synopsis presentation (in old cases)/SRC thesis presentation, s/he may continue to supervise the scholar(s) in TERI SAS as external Co-Supervisor only. However, the out-going supervisor will be considered as Co-supervisor, only if S/he wishes so and upon approval from DRC/CRC and only if the student has cleared the comprehensive examination (in old cases)/research proposal defense. The outgoing Supervisor may recommend a new Supervisor in proper consultation with the SRC and the scholar for due approval from the D/CRC. If, this process has not been completed before leaving of the faculty, then the D/CRC Chairperson shall initiate the process of change of Supervisor in consultation with erstwhile SRC

may be given preference for appointment as a new Supervisor.	members and the scholar. The erstwhile SRC members may be given preference for appointment as a new Supervisor. (b) If the Supervisor leaves after the successful completion of the requirements of synopsis presentation (in old cases)/SRC thesis presentation by the student, s/he shall continue as the Supervisor if a request for the same is received three months before date of leaving/retiring by H/CoD from the outgoing Supervisor and the same is duly recorded in the DRC minutes. To facilitate the scholar for submission of her/his thesis and take care of the timebound academic and administrative matters a faculty member of TERI SAS shall be appointed as 'officiating Supervisor' by D/CRC to facilitate the scholar for submission of her/his thesis and take care of the timebound academic and administrative matters. The name of the officiating Supervisor won't be appearing in the thesis. Due acknowledgement may be given to the officiating supervisor for his/her contributions by the student. If a Co-Supervisor from TERI SAS already exists, then S/he shall act as the officiating Supervisor to facilitate thesis submission. In absence of a Co Supervisor from TERI SAS , if DRC and SRC fail to appoint an officiating Supervisor, the DRC Chairman would assume the position of officiating supervisor for the purpose. In case no request for continuation is received from outgoing Supervisor by due date, then D/CRC Chairperson shall initiate the process of change of Supervisor in consultation with erstwhile SRC members and the scholar. The erstwhile SRC members may be given preference for appointment as a new Supervisor.

9.2. A Supervisor under exceptional circumstances may place a request to relinquish a student to the DRC/CRC, in consultation with the SRC. The DRC/ CRC Chairperson shall initiate the process of change of Supervisor in consultation with SRC members.	9.2. A Supervisor under exceptional circumstances may place a request to relinquish a student to the DRC/CRC, in consultation with the SRC. The D/ CRC Chairperson shall initiate the process of change of Supervisor in consultation with SRC members.
9.3. After research proposal defence, change of the Supervisor will not be allowed.	9.3. Delete.
9.4. In all such matters, the final approving authority will be the DRC/CRC. However, in exceptional cases prior to final approval, the matter will be placed before the Doctoral Programme Advisory Committee (DPAC) of University for its specific views and recommendations.	9.4. In all such matters, the final approving authority will be the DRC/CRC. However, in exceptional cases prior to final approval, the matter will be placed before the Doctoral Programme Advisory Committee (DPAC) of TERI SAS for its specific views and recommendations.

Enclosure 7

LIST OF APPROVED ACADEMIC PROGRAMMES
AY 2018-20

PROGRAMMES OFFERED WEF AY 2018-19			
Ser	Name of Programme	AICTE Approval	Offered by
1	Doctor in Philosophy (Ph.D.)		Department of Energy and Environment
2	M.Sc. (Environmental Studies and Resource Management)		Department of Energy and Environment
3	M.Sc. (Climate Science and Policy)		Department of Energy and Environment
4	M.Tech. (Renewable Energy Engineering and Management)	AICTE letters F.No. North-West /2018-19/1-3761633661 dated 10 April 2018 & F.No. North-West /1-4262377364/209/EOA dated 10 April 2019	Department of Energy and Environment
5	M.Tech. (Urban Development Management)	AICTE letters F.No. North-West /2018-19/1-3761633661 dated 10 April 2018 & F.No. North-West /1-4262377364/209/EOA dated 10 April 2019	Department of Energy and Environment
6	Doctor in Philosophy (Ph.D.)		Department of Natural Resources
7	M.Sc. (Geoinformatics)		Department of Natural Resources
8	Doctor in Philosophy (Ph.D.)		Department of Biotechnology

PROGRAMMES OFFERED WEF AY 2018-19			
Ser	Name of Programme	AICTE Approval	Offered by
9	M.Sc. (Plant Biotechnology)		Department of Biotechnology
10	Doctor in Philosophy (Ph.D.)		Department of Business & Sustainability
11	M.B.A. (Infrastructure)	AICTE letters F.No. North-West /2018-19/1-3761633661 dated 10 April 2018 & F.No. North-West /1-4262377364/209/EOA dated 10 April 2019	Department of Business & Sustainability
12	M.B.A. (Business Sustainability)	AICTE letters F.No. North-West /2018-19/1-3761633661 dated 10 April 2018 & F.No. North-West /1-4262377364/209/EOA dated 10 April 2019	Department of Business & Sustainability
13	Doctor in Philosophy (Ph.D.)		Department of Regional Water Studies
14	M. Tech (Water Resource Engineering and Management)	AICTE letters F.No. North-West /2018-19/1-3761633661 dated 10 April 2018 & F.No. North-West /1-4262377364/209/EOA dated 10 April 2019	Department of Regional Water Studies
15	M.Sc. (Water Science and Governance)		Department of Regional Water Studies
16	PG Diploma (Water Science and Governance)		Department of Regional Water Studies
17	CWSG (Certificate Course in Water Science and Governance)		Department of Regional Water Studies
18	Doctor in Philosophy (Ph.D.)		Department of Policy Studies

PROGRAMMES OFFERED WEF AY 2018-19			
Ser	Name of Programme	AICTE Approval	Offered by
19	M.Sc. (Economics)		Department of Policy Studies
20	M.A. (Sustainable Development Practice)		Department of Policy Studies
21	M.A. (Public Policy and Sustainable Development)		Department of Policy Studies
22	PG Diploma (Public Policy and Sustainable Development)		Department of Policy Studies
23	Doctor in Philosophy (Ph.D.)		Centre for Post Graduate Legal Studies
24	LLM (Specialisation in Environment and Natural Resources Law / Infrastructure and Business Law)		Centre for Post Graduate Legal Studies

PROGRAMMES OFFERED WEF AY 2020-21			
Ser	Name of Programme	AICTE Approval	Offered by
1	Doctor in Philosophy (Ph.D.)		Department of Energy and Environment
2	M.Sc. (Environmental Studies and Resource Management)		Department of Energy and Environment

PROGRAMMES OFFERED WEF AY 2020-21			
Ser	Name of Programme	AICTE Approval	Offered by
3	M.Sc. (Climate Science and Policy)		Department of Energy and Environment
4	M.Tech. (Renewable Energy Engineering and Management)	AICTE letter F.No. North-West /1-7011507997/2020/EOA dated 09 June 2020	Department of Energy and Environment
5	M.Tech. (Urban Development Management)	AICTE letter F.No. North-West /1-7011507997/2020/EOA dated 09 June 2020	Department of Energy and Environment
6	Doctor in Philosophy (Ph.D.)		Department of Natural Resources
7	M.Sc. (Geoinformatics)		Department of Natural Resources
8	Doctor in Philosophy (Ph.D.)		Department of Biotechnology
9	M.Sc. (Plant Biotechnology)		Department of Biotechnology
10	Doctor in Philosophy (Ph.D.)		Department of Business & Sustainability
11	M.B.A. (Infrastructure Management)	AICTE letter F.No. North-West /1-7011507997/2020/EOA dated 09 June 2020	Department of Business & Sustainability
12	M.B.A. (Sustainability Management)	AICTE letter F.No. North-West /1-7011507997/2020/EOA dated 09 June 2020	Department of Business & Sustainability
13	Doctor in Philosophy (Ph.D.)		Department of Regional Water Studies
14	M. Tech (Water Resource Engineering and Management)	AICTE letter F.No. North-West /1-7011507997/2020/EOA dated 09 June 2020	Department of Regional Water Studies
15	M.Sc. (Water Science and Governance)		Department of Regional Water Studies

PROGRAMMES OFFERED WEF AY 2020-21			
Ser	Name of Programme	AICTE Approval	Offered by
16	PG Diploma (Water Science and Governance)		Department of Regional Water Studies
17	CWSG (Certificate Course in Water Science and Governance)		Department of Regional Water Studies
18	Doctor in Philosophy (Ph.D.)		Department of Policy Studies
19	M.Sc. (Economics)		Department of Policy Studies
20	M.A. (Sustainable Development Practice)		Department of Policy Studies
21	M.A. (Public Policy and Sustainable Development)		Department of Policy Studies
22	PG Diploma (Public Policy and Sustainable Development)		Department of Policy Studies
23	Doctor in Philosophy (Ph.D.)		Centre for Post Graduate Legal Studies
24	LLM (Specialisation in Environment and Natural Resources Law / Infrastructure and Business Law)		Centre for Post Graduate Legal Studies

Enclosure 8

Department of Energy and Environment

Ph.D. Programme Outline

Programme Overview

Department of Energy and Environment (DEE) at TERI School of Advanced Studies (TERI SAS) provides a competent and vibrant environment to PhD students for achieving academic excellence of highest global standards and the opportunity to nurture an independent, analytical and critical thinking. The mode of operation and key features of the doctoral programme are governed by the provisions as laid down in '***TERI School of Advanced Studies Ph.D. Regulations-2019***". While the emphasis is laid down on interdisciplinary approaches, disciplinary thrust is maintained with focus on a range of themes such as energy, urban development, climate science and environment resources.

Programme USP

The PhD programme at DEE is designed to strengthen both core and applied knowledge base as well as build research acumen in the field of energy, urban development, climate science and environment resources among scholars through intensive course work spanning between one and two semesters. It inculcates interdisciplinarity in research and develops innovative skills among outstanding research-oriented learners. PhD scholars are provided opportunities to augment their research skills through involvement in faculty-led research projects as well as explore nuances of teaching post-graduate students through teaching assistantship (particularly in laboratory work). At the culmination of the degree, scholars are fully prepared for autonomous research and scholarship at the vanguard in their chosen fields of energy, urban development, climate science and environment resources as well as have acquired competencies to pursue teaching. The PhD programme promotes impactful and cutting-edge interdisciplinary research demonstrating with opportunities for broader research excellence framework to enable scholars to play an active role in national and international communities.

Programme Outcomes

After the completion, Ph.D. students should be able to:

- Develop an understanding of research, philosophy and domain knowledge for addressing current research problems and identifying emergent themes in the area of specialization.
- Critically apply concepts, methods, and learning to address underlying queries in their discipline of research as well as imbibe the spirit of inquiry and solution-oriented ideas.
- Engage in the research of impact in the fundamental discipline or an interdisciplinary research.
- Understand and apply scientific methods, tools, and techniques to carry out high quality research work.
- To have intellectual independence, creative scholarship and ingenuity in tackling and solving research problems.
- Cultivate and demonstrate skills in articulating their research outputs in scientific writing, oral presentation and publishing the results of their research in conferences and journals of repute, maintaining high ethical standards in research and academia.
- Demonstrate their skills and knowledge at conceptualizing, planning and executing research independently and/or in team that extends the existing horizons of interdisciplinary research/thematic

Programmes Structure

PhD Programme is divided into three stages. These are:

Stage I: Ph.D. Course work

The PhD course work at TERI SAS is designed to develop rigorous research and analytical skills among the students and enable them with necessary research analytical and methodological skill sets. The Ph.D. Course work is governed by the 'TERI School of Advanced Studies Ph.D. Regulations-2019'.

Ph.D. Course work structure and requirement

The credit assigned to the Ph.D. course work shall be a minimum of 8 credits and a maximum of 16 credits. The course requirement will be prescribed by the Departmental Research Committee (DRC) on the recommendations of the Students Research Committee (SRC). The Ph.D. course work must be completed within the first two semesters from the date of registration.

Every Ph.D. student must take the following mandatory courses.

a) Research Methodology – 3 Credits (Credit only course)

b) Research and Publication Ethics - 2 Credits (Credit or audit course)

c) Quantitative Research Method – minimum 3 Credits from the list of the applicable quantitative methods courses.

Apart from the above, Ph.D. students can take 'Communication Skills' as non-mandatory course. Other advanced level courses from the list of courses offered for Master's Programmes may also be prescribed by SRC after considering the student's background in relation to the proposed topic of research.

The list of available courses in DEE under Quantitative Methods category are

- Environmental Statistics (4 credits)
- Multivariate Data Analysis (3 credits)
- Optimization techniques for energy management and planning (3 credits)
- Applied Numerical Methods (3 credits)
- Stochastic Modelling (4 credits)
- Spatiotemporal Data Analysis (3 credits)

Stage II: Research proposal defense and research work

- A student will be permitted to appear for defending the research proposal only after he/she has completed the Ph.D. course work as prescribed by the SRC.
- As a part of the research proposal defense, a draft research proposal must be prepared by the student in consultation with the Supervisor(s) and duly approved by SRC members.
- The Supervisor will schedule the research proposal defense activity before a panel comprising of SRC members and an external expert if supervisor has requested so.

- After the satisfactory defense, the student will be required to submit his/her final research proposal and related documents to the DRC with due approval from the Supervisor. The final research proposal must be submitted to the DRC within a period of 24 months from the date of registration in the Ph.D. programme.
- During Ph.D. programme, the student shall appear before the SRC at least once in each semester to make a presentation of the progress of his/her work. This process will continue until the thesis submission.

Stage III: Thesis submission

- Ph.D. scholars may submit his/her thesis at any time if he/ has completed the minimum period of registration and complied with all the necessary requirements as specified in "***TERI School of Advanced Studies Ph.D. Regulations-2019***" (and subsequent amendments). Prior to the thesis submission, the scholar shall make a presentation in the Department before the DRC. A Ph.D. student must submit his/her thesis within the stipulated period, failing which his/her registration will be considered null and void.

Additional Information

The detailed information can be found in TERI School of Advanced Studies PhD Regulations - 2019.

Course Reviewer's

1. **Prof. Bishwajit Bhattacharjee**, Civil Engineering Department, Indian Institute of Technology, Delhi
2. **Prof. AL Ramanathan**, School of Environmental Sciences, Jawaharlal Nehru University
3. **Prof. Atiqur Rehman**, Faculty of Natural Sciences, Jamia Millia Islamia
4. **Prof. A K Keshari,** Civil Engineering Department, Indian Institute of Technology, Delhi

Enclosure 9

<table>
<tr><td colspan="4">Course title: Research Methodology</td></tr>
<tr><td>Course code:</td><td>No. of credits:</td><td>L-T-P: 36-0-12</td><td>Learning hours: 42</td></tr>
<tr><td colspan="4">Pre-requisite course code and title (if any):</td></tr>
<tr><td colspan="4">Department: Department of Policy Studies</td></tr>
<tr><td colspan="2">Course coordinator(s):</td><td colspan="2">Course instructor(s):</td></tr>
<tr><td colspan="4">Contact details:</td></tr>
<tr><td colspan="2">Course type:</td><td colspan="2">Course offered in:</td></tr>
<tr><td colspan="4">Course description

Research Methodology course has been designed to impart the fundamentals of methods and techniques of academic research among the research scholars. The scholars will be trained and oriented with various components of research – starting from philosophy of research to review of literature, problem definition, research design, data collection, data analysis, report writing, and presentation. It will also discuss the validity, reliability, limitations, benefits, appropriateness, and challenges of using qualitative and quantitative research. The students will be writing a concept note based on their areas of research and will develop full length research proposal subsequently.</td></tr>
<tr><td colspan="4">Course objectives

• To widen students' perspective by providing them an exposure to basics of research methodology
• To develop students' analytical skills and ability to think logically in addressing issues and challenges related to their own field of research</td></tr>
<tr><td colspan="4">Course content</td></tr>
</table>

Module	**Topic**	L	T	P
1.	**Research Philosophy** The focus of this module is to give an overview of research philosophy including research paradigm, methodology and methods. The basic concepts of quantitative and qualitative research methodology will be discussed under three philosophical approaches like positivism, interpretivism and critical. Apart from these philosophical approaches, there is a rise of mixed method approach. After knowing the pros and cons of each approach, the students will be able to decide which approach should be adopted and why. Hence, they will be oriented with the research paradigms like – • Positivism • Interpretivism • Critical • Mixed Method	2		
2.	**Review of Literature** Purpose of this module is to make the students to know the significance and the process of review of existing literature, critical review of literature and identification of gaps and identification of various sources of information. At the end of the module, the students will be able to understand and write the literature review systematically. The following topics will be covered under this module: • Types of literature review (Argumentative, integrative, methodological, theoretical review) • Steps of review process	4		4

	• Writing literature review			
3.	**Designing Research** Purpose of this module is to make the students understand how to reach at conceptual and theoretical framework and determine correct research questions. Through this module the students will be competent enough to understand what research problem is and what is not. Eventually, they will be able to formulate hypothesis, objectives, and research questions. The following topics will be covered under this module: – Types of Research Design – Research process: Defining research problem, variable, objectives, hypothesis, Developing research questions	6		4
4.	**Research Method and Tools:** The purpose of this module is to understand various tools and techniques of data collection. It starts with the nature of data and the collection secondary and primary data, etc. Hence, the researcher requires respective tools or techniques to serve the purpose of the research. Tools may vary in complexity, interpretation, design, and administration. Each tool is suitable for the collection of certain type of information. One must select from the available tools those which will provide data s/he seeks for testing hypothesis or answering specific research questions. The following topics will be covered accordingly: • **Nature of data** (primary and secondary data, qualitative and quantitative data)	10		4

	• **Collecting secondary data:** (types, suitability of data, authentication and credibility)
	• **Collecting primary data:**
	  • **Sampling design** (census and sample survey, implications of a sample design, steps in sampling design, criteria of selecting a sampling procedure/ types of sample design – probability and non-probability)
	  • **Data collection methods:**
	  • Questionnaire and Schedule
	  • Interviews (structured, semi-structured and unstructured)
	  • Observation (participant and non-participant);
	  • Focus group discussion
	  • Ethnography
	  • Case Study Method
	  • **Validity and reliability/triangulation**			

5.	**Quantitative Data Analysis** The aim of this module is to introduce students with the basics of the quantitative methods for research. The primary objective is to build a sense of quantitative techniques among the scholars. This module would describe the following quantitative methods under various research problems – • Methods of descriptive data analysis – various methods of central tendency and dispersions	8		

	• Concept of theoretical distribution – discrete and continuous • Concept of hypothesis testing • Correlation & causality – relationship between/among variables • Regression – simple & multiple, forecasting & determinants			
6.	**Qualitative Data analysis** The purpose of this section is to understand the procedures to analyse the qualitative information that has been collected during empirical data collection. The analysis is usually based on an interpretative philosophy. The idea is to examine the meaningful and symbolic content of qualitative data. In this module various steps of qualitative data analysis will be covered: • Steps in analysing qualitative data • Analysis of text, documents, and discourse	4		
7.	**Research Proposal and thesis writing** • In this section students will be oriented with the various steps of research proposal writing and thesis writing. The students will be given hands on training for writing research proposal by taking a topic from their respective research areas.	2		
	Total	36		**12**
Evaluation criteria: **Assignment-1: Submission of Concept Note on the topic of students' research interest (20 %)** • (1) Identification of Research Paradigm; (2) Identification of Research				

Problem (3) formulating the objectives and hypothesis **Assignment-2: Submission of Research Proposal -- 80%** **i) Structure:** 1) Research problem statement and background 2) Research rationale 3) Review of Literature and identification of research gaps (4) Research objectives and questions (5) Research methods (6) Research limitation (7) Reference **ii) Indicators for assessment:** (a) Identification of research problem; (b) Identification of research objectives and questions and methodology; (c) Structure and form; (d) Content, language, clarity (Academic Merit); (e) Sincerity and timely submission (f) number and types of literatures cited			
Learning outcomes - Students will be able to conceptualize the research idea and initiate a process for carrying out independent research pertaining to any specific issue (Assignment-1) - Students will be enabled to write a full-fledged research proposal (Assignment-2)			
Pedagogical approach – In order to support active learning, the lectures in this course will be supplemented with practical work. The emphasis of these practical hours (reviewing literatures, formulating research problem, research questions and objectives, preparing interview schedule, conducting FGD etc.) will be to encourage active involvement of students in undertaking tasks that help them better understand concepts / methods / tools in social research. Students will practice and learn by conducting interviews, focus groups, participatory exercises and survey methods. Role-plays, in-class activities and group exercises will be extensively used.			
Course Reading Materials			

Module 1: Research Philosophy

- Bryman, Alan. (2012) Social Research Methods, Oxford University Press, New Delhi (Chapter 2 and 5)
- Corbetta P. (2003) Social Research, Theory, Methods and Techniques, Sage Publication, New Delhi (Chapter 1)
- Walliman, N. (2011) Research Methods, The Basics. Routledge: UK (Chapter 1 & 2)
- Sarantakos, S. (1998) Social Research. Macmillan Press: Australia (Chapter 2)
- Cresswell JW (2014) Research Design, Qualitative, Quantitative and Mixed Method Approach, Sage: New Delhi (Chapter 1)

Module 2: Review of Literature

- Bryman, Alan. (2012) Social Research Methods, Oxford University Press, New Delhi (Chapter 5)
- Cresswell JW (2014) Research Design, Qualitative, Quantitative and Mixed Method Approach, Sage: New Delhi (Chapter 2)
- Walliman, N. (2011) Research Methods, The Basics. Routledge: UK (Chapter 4 & 5))

Module 3: Designing Research

- Bryman, Alan. (2012) Social Research Methods, Oxford University Press, New Delhi (Chapter 3, 4, 5 & 6)
- Kothari CR (2004) Research Methodology, Methods and Techniques, New Age International Publication Limited: New Delhi (Chapter 2 & 3)
- Sarantakos, S. (1998) Social Research. Macmillan Press: Australia (Chapter 3, 4, 5 & 6)
- Walliman, N. (2011) Research Methods, The Basics. Routledge: UK (Chapter 3)

Module 4: Research Method and Tools:

- Bryman, Alan. (2012) Social Research Methods, Oxford University Press, New Delhi (Chapter 8, 9, 10, 11, 12)
- Corbetta P. (2003) Social Research, Theory, Methods and Techniques, Sage Publication, New Delhi (Chapter – 9, 10 & 11)
- Czaja, R. and Blair, J., (2005) Designing surveys: A guide to decisions and procedures, 2nd edition, Thousand Oaks and London: Pine Forge.
- Grosh, M. and Glewwe, P., (2000) eds., Designing household survey questionnaires for developing countries: Lessons from 15 years of the living standards measurement study. Washington, D.C.: World Bank.
- Kothari CR (2004) Research Methodology, Methods and Techniques, New Age International Publication Limited: New Delhi (Chapter 4 & 6)
- Pandey P. & Pandey MM (2015) Research Methodology: Tools and Technique, Bridge Centre, Romania (Chapter 7 & 8)
- Pandey P. & Pandey MM (2015) Research Methodology: Tools and Technique, Bridge Centre, Romania (Chapter 2 to 7)
- Sarantakos, S. (1998) Social Research. Macmillan Press: Australia (Chapter 6, 7, 8, 9, 10, 11, 12 &13)
- Walliman, N. (2011) Research Methods, The Basics. Routledge: UK (Chapter 7 & 8)
- Groves, RM., Floyd Fowler J. Jr., Couper MP., Lepkowski James M., Singer E., Tourangeau R. (2009) Survey methodology, 2nd edition, Hoboken: Wiley.
- Hammersley, M., (1992) What's wrong with ethnography? London: Routledge. Scheyvens R. and Storey, D., (2003) eds., Development fieldwork: A practical guide, London: Sage (chapter 4).

Module 5: Quantitative Data Analysis

- Kothari CR (2004) Research Methodology, Methods and Techniques, New Age International Publication Limited: New Delhi (Chapter 7, 8 & 12)
- Sarantakos, S. (1998) Social Research. Macmillan Press: Australia (Chapter 15, 16, 17, 18)
- Walliman, N. (2011) Research Methods, The Basics. Routledge: UK (Chapter 9)
- Sirkin RM. (2005) Statistics for the Social Sciences, 3rd edition, SAGE Publications, USA.

Module 6: Qualitative Data analysis

- Bryman, Alan. (2012) Social Research Methods, Oxford University Press, New Delhi (Chapter 2)
- Walliman, N. (2011) Research Methods, The Basics. Routledge: UK (Chapter 10)
- Sarantakos, S. (1998) Social Research. Macmillan Press: Australia (Chapter 14)
- Robson C., (1993) Real world research: A resource for social scientists and practitioner-researchers. Oxford: Blackwell (chapter on analysing qualitative data).

Module 7: Research Proposal and thesis writing

- Pandey P. & Pandey MM (2015) Research Methodology: Tools and Technique, Bridge Centre, Romania (Chapter 14 & 15)
- Sarantakos, S. (1998) Social Research. Macmillan Press: Australia (Chapter 19)
- Walliman, N. (2011) Research Methods, The Basics. Routledge: UK (Chapter 11)

- **Student responsibilities:** The students are expected to submit assignments in time and come prepared with readings when provided.

Prepared by:

- **Dr Swarup Dutta, Assistant Professor, TERI SAS**
- **Dr Montu Bose, Assistant Professor, TERI SAS**

Course reviewers:

- **Prof Ragini Sahay, Amity University**
- **Dr Mercian Daniel, The George Institute for Global Health,**

Enclosure 10

<table>
<tr><td colspan="4">Course title: Research and Publication Ethics</td></tr>
<tr><td>Course code:</td><td>No. of credits 2</td><td>L-T-P distribution:22-0-12</td><td>Learning hours: 28</td></tr>
<tr><td colspan="4">Pre-requisite course code and title (if any) : None</td></tr>
<tr><td colspan="4">Department:</td></tr>
<tr><td colspan="2">Course coordinator(s):</td><td colspan="2">Course instructors(s):</td></tr>
<tr><td colspan="4">Contact details:</td></tr>
<tr><td colspan="2">Course type:</td><td colspan="2">Course offered in:</td></tr>
<tr><td colspan="4">Course description:

In today’s academic world, research ethics is a trending topic. Although conducting research is fascinating, it also entails certain inherent challenges that involve very different ethical issues, such as bias, plagiarism, conflicts of interest, falsification of research results, informed consent, determination of authorship and adequacy of peer review publication processes. With the adequate combination of both theory and practice, this course will certainly help students critically analyzing research philosophy, ethics and case studies in an independent manner. From the pedagogical point of view, they will learn how to manage and evaluate a research work from the very preliminary stage of identifying ethical standards until the final publication of the work. Significantly, through this comprehensive course, students are motivated to address the impact of new technologies and social trends on research ethics and deliberate upon their ideas as to how to rebuild necessary codes of conduct to regulate multidisciplinary research activity. In the process of evaluating and critically debating issues relating to research philosophy and ethics in an exhaustive manner, students will necessarily comprehend the importance of scientific integrity in academic research. Thus, ensues acquisition of relevant reasoning skills that significantly increase the scope of sustainable scientific quality in their future research.</td></tr>
<tr><td colspan="4">Course objectives:

The purpose of this course is to engage student researchers in reading about, understanding and discussing the responsible code of conduct of interdisciplinary scientific research. Specific learning objectives with respect to research ethics include:</td></tr>
</table>

- To know rules, issues, options, and resources for research ethics
- To familiarize with various institutional ethics review boards/academic integrity guidelines
- To understand the purpose and value of ethical decision-making
- To have a positive disposition towards continued learning about research ethics

Course Overview:

This course has a total seven modules focusing on the basics of philosophy of research and ethics, research integrity and publication ethics in general. Practical sessions are designed to identify areas of research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics and plagiarism tools will be introduced as part of this course.

Course content

Module	Topic	L	T	P
1.	**Research Philosophy & Ethical Norms & Politics** i. Introduction to Research Philosophy: Concept; Definitions; Nature & Scope ii. General Characteristics of a value-based Research, Axiological approach iii. Research Ethics; Definition; Moral Philosophy; Nature of Moral Judgments iv. Political Issues in Research, Ethical Norms & Responses v. Enhancing research interests, Research Collaboration & Research Recognition vi. Ethical guidelines in field research, Concealed Information & Extent of Respondents' rights	4	0	0
2.	**Scientific Research Conduct & Multidisciplinary Research** i. Elements of Research Ethics & Types of Research ii. Mixed Methods in Applied & Action Research iii. Internet search, deep web search, Authenticated *v.* Fake information iv. Research Integrity & Academic Honesty in Interdisciplinary Research v. Redundant Publications; Duplicate & Overlapping	4	0	0

	Publications; Salami Slicing vi. Selective Reporting and Misrepresentation of Data			
3.	**Publication Ethics & Best Practices** i. Publication Ethics: Introduction, Definition, & Importance ii. Scientific Research Misconduct; Falsification, Fabrication & Plagiarism/Self-plagiarism, Kinds & Remedies iii. Intellectual Property; Reasonable & Fair Use; Copyright and related IPR Issues iv. Violation of Publication Ethics; Authorship/Co-authorship, Joint research/ Contributorship & Patentable Inventions- Extent of Rights & Claims v. Best Practices/Standards Setting Initiatives and guidelines; COPE, WAME, UGC-CARE list *etc.* vi. Publication Misconduct; Concept; Definition & Kinds of Problems & Unethical Behaviour **vii.** Identification of Publication Misconduct, Complaints & Appeal Provisions	5	0	0
4.	**Open Access Publishing & IPR Policy** i. Open Access Publications and Initiatives, Creative Common License ii. Predatory Publishers & Journals iii. Reference Management & Referencing Standards in Open Access Publishing iv. SHERPA/RoMEO; Online Resources for Publisher Copyright & Self-archiving Policies v. Data Management, Data Sharing Techniques, Data Reuse & Data Citation vi. Software Tool to identify Predatory Publications developed by SPPU vii. Journal Finder/ Journal suggestions tools viz., JANE, Elsevier Journal Finder, Springer Journal Suggester *etc*.	3	0	2
5.	**Publication Misconduct & Remedies** **A.Group Discussions (2 hrs.)** i. Subject specific Ethical Issues, FFP, Authorship ii. Conflict of Interests; Copyright/Plagiarism Issues			

	iii. Sharing of data collected for a research (confidentiality, reuse, dissemination or republishing) iv. Consent in publishing/ using different kinds of data and Simultaneous Submission v. Complaints & Appeals: Case Studies/Examples of Publication Frauds from India & abroad **B. Software Tools (2 hrs.)** i. Research Literacy & Advocacy; Digital Humanities ii. Use of Plagiarism Software like Turnitin, Urkund & other Open Source Software Tools iii. Grammarly, FigShare *etc.* iv. Library Support & Regular Training/Practice Sessions on various other Software and Tools like; Mendeley, Endnote, Zotero *etc.*	2	0	4
6.	**Database (4 hrs.)** i. Indexing Database; Cross-disciplinary Research & Comprehensive Citation Search ii. Citation Database; Web of Science, SCOPUS, OSCOLA *etc.* iii. Article Influence Score & Cite score	2	0	4
7.	**Research Metrics (3 hrs.)** i. Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI), Emerging Sources Citation Index (ESCI) and the Conference Proceedings Citation Index (CPCI) ii. Impact factor as per Journal Citation Report, SNIP, SJR, IPP Journal Metrics & Cite Score iii. Citation based Metrics; h-index, g index, i10 index, etc., Google Scholar, Alternative Metrics/ Altmetrics	2	0	2
	Total	**22**	**0**	**12**

Evaluation criteria:

Continuous assessment will be done through classroom practical exercises, assignments, quizzes or group discussions. Student evaluation will be based on the term paper and the book review followed by the final major test to be conducted at the end of the course.

This course has seven modules in total.

- **Test 1**: Term Paper (written Submission based on modules 1,2 &3 -25%)
- **Test 2**: Book Review (Relevant to the area of Research-25%)
- **Test 3**: Written Test (Based on all modules-40%)
- **Class Participation:** (10%)

Learning outcomes:

On completion of this course, the students would be able to:

i. To have a positive disposition towards continued learning about research philosophy & ethics

ii. To know Rules, Regulations, Issues, Options, and Scientific Resources of Research Ethics

iii. To learn the culture of fairness, honesty and integrity in academic communications and to understand the purpose and value of ethical decision-making

iv. Avoid wasteful and duplicate publications & encourage original contributions to advance Academic Research and Scholarship

v. Acquiring knowledge & professional competence and expertise about Patents, Copyrights, and other forms of Intellectual Property Rights

vi. To promote social good and prevent or mitigate societal hazards through innovative ideas, creativity and research advocacy

Pedagogical Approach:

- Classroom lectures and tutorials, guest lectures, group activity and practical sessions with a significant focus on the detailed discussion of original research articles from scientific journals in class.
- Weightage will be given for active class participation.

Employability:

i. Academic and Industrial Research involving *multidisciplinary* approach

ii. Academic Supervision to educate, mentor, and advise students

iii. Gain experience and advance knowledge of IPR Issues in Educational/Literary Works

iv. Promotion of research integrity through awareness of academic campaigns

Course Materials:

Required/Suggested readings

- The Handbook of Social Research Ethics, Donna M. Mertens, Pauline E. Ginsberg, SAGE (2009).

- What are Qualitative Research Ethics? Rose Wiles, Bloomsbury (2013).
- Research Ethics: Cases and Materials, Robin Levin Penslar, eds, Indiana University Press (1995).
- Research Ethics: A Philosophical Guide to the Responsible Conduct of Research, Gary Comstock, Cambridge University Press (2013)
- Scientific Integrity and Research Ethics: An Approach from the Ethos of Science, David Koepsell, Springer (2017)
- An Introduction to Ethical, Safety and Intellectual Property Rights Issues, Padma Nambisan, Elsvier (2017)

1. Case studies (Indicative):
   - Ethics Education Library: http://ethics.iit.edu/eelibrary/case-study-collection
   - UKRI Economic and Social Research Council: http://ethics.iit.edu/eelibrary/case-study-collection
   - University of Miami Research Ethics Case Studies: http://miamictsi.org/research-ethics-case-studies
2. Websites (Indicative):
   - For the latest regulations; guidelines on publication ethics and scientific research misconduct and falsification, fabrication & plagiarism/self-plagiarism: Refer the official website of the *University Grants Commission* @ https://www.ugc.ac.in/
   - For Guidelines on IPR: Refer the official website of *Intellectual Property India* @ http://www.ipindia.nic.in/#content
   - Committee on Publication Ethics @ https://publicationethics.org/
   - World Association of Medical Editors @ https://www.wame.org/
   - Open Access Publications :
     - What is Open Access? : https://www.openaccess.nl/en / https://opensource.com/resources/what-open-access
     - Open Access Scholarly Publishers Association: https://oaspa.org/
     - *Open Access* YouTube Channel: https://www.youtube.com/playlist?list=PL6165F4EEC7535538
     - Directory of Open Access Journals: https://doaj.org/
   - Yale University list of predatory publishers & journals: https://guides.library.yale.edu/c.php?g=296124&p=1973764
   - SHERPA/RoMEO; Online Resources for Publisher Copyright & Self-archiving Policies: http://sherpa.ac.uk/romeo/index.php
   - Software Tool to identify Predatory Publications developed by SPPU:

https://ugccare.unipune.ac.in/Apps1/User/Web/CloneJournals

- Journal Finder/ Journal suggestions tools
  - JANE: https://jane.biosemantics.org/
  - Elsevier Journal Finder: https://journalfinder.elsevier.com/
  - Springer Journal Suggester: https://journalsuggester.springer.com/
- Digital Humanities: https://mitpress.mit.edu/books/digitalhumanities
- Plagiarism Softwares (Contact TERI SAS Library for accessing the following software)
  - Turnitin: https://www.turnitin.com/
  - Urkund: https://www.urkund.com/
  - Open Source Software Tools : https://elearningindustry.com/top-10-free-plagiarism-detection-tools-for-teachers
- Other useful websites/softwares:
  - Grammarly: https://www.grammarly.com/
  - FigShare: https://figshare.com/
  - Mendeley: https://www.mendeley.com/?interaction_required=true
  - Endnote: https://endnote.com/
  - Zotero: https://www.zotero.org/
  - OSCOLA : https://www.law.ox.ac.uk/sites/files/oxlaw/oscola_4th_edn_hart_2012.pdf
  - Bluebook: https://www.legalbluebook.com/
- Indexing Database:
  - Web of Science: https://mjl.clarivate.com/home
  - SCOPUS: https://www.scopus.com/
- Article Influence Score & CiteScore:
  - Eigenfactor: http://www.eigenfactor.org/methods.pdf

    CiteScore:https://www.elsevier.com/editors-update/story/journal-metrics/citescore-a-new-metric-to-help-you-choose-the-right-journal

3. Journals: Journals listed in the 'UGC Approved List of Journals' at https://www.ugc.ac.in/journallist/

Additional information (if any):

i. Class Participation

ii.	Study of other books/articles/reports/case studies/course materials *etc.* as specified by the instructor

Student responsibilities

Attendance, feedback, institutional discipline, research norms & ethics

Course Reviewers:

- Prof. Dr. Vinay K Srivastava , Director, Anthropological Survey of India
- Prof. Dr. Ramesh C Gaur, IGNCA
- Dr. L.N. Venkataraman, TERISAS
- Ms. Nidhi Srivastava, Fellow, TERI

Prepared By

Dr. Jaya Vasudevan

Enclosure 11

Revised Programme Outline for M.Sc. (Climate Science and Policy)

Minimum credit requirement for the award of degree: 70

Semester wise break up of minimum credit requirement

Year/Semester	Courses	Credits	Duration*
First Year			
1st Semester	8 core courses of 2-4 credits each and bridge courses as required*	22	15 weeks
2nd Semester	5 core courses of 2-3 credits each and minimum 1 elective of 3 credits	16	15 weeks
Summer	Minor project	2	6-8 weeks
Second Year			
3rd Semester	1 core course and 4 elective courses of 3-4 credits each	15	15 weeks
4th Semester	Major project	15	At the location of the project

***Bridge courses:** Students who have not studied the below mentioned bridge courses previously should take these bridge courses. These courses will be offered at the start of/ during the semester 1.

The revised bouquet of courses in the first, second, and third semester to meet the minimum credit requirement as mentioned is placed below

Course no.	**Course title**	**Type**	**Credits**
Semester- I			
NRE 113	Applied Mathematics	Bridge (audit)	3

Course no.	Course title	Type	Credits
NRC 103	Basic Computer Programming	Bridge (audit) – 10 hours of lectures	0
NRC 143	Basics of Economics	Bridge (audit) – 10 hours of lectures	0
NRC 136	Earth system sciences	Core	3
NRC 131	Basics of climate science	Core	3
NRC 107	Climate Lab	Core	2
NRC 105	Concepts and theories of development	Core	3
NRC 183	Energy; science, technology and policy	Core	2
NRE 155	Environmental law and policy	Core	3
NRE 111	Environmental statistics	Core	4
NRE 101	Communication skills and technical writing	Core	2
Semester-II			
NRC 132	Mitigation of climate change	Core	3
NRC 135	Climate change vulnerability and adaptation	Core	3
NRC 185	Impacts of climate change	Core	2
NRE 172	Principles of geoinformatics	Core	3
NRE 173	Research methodology and thesis writing	Core	2
MPL 134	Climate change and law	Elective	2
NRC 122	Introduction to climate modelling	Elective	3
NRC 138	Climate change and water	Elective	3
NRC 139	Climate change and public health	Elective	3
NRC 145	Economics of climate change	Elective	3

Course no.	Course title	Type	Credits
NRE 112	Multivariate data analysis	Elective	3
NRE 144	Environmental health and risk assessment	Elective	3
NRE 162:	Hydrology	Elective	3
Semester-III			
NRE 102	Seminar course in global change	Core	3
Policy bouquet			
BSI 125	Accounting and finance for sustainability	Elective	3
NRC 162	Climate change and disaster risk reduction	Elective	3
MPD 122	Public health and development: Issues and methods	Elective	3
NRE 168	Food security and agriculture	Elective	3
NRC 141	Governance of climate change	Elective	3
NRE 105	Independent study	Elective	3
NRE 145	Integrated impact assessment	Elective	4
Science bouquet			
NRC 172	Advance climate modelling	Elective	3
NRC 151	Eco-system and climate change	Elective	3
NRC 186	Energy system modelling	Elective	3
NRC 184	Renewable energy technologies	Elective	3
NRC 133	Aerosol Science	Elective	3
NRE 136	Glacier hydrology	Elective	3
NRE 175	Geoinformatics for resource management	Elective	4
NRE 167	Integrated watershed management	Elective	3
NRE 178	Satellite meteorology	Elective	3

Course no.	Course title	Type	Credits
NRC 142	Spatio-temporal data analysis	Elective	3
NRE 129	Industrial Ecology	Elective	3

Enclosure 12

Revised Programme Outline for M.Sc. (Environmental Studies & Resource Management)

Table 1. Broad structure

Year	Courses	Credits	Duration*
First Year			
1st Semester	7 core courses of 3-4 credits each 1 compulsory audit of 1 credit equivalent	21	15 weeks
2nd Semester	1 core courses of 2 credits Minimum 5 electives of 3 credits each	17	15 weeks
Summer	Minor Project	2	8 weeks
Second Year			
3rd Semester	1 core course of 4 credits Minimum 3 electives of 3-4 credits each	15	15 weeks
4th Semester	Major project	15	At the location of the project

Figure 1. Flow of the courses in the progarmme.

Semester 1 [21 credits]

	Course title	Type	Credit
Course no.	Applied Mathematics	Audit*	3
NRE113	Introduction To Sustainable Development	Compulsory Audit	1
NRE139	Environmental Geosciences	Core	3
NRE121	Ecology	Core	3
NRE131	Environmental Chemistry And Microbiology	Core	3
NRE138	Environmental Monitoring Laboratory	Core	3
NRE155	Environmental Law And Policy	Core	3
NRE111	Environmental Statistics	Core	4
NRE101	Technical writing and communication skills	Core	2
This couse is offered only to those students who have not studied mathematics in their 10+2			

i. **Environmental Geosciences -** Introduces the students to the basic understanding of Earth's components and its processes. The students will also learn the linkages of Earth's processes with natural resources management. *(Attached revised outline in Appendix)*

ii. **Ecology -** The course will lead the students through the different levels of the living world starting with the biology of organisms, through populations and introduces finally in communities, landscape and ecosystem restoration related to each of those levels. *(Attached revised outline in Appendix)*

iii. **Environmental Chemistry And Microbiology -** The objective of the course is to provide detail understating of various aspects of chemistry, which are particularly valuable to environmental scientific practice and lay a foundation for understanding in specialized areas of environment management and practices. Students will get the training in analytic and conceptual skills required for environmental chemistry research. https://www.terisas.ac.in/uploads/1551931894_648253_NRE%20131.pdf

iv. **Environmental Law And Policy -** This course will introduce the students to how law and policy play a role in the conservation and management of natural resources as well as pollution control. Students will learn about the law related to various environmental resources and regulatory framework for managing the environment. https://www.terisas.ac.in/uploads/NRE155.pdf

v. **Introduction To Sustainable Development -** The course seeks to build an inter-disciplinary perspective on understanding sustainable development concerns and challenges. https://www.terisas.ac.in/uploads/NRE165.pdf

vi. **Environmental Statistics -** Through this course, the students will learn how to analyse and extract information from data, and how this can be used for understanding trends and patterns of various environmental problems. *(Attached revised outline in Appendix)*

vii. **Environmental Monitoring Laboratory -** The course introduces the students to various standard protocols for quantitative analysis of physical, chemical and biological parameters involved in water, air, soil and microbiology research which are required in environmental monitoring and evaluation. https://www.terisas.ac.in/uploads/1551932028_328924_NRE%20138.pdf

viii. **Technical writing and communication skills –** Through this course the students will learn how to communicate effectively through reports and scientific publications. They will learn the basic tools for effective communication of the knowledge they have gained through scientifically written documents. https://www.terisas.ac.in/uploads/NRE101.pdf

Semester 2 [17 credits]

Course No.	Course title	Type	Credit
NRE173	Research methodology and thesis writing	Core	2
NRExxx	Advanced Geosciences	Elective	3
NRE162	Hydrology	Elective	3
NRExxx	Soil Science	Elective	3
NRExxx	Energy and Environment	Elective	3
NRE134	Air quality management	Elective	3
NRE142	Water quality management	Elective	3
NRE189	Solid and hazardous waste management	Elective	3
NRE123	Biodiversity assessment and conservation	Elective	3
NRE144	Environment health and risk assessment	Elective	3

NRE141	Basic course in environmental and resource economics	Elective	3
MEU121	Urban Ecology and Environment (UDM)	Elective	3
MPD126	Key Concepts of Cultural and Political Ecology (SDP)	Elective	3
NRE172	Principles of geoinformatics	Elective	3
NRE112	Multivariate data analysis	Elective	3
NRExxx	Advanced analytical techniques for environmental application	Elective	3

i. **Research methodology and thesis writing -** It aims to introduce the student to the scientific perspective, attitude and skills for systematic enquiry by developing understanding of philosophical foundations of research, various elements of research design and methods and tools for data collection and analysis and how to communicate these knowledge through effective research writing skills. https://www.terisas.ac.in/uploads/1551932399_326817_NRE%20173.pdf

ii. **Advanced Geosciences** – This course will introduce the students to key processes of the Earth's system and its linkages with Natural disasters and anthopogenic interferences. *(Proposed new course)*

iii. **Hydrology -** This course will introduce the core concepts of hydrology. It would provide an understanding of the basic methods and techniques to analyse the different processes governing the hydrological cycle. It would provide the students with an overview of monitoring and evaluation models of key hydrologic parameters. https://www.terisas.ac.in/uploads/1551932459_841364_NRE%20162.pdf

iv. **Soil Science -** Soil physics, soil fertility and fertilizer use, soil chemistry, soil mineralogy, genesis, classification and survey, soil erosion and conservation, soil biology and biochemistry, geomorphology and geochemistry, radioisotopes in soil and plant studies, soil, water and air pollution, remote sensing and GIS techniques for soil and crop studies. *(Proposed new course)*

v. **Energy and Environment -** This course will introduce the students to energy technologies, renewable energy sources and energy management systems. The students will gain an understanding of the environmental impacts of energy technology choices and methods to address various contemporary challenges arising from the growing energy demands and urbanization. *(Proposed new course)*

vi. **Air quality management –** Through this course, the students will learn about the types and sources of air pollution, pathways (air pollutants transformation and transport mechanisms) and receptors. They will also study impacts of air pollution and its management. https://www.terisas.ac.in/uploads/1551932362_210790_NRE%20134.pdf

vii. **Water quality management –** This course will help the students to understand the sources, causes and impacts of water pollutants, national and international water quality criteria and standards and learn about various physical, chemical and biological methods water treatment. https://www.terisas.ac.in/uploads/1551932281_387671_NRE%20142.pdf

viii. **Solid and hazardous waste management** - Through this course, the students will gain knowledge on the problems of various types of wastes (municipal, biomedical, hazardous, e-waste, industrial, etc.). They will also be introduced to the legal,

institutional and financial aspects of management of solid wastes, its consequences and solutions for managing it. https://www.terisas.ac.in/uploads/1551932313_799983_NRE%20189.pdf

ix. **Biodiversity assessment and conservation** - The aim of the course is that the students understand biodiversity in the context of ecosystem dynamics, ecosystem functioning and provision of ecosystem services. Understanding the basics of science of biodiversity in an ecological context, Learning tools and techniques relevant to monitoring of biological diversity, Ability to design a field based project with rationale and appropriate methodology. https://www.terisas.ac.in/uploads/1551932434_958256_NRE%20123.pdf

x. **Environment health and risk assessment**- The course provides students with the technical and policy knowledge required to identify, assess and address important and emerging environmental health issues to reduce environmental risks to public health. https://www.terisas.ac.in/uploads/NRE144.pdf

xi. **Basic course in environmental and resource economics-** The course introduces the students to the basic economic analysis of environmental and natural resources, which could later be applied for development policy. https://www.terisas.ac.in/uploads/1551932518_394920_NRE%20141.pdf

xii. **Urban Ecology and Environment** *(existing course from M.Tech. UDM)* **-** This course provides an ecological perspective to the environmental challenges and opportunities related to urban development adopting an interdisciplinary approach. https://www.terisas.ac.in/uploads/1551940846_789492_MEU%20121.pdf

xiii. **Key Concepts of Cultural and Political Ecology** *(Existing course from M.A. SDP)* **–** Through this course the students will understand the inter-linkages between society and environment, community practices, traditional ecological knowledge and native worldview. The students will learn about the social and political conditions surrounding the causes, experiences and management of environmental problems and critical issues such as access and entitlements, resource use, role of social movements participation, governance and vulnerability. https://www.terisas.ac.in/uploads/MPD126.pdf

xiv. **Principles of Geoinformatics** – The course aims to give the students a basic introduction in remote sensing, image interpretation and geographical information system (GIS). https://www.terisas.ac.in/uploads/1551932487_702793_NRE%20172.pdf

xv. **Multivariate data analysis** -This course introduces the student to various multivariate data analysis tools. The focus is on cross-disciplinary application of these techniques. https://www.terisas.ac.in/uploads/1551932908_501175_NRE%20112.pdf

xvi. **Advanced analytical techniques for environmental application** - Principles of environmental monitoring techniques– Neutron Activation Analysis; calorimetric; Colourimetry; Atomic Absorption Spectroscopy; Gas chromatography, HPLC, Ion exchange Chromatography and Polarography. XRF, XRD. *(Proposed new course)*

Summer internship [2 Credits]

Course name	Credit	Type
Minor project	2	Core

Revised outline attached in annexure

Semester 3 [15 Credits]

Sl No	Course title	Type	Credit
NRE145	Integrated Impact Assessment	Core	4

NRE133	Environmental Management System	Elective	4
NRE171	Environmental Modelling	Elective	4
NRE174	Water And Wastewater Treatment Processes And Design	Elective	4
NRE163	Groundwater Hydrology And Management	Elective	3
NRE167	Integrated Watershed Management	Elective	3
NRE151	Wildlife Conservation And Management	Elective	3
NRE139	Glacier Hydrology	Elective	3
NRE168	Food Security And Agriculture	Elective	3
NRE162	Climate change and Disaster Risk Reduction (MSc CSP)	Elective	3
NRE178	Satellite Meterology	Elective	3
NRE149	Governance And Management Of Natural Resources	Elective	3
NRE147	Environmental Economics	Elective	3
NRE175	Geoinformatics For Resource Management	Elective	4
NRC142	Spatiotemporal Data Analysis	Elective	3
NRE102	Seminar Course In Global Change	Elective	3
NRE105	Independent Study	Elective	3
MPD122	Public Health and Development: Issues and Methods (M.A. SDP)	Elective	3

i. **Integrated Impact Assessment –** Through this course the student will gain exposure to the key approaches to integrated impact assessment (environmental, social and health) with a focus on methodology and tools in the key discipline areas. https://www.terisas.ac.in/uploads/NRE145.pdf

ii. **Environmental Management System –** Through this course, the students will learn the complex and trans-disciplinary nature of environmental management issues specially in a corporate setting and of the inherent challenges in multi-disciplinary group approaches. They will learn a wide range of tools used in environmental management and for environmental decision- making. https://www.terisas.ac.in/uploads/NRE133.pdf

iii. **Environmental Modelling –** In this course, the students will be introduced to the idea, methodology and basic tools of environmental modeling. They will learn about different modeling approaches and its application in environmental management and decision making. https://www.terisas.ac.in/uploads/1551932689_399088_NRE%20171.pdf

iv. **Geoinformatics For Resource Management** - The course is conceptualized to provide competency in remote sensing (RS), geographic information systems (GIS), global positioning system (GPS), and related technologies. https://www.terisas.ac.in/uploads/1551932635_253725_NRE%20175.pdf

v. **Spatiotemporal Data Analysis -** The course will introduce students to statistical analysis in temporal and spatial domain, analysis and interpretation of spatial and temporal data using different tools. The course would enable the students to analyse environmental data for improved decision-making, enabling efficient resource management. https://www.terisas.ac.in/uploads/1551934699_114670_NRC%20142.pdf

vi. **Glacier Hydrology –** This course will acquaint students with the fundamentals of glacier science, glacier environment and significance of glaciers in regulating water availability.

The will learn the concepts about flow variations in proglacial streams feeding to hydropower plants in Himalayas.
https://www.terisas.ac.in/uploads/1551932964_960880_NRE%20136.pdf

vii. **Satellite Meterology -** The course will provide an introduction to fundamentals of meteorological remote sensing as well as operational and future satellite missions. It will also deal with strength and weaknesses of infrared, visible and water-vapour imagery and estimation of meteorological parameters. The course will further focus on various applications of satellite-derived parameters in meteorology and weather forecasting. https://www.terisas.ac.in/uploads/NRE178.pdf

viii. **Water And Wastewater Treatment Processes And Design** – Through this course the students will learn the latest developments in treatment technologies and their application in diverse pollution sources including industries. It will provide fundamentals of fluid mechanics and understanding of motion of water that is essential in design of treatment plants for various industries.
https://www.terisas.ac.in/uploads/1551932996_620218_NRE%20174.pdf

ix. **Wildlife Conservation And Management** - 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. https://www.terisas.ac.in/uploads/1551933044_531924_NRE%20151.pdf

x. **Groundwater Hydrology And Management -** his course will provide an insight into the field of groundwater hydrology. The students will equip themselves with the knowledge of interpretation of groundwater data, conducting the surface and subsurface investigations for the groundwater using the latest methods and tools.
https://www.terisas.ac.in/uploads/1551932934_230034_NRE%20163.pdf

xi. **Integrated Watershed Management** - 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. https://www.terisas.ac.in/uploads/1551933013_311931_NRE%20167.pdf

xii. **Food Security And Agriculture -** Through this course, the students will learn about food security and it's inter-relationship with the environment and climate, how global climate change, environmental pollution and natural resources management influences the key components of food security. https://www.terisas.ac.in/uploads/NRE168.pdf

xiii. **Climate change and Disaster Risk Reduction –** This course introduces the concepts, tools, methods for disaster risk management, specifically for climate and weather-related disasters; role of policies and frameworks at international, national and sub-national contexts, with focus on emerging issues and recent developments.
https://www.terisas.ac.in/uploads/NRC162.pdf

xiv. **Governance And Management Of Natural Resources -** In this course, the students would be introduced to this complex array of institutions, ideas of collective action in managing environment/natural resources and the role of actors (within the realm of state, market and civil society) in attaining the goal of sustainable management of natural resources. https://www.terisas.ac.in/uploads/NRE149.pdf

xv. **Environmental Economics** - This course will familiarize students with the theory and application of economics to environmental problems and prepare them for analysing

issues in environmental economics and policy. It will focus on the design of cost-effective environmental policies and on methods for determining the value of environmental amenities. https://www.terisas.ac.in/uploads/NRE147.pdf

xvi. Seminar Course In Global Change - It is an interdisciplinary course which provides the knowledge and confidence on various global issues and its complexities. The course familiarizes students with various methodologies of their chosen subjects and allows them to represent case examples and new knowledge available. https://www.terisas.ac.in/uploads/1551932863_973365_NRE%20102.pdf

xvii. Independent Study - This course offers an opportunity to the students to study an area of their interest, which otherwise is not offered as a taught course, under the supervision of a faculty from the TERI School of Advanced Studies. The independent study could be in the form of a small research project, pilot study, literature based study on a specific subject area chosen with the mutual consent of the student and the faculty attached and approved by a panel of faculty members. https://www.terisas.ac.in/uploads/1551932787_234915_NRE%20105.pdf

xviii. **Public Health and Development: Issues and Methods** - his course is designed to provide an interdisciplinary perspective on public health and development, in the global context. Along with the fundamental learnings of concepts, methods and approaches of Epidemiology, the course aims to equip students with theoretical and analytical ability for enriching problem-solving approach, so to make them effectively deal with public health challenges of varied nature. https://www.terisas.ac.in/uploads/MPD122.pdf

Semester 4 [15 Credits]

During Semester 4, students will be assigned to major projects in industries and other organizations outside the University in areas of their interest but relevant to the subjects they have learnt in the first three semesters. The students will carry out this research under the supervision of a qualified researcher/ professional from the host organization. A faculty member from TERI SAS acts an internal supervisor. The project is spread over a duration of 4.5 to 5 months.

Course name	Credit	Type
Major project	15	Core

Revised outline attached in annexure

Enclosure 13

Revised Course Outline

<table>
<tr><td colspan="4">Course title: Environmental Geosciences</td></tr>
<tr><td>Course code: NRE 139</td><td>No. of credits: 3</td><td>L-T-P: 38-2-4</td><td>Learning hours: 44</td></tr>
<tr><td colspan="4">Pre-requisite course code and title (if any):</td></tr>
<tr><td colspan="4">Department: Energy and Environment</td></tr>
<tr><td colspan="2">Course coordinator:</td><td colspan="2">Course instructor:</td></tr>
<tr><td colspan="4">Contact details:</td></tr>
<tr><td colspan="2">Course type: Core</td><td colspan="2">Course offered in: Semester 1</td></tr>
<tr><td colspan="4">Course Description

The earth is facing several developmental challenges such as environmental pollution, depletion of natural resources and global climate change. All these challenges are intrinsically linked with the various components of the Earth’s systems and its processes. Thus for addressing the various global developmental challenges, knowledge on the Earth’s physical functioning and its inter-linkages with the various developmental aspects is essential.

This course aims to provide the students with the fundamental scientific understanding of the Earth’s components and the various environmental processes that controls its functioning.

The course will also introduce the students on how development and various anthropogenic activities affect the Earth’s environment.

The course will provide the necessary knowledge and skillsets to the students for studying how the Earth’s environment and climate have changed over time under natural as well as</td></tr>
</table>

anthropogenic influences.

Course objectives

- The course will introduce students to the fundamental scientific understanding of the Earth's components and its drivers.
- To apply the theoretical knowledge of the Earth's functioning in understanding real life environmental challenges.

Course content

Module/ Unit	**Topic**	**L**	**T**	**P**
1	**Introduction** Earth's systems sciences	2		
2	**Earth and the Environment**			
	Dynamics and Structure of Earth - Earth's interior; Mineralogy and Geomorphology, Rock (formation and types), Sedimentology, Plate tectonics, orogenesis	10		
	Environmental Geology- Paleo-environment, Hydrogeology, Aquifers, mineral deposits, Quartenary Geology and Anthropocene	6		
	Understanding natural disasters- earthquakes, volcanoes, cyclones, landslides, floods, drought, tsunamis	6		
3	**Biogeochemical cycles**	4		
4	**Natural Resources and Contemporary Environmental Problems**			

	Water	2		
	Energy	2		
	Waste	2		
	Biogeography	2		
	Land resources and land use; Land Degradation Neutrality	2		
5	**Field Methods in Environmental Geoscience** Students will conduct guided field-based assignments through the semester on any one environmental issue. They will also learn to apply various environmental tools in understanding these challenges.		2	4
		38	**2**	**4**

Evaluation criteria

- Test 1: 20%
- Test 2: 20%
- Test 3: 40% [Module 1 to 4]
- Assignment: 20%

Learning outcomes

Upon completion of this course, the students will be able to:

- Demonstrate knowledge of fundamental geological processes (Test 1)
- Identify contemporary environmental problems and their drivers including anthropogenic activities. (Test 2)
- Apply geosciences knowledge in solving environmental issues (Test 3)

- Able to systematically apply the knowledge on earth's system in analyzing environmental issues. (Assignment)

Pedagogical approach

A mix of theory, classroom discussion, case studies and field studies

Materials

Textbooks

- Keller, E. A. (2012). Introduction to environmental geology. Upper Saddle River, NJ, Prentice Hall.
- Skinner, B. J., and Porter, S. C. 1995. The Blue Planet, An Introduction to Earth System Science, John Wiley & Sons, Inc.
- Carla Montgomery (2019) Environmental Geology (11th Edition) McGraw-Hill
- Valdiya KS, 2013. Environmental Geology, Tata McGraw-Hill Education
- Valdiya KS, 2004. Coping with Natural Hazards: Indian Context, Orient Longmann

Suggested readings

- Strahler and Strahler (2010), *Modern Physical Geography*, John Wiley & Sons, Inc.
- Mukherjee, S. (2006). Earthquake Prediction. Published by Brill Academic Publishers Koninklijke Brill NV, Leiden (The Netherlands) & Boston (USA). ISBN-10: 90 6764 450 1 and ISBN-13 (i) 978 9067644 50
- Bryant R.H. (1990) Physical Geography: Made Simple, New Delhi, Rupa Publications.
- Chorley R.J. (1969) Water, Earth and Man: A Synthesis of Hydrology, Geomorphology and Socio-economic Geography, London: Methuen Young Books.

Journals

- Geoscience Frontiers

- Geoscience Journal
- Nature Geoscience
- Environmental Pollution
- Atmospheric Environment
- Science of the Total Environment
- Science

Relevant and updated research articles will be shared with the students during the course.

Additional information (if any)

Student responsibilities

Students are expected: to read the background material and come for the lecture, to be interactive in the class discussions

Course prepared by

Dr Chubamenla Jamir

Course Reviewers (External):

Prof. Saumitra Mukherjee, Former Dean, School of Environmental Sciences, Jawaharlal Nehru University

Dr Pawan Kumar Jha, Centre for Environmental Sciences, University of Allahabad.

Course title: Ecology			
Course code: NRE 121	**No. of credits:** 3	**L-T-P: 32**-6-4	**Learning hours:** 48
Pre-requisite course code and title (if any):			

Department: Energy and Environment	
Course coordinator:	**Course instructor:**
Contact details:	
Course type: Core	**Course offered in:** Semester 1

Course Description

The course will lead the students through the different levels of the living world starting with the biology of organisms, continues through populations and introduces finally in communities. In the last part of the course the students will be introduced to landscape and ecosystem restoration related to each of those levels.

The course work will be guided by work on scientific papers and field experience.

Course objectives

- The course will introduce students to the techniques that ecologists use to develop hypotheses and observe these in the field
- To draw through different levels of the living world (organism, populations, communities, ecosystems. landscape, biomes and biosphere)
- To introduce and work on case studies related to each of these levels.

Course content

Module/ Unit	Topic	L	T	P
1.	**Ecology:** Definition and scope of ecology, history; types of ecology; definitions of population, community, ecosystem landscape, biome and biosphere. Biotic and abiotic factors, soils and their types. Scales in ecology.	5		

	Evolution and ecology - origin of species; Darwin Wallace theory of inheritance. Linkages between evolution and ecology.	3		
2.	**Population ecology:** Population attributes, age distribution, life tables and survivorship curves, growth models, species interactions.	4		
	Community ecology: Community structure, habitats and niches, two-species interactions, prey-predator interaction, food webs. succession; Climax communities; Biodiversity-types and uses; IUCN Red List and protected area categories. Methods of studying communities.	6	2	
3.	**Ecosystem ecology:** Ecosystem organisation and processes, types of ecosystems, energy flow, production, nutrient cycling, and hydrological cycling; ecosystem integrity, resilience and health; diversity-stability paradox, ecosystem services – types and benefits from different ecosystems.	6	2	
4.	**Landscape Ecology:** Island biogeography theory; patch, matrix and corridor model of landscapes; metapopulations, heterogeneity, patterns; fragmentation; flows between landscape elements and ecosystems.	4		
5.	**Ecosystem Restoration:** Definition, Ecosystem degradation, disturbance**,** reference ecosystem, attributes of restored ecosystems**;** preparation of restoration plan; ecosystem approach for environment management; Tools for preparation of restoration plans.	4	2	
6.	**Field Work:** Visit to Aravalli/Yamuna biodiversity			**8**

	park/Okhla bird sanctuary and submission of report by students; Estimation of density and relative abundance of species using quadrats; estimation of species diversity.			
		32	**6**	**8**

Evaluation criteria

- Test 1: 25%
- Test 2 (Practicals): 25%
- Test 3: 50%

Learning outcomes

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

- Define important ecological terms.
- Describe important ecological processes
- Use the scientific methods to design an ecological study.
- Demonstrate knowledge of the important ecological principles operating at different levels of organizations

Pedagogical approach

Materials

Required text

1. Molles, M.C. (2013) Ecology – Concepts and Applications, Seventh Edition, McGraw Hill Education,
2. Smith, T.M. and Smith, R.L. (2014) *Elements of Ecology*, Pearson
3. Stiling, P. (2012) *Ecology – Global Insights and Investigations*, McGraw Hill
4. Morin, P.J. (2011) *Community Ecology*, Second Edition, Wiley Blackwell

Suggested readings

5. Cox, C. Barry, Moore, P.D. and Ladle, R.J. (2016) *Biogeography – An Ecological and Evolutionary Approach*, Ninth Edition, Wiley Blackwell
6. Krebs, C.J. (2013) *Ecology – The Experimental Analysis of Distribution and Abundance*, Sixth Edition, Pearson.
7. Odum E.P. and Barret, G.W. (2005) *Fundamentals of Ecology*, Fifth Edition, Thomson Brooks/Cole
8. Greipsson, S. (2011) *Restoration Ecology,* Jonnes & Barellet Learning.
9. Jelte van Andel and James Aronson (editors) (2006). *Restoration ecology*: *The New Frontier*, Blackwell Publishing, 319p
10. Turner M. and Gardner R.H**.** (2001) *Landscape Ecology in Theory and Practice: Pattern and Process***,** Springer Verlag.
11. Walker, P. and Wood, E. (2010) *Ecology Experiments*, Infobase Publishing
12. Misra, R. (2013) *Ecology Workbook*, Scientific Publishers

Journals

1. Journal of Applied Ecology
2. Journal of Ecology
3. Journal of Tropical Ecology
4. Ecological Indicators
5. Biological Conservation

……

Additional information (if any)

Articles used in the Course

1. Brown, E.D. and Williams, B.K. (2016) Ecological integrity assessment as a metric of

biodiversity: are we measuring what we say we are? *Biodiversity Conservation*, 25: 1011-1035.Springer. DOI 10.1007/s10531-016-1111-0.

2. Török,P. Helm, A. (2017) Ecological theory provides strong support for habitat restoration, *Biological Conservation*, 206: 85–91; Elsevier
3. Rezaa, M.I.H. and Abdullaha, S.A. (Regional Index of Ecological Integrity: A need for sustainable management of natural resources, Ecological Indicators 11: 220–229. Elsevier.
4. Qiuqin, Z. Zhang, T. and Liu, X. (2018). Index System to Evaluate the Quarries Ecological Restoration, *Sustainability*, 10, 619; doi:10.3390/su10030619

Students will be provided with more research papers during teaching of the course

Student responsibilities

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

Course Prepared By

Prof. J.K. Garg

Course Reviewers:

Prof. Brij Gopal, Formerly Professor, School of Environmental Sciences Jawaharlal Nehru University, New Delhi.

Prof. CK Varshney, Former Dean, School of Environmental Studies and Professor Emeritus, Jawaharlal Nehru University, New Delhi.

Prof. KG Saxena, Professor of Ecology, School of Environmental Sciences Jawaharlal Nehru University, New Delhi.

Prof. KS Rao, Professor & Head, Department of Botany, University of Delhi

Course title: Environmental statistics			
Course code: NRE 111	**No. of credits:** 4	**L-T-P:** 42-14-0	**Learning hours:** 56
Pre-requisite course code and title (if any): No pre-requisite required			
Department: Energy and Environment			
Course coordinator(s):		**Course instructor(s):** Prof. Prateek Sharma	
Contact details: prateeks@terisas.ac.in			
Course type: Core		**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 environmental statistics
- Introduce basic concepts useful for environmental data analysis
- Become aware of a wide range of applications of statistics in environmental management & decision making
- Develop technical skills to use statistical tools and software in environmental data analysis

Course content

Module	Topic	L	T	P
8.	**Introduction** Environmental models – deterministic and stochastic; generation of environmental data; types and objectives of environmental studies, stochastic processes in environment; the nature environmental data; concept of random variable and its relevance with respect to the environmental data; relevance of statistics in environmental management; populations and samples – parameters and statistic.	1		
9.	**Describing environmental data** Measurement scales; statistical descriptors of environmental data – numerical and graphical; measurement uncertainty – accuracy, precision and bias estimation of environmental data; variability and errors in environmental pollution data.	4	1	
3.	**Probability models and their use** Probability concepts; probability distribution functions and their applications – discrete and continuous distributions. Probability distribution applications – interpreting environmental standards,	4	1	

	flood frequency analysis and air quality data.			
4.	**Environmental data sampling** Need and purpose of sampling; methods for selecting sampling locations and times for different environmental matrices – monitoring of water bodies for hydrological and water quality data; air quality monitoring; soil sampling – statistical considerations; types of sampling designs – probability and non-probability sampling designs for environmental monitoring and sampling; Sampling theory, sampling distributions; environmental parameter estimation – point and interval estimates; confidence interval estimation; sample size determination.	10	4	
5.	**Tests of hypothesis** Hypothesis testing – parametric and non-parametric tests: assessment of violation of environmental standards, comparing environmental parameters (differences of means, proportions, difference of proportions, multiple proportions, variances, ratio of variances and analysis of variance).	12	4	
6.	**Environmental data analysis** Measuring association between two variables – Correlation analysis: graphical analysis, covariance, correlation coefficient, distribution of correlation coefficient and its statistical significance. Empirical model building – Regression analysis: assumptions and definitions, principle of least squares, regression parameters their distribution and statistical significance; applications in			

	environmental process description and prediction; non-linear processes in environment; use of transformation for linearising non-linear relations; introduction to multiple linear regression. Case studies: Climate change and volume-discharge curve Applications: Stage-discharge curve and volume-discharge curves, water quality parameters and agriculture. Analysis of trend in the environmental data Introduction to time-series analysis; characteristics of hydrological, water and air quality time series; Trend and seasonality; detecting and estimating trends – applications to hydrological, meteorological, water and air quality data.	7 4	2 2	
	Total	**42**	**14**	

Evaluation criteria

- Test 1: 20% [Module 1 & 2, after 5-6 weeks of teaching]
- Test 2: 20% [Module 3 & 4, after 12-13 weeks of teaching]
- Test 3: 40% [Module 1 to 6, end of semester]
- Tutorials: 20% [10 tutorial assignments spread over entire semester]

Learning outcomes

After completing this course the students will be able to

- develop an intuitive statistical sense for inferring meaning out of data collected from different environmental matrices
- implement statistics for environmental monitoring and sampling

- able to critically analyse environmental evidence
- analyse, model and quantify uncertainty and variability in environmental data
- extract information and draw scientific inference from large amount of data collected to solve environmental problems
- analyse trend and seasonality in environmental data
- apply statistical tools and software to analyse environmental data

[Assessment mechanism for learning outcomes: The three tests and tutorial assignments spread over the entire semester]

Pedagogical approach

Classroom lectures, tutorial assignment along with relevant case studies.

Materials

Textbooks

The following textbooks independently cover all the 6 modules.

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

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

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

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

Suggested readings

Suggested readings may be referred to for getting more insights and additional relevant examples for the more interested student.

Berthouex P.M. and Brown L.C. (1994) *Statistics for Environmental Engineers*, Lewis

Publishers, CRC Press, Boca Raton, FL.

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

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

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

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

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.

McBride G.B. (2005) *Using Statistical Methods for Water Quality Management: Issues, Problems and Solutions,* John Wiley & Sons, Hoboken, NJ, USA.

Ott W.R. (1995) *Environmental Statistics and Data Analysis*, Lewis Publishers, Boca Raton, FL.

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

USEPA (2002). *Guidance on Choosing a Sampling Design for Environmental Data Collection,* United States Environmental Protection Agency, Office of the Environmental Information, Washington DC, 20460, EPA/240/R-02/005

Walford N. (2011) *Practical Statistics for Geographers and Earth Scientists*, John Wiley &

Sons, New Jersey, USA.

Zhang C. (2007) *Fundamentals of Environmental Sampling and Data Analysis*, John Wiley & Sons, NJ, USA.

Journals

1. Applied Statistics
2. Biometrika
3. Environmental and Ecological Statistics
4. Environmetrics
5. International Statistical Review
6. Journal of Statistical Computing and Simulation
7. Journal of the American Statistical Association
8. Risk Analysis
9. Statistical Science
10. Technometrics
11. 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:

- Prof V.K. Minocha, Department of Civil Engineering, Delhi Technological University, Delhi
- Prof. S. Shiva Nagendra, Department of Civil Engineering, Indian Institute of Technology Madras, Chennai

- Dr Anil Haritash, Associate Professor, Department of Environmental Engineering, Delhi Technological University, Delhi

Enclosure 14

Revised Course Outline

<table>
<tr><td colspan="4">Course title: Environmental statistics</td></tr>
<tr><td>Course code: NRE 111</td><td>No. of credits: 4</td><td>L-T-P: 42-14-0</td><td>Learning hours: 56</td></tr>
<tr><td colspan="4">Pre-requisite course code and title (if any): No pre-requisite required</td></tr>
<tr><td colspan="4">Department: Energy and Environment</td></tr>
<tr><td colspan="2">Course coordinator(s):</td><td colspan="2">Course instructor(s): Prof. Prateek Sharma</td></tr>
<tr><td colspan="4">Contact details: prateeks@terisas.ac.in</td></tr>
<tr><td colspan="2">Course type: Core</td><td colspan="2">Course offered in: Semester 1</td></tr>
<tr><td colspan="4">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.</td></tr>
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Course objectives

- Need for studying environmental statistics
- Introduce basic concepts useful for environmental data analysis
- Become aware of a wide range of applications of statistics in environmental management & decision making
- Develop technical skills to use statistical tools and software in environmental data analysis

Course content

Module	Topic	L	T	P
10.	**Introduction** Environmental models – deterministic and stochastic; generation of environmental data; types and objectives of environmental studies, stochastic processes in environment; the nature environmental data; concept of random variable and its relevance with respect to the environmental data; relevance of statistics in environmental management; populations and samples – parameters and statistic.	1		
11.	**Describing environmental data** Measurement scales; statistical descriptors of environmental data – numerical and graphical; measurement uncertainty – accuracy, precision and bias estimation of environmental data; variability and errors in environmental pollution data.	4	1	
3.	**Probability models and their use** Probability concepts; probability distribution functions and their applications – discrete and continuous distributions. Probability distribution applications – interpreting environmental standards,	4	1	

	flood frequency analysis and air quality data.			
4.	**Environmental data sampling** Need and purpose of sampling; methods for selecting sampling locations and times for different environmental matrices – monitoring of water bodies for hydrological and water quality data; air quality monitoring; soil sampling – statistical considerations; types of sampling designs – probability and non-probability sampling designs for environmental monitoring and sampling; Sampling theory, sampling distributions; environmental parameter estimation – point and interval estimates; confidence interval estimation; sample size determination.	10	4	
5.	**Tests of hypothesis** Hypothesis testing – parametric and non-parametric tests: assessment of violation of environmental standards, comparing environmental parameters (differences of means, proportions, difference of proportions, multiple proportions, variances, ratio of variances and analysis of variance).	12	4	
6.	**Environmental data analysis** Measuring association between two variables – Correlation analysis: graphical analysis, covariance, correlation coefficient, distribution of correlation coefficient and its statistical significance. Empirical model building – Regression analysis: assumptions and definitions, principle of least squares, regression parameters their distribution and statistical significance; applications in			

	environmental process description and prediction; non-linear processes in environment; use of transformation for linearising non-linear relations; introduction to multiple linear regression. Case studies: Climate change and volume-discharge curve Applications: Stage-discharge curve and volume-discharge curves, water quality parameters and agriculture. Analysis of trend in the environmental data Introduction to time-series analysis; characteristics of hydrological, water and air quality time series; Trend and seasonality; detecting and estimating trends – applications to hydrological, meteorological, water and air quality data.	7 4	2 2	
	Total	**42**	**14**	

Evaluation criteria

- Test 1: 20% [Module 1 & 2, after 5-6 weeks of teaching]
- Test 2: 20% [Module 3 & 4, after 12-13 weeks of teaching]
- Test 3: 40% [Module 1 to 6, end of semester]
- Tutorials: 20% [10 tutorial assignments spread over entire semester]

Learning outcomes

After completing this course the students will be able to

- develop an intuitive statistical sense for inferring meaning out of data collected from different environmental matrices
- implement statistics for environmental monitoring and sampling
- able to critically analyse environmental evidence

- analyse, model and quantify uncertainty and variability in environmental data
- extract information and draw scientific inference from large amount of data collected to solve environmental problems
- analyse trend and seasonality in environmental data
- apply statistical tools and software to analyse environmental data

[Assessment mechanism for learning outcomes: The three tests and tutorial assignments spread over the entire semester]

Pedagogical approach

Classroom lectures, tutorial assignment along with relevant case studies.

Materials

Textbooks

The following textbooks independently cover all the 6 modules.

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Suggested readings

Suggested readings may be referred to for getting more insights and additional relevant examples for the more interested student.

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

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

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

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.

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McBride G.B. (2005) *Using Statistical Methods for Water Quality Management: Issues, Problems and Solutions*, John Wiley & Sons, Hoboken, NJ, USA.

Ott W.R. (1995) *Environmental Statistics and Data Analysis*, Lewis Publishers, Boca Raton, FL.

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

USEPA (2002). *Guidance on Choosing a Sampling Design for Environmental Data Collection*, United States Environmental Protection Agency, Office of the Environmental Information, Washington DC, 20460, EPA/240/R-02/005

Walford N. (2011) *Practical Statistics for Geographers and Earth Scientists*, John Wiley & Sons, New Jersey, USA.

Zhang C. (2007) *Fundamentals of Environmental Sampling and Data Analysis*, John Wiley & Sons, NJ, USA.

Journals

1. Applied Statistics
2. Biometrika
3. Environmental and Ecological Statistics
4. Environmetrics
5. International Statistical Review
6. Journal of Statistical Computing and Simulation
7. Journal of the American Statistical Association
8. Risk Analysis
9. Statistical Science
10. Technometrics
11. 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:

- Prof V.K. Minocha, Department of Civil Engineering, Delhi Technological University, Delhi
- Prof. S. Shiva Nagendra, Department of Civil Engineering, Indian Institute of Technology Madras, Chennai
- Dr Anil Haritash, Associate Professor, Department of Environmental Engineering, Delhi Technological University, Delhi

Enclosure 15

Revised Programme Outline: M.Tech (Water Resources Engineering and Management)

The following programme outline has been approved w.e.f AY 2020.

Total credits: 86

Year	Courses	Credits	Duration*
First Year			
1st Semester	8 core courses	26	15 weeks
2nd Semester	7 core courses	26	15 Weeks
	Field trip	1	
Second Year			
3rd Semester	2 core courses, + 2 electives and Minor Project	17	15 weeks
4th Semester	Major project	16	15 weeks

*Course coordinators shown below are provisional and subject to the availability of a faculty.

Course No.	Course Title	Type	Number of Credits	No. of L-T-P
WSW 133	Advanced Hydraulics	Core	3	28-14-0
WSW 167	Applied hydrology and meteorology	Core	3	29-13-0
WSW 163	Gender, rights and equity perspective for sustainable water management	Core	3	22-20-0
WSW 169	Introduction to Geoinformatics	Core	4	34-10-24
MEU 173	Stochastic modelling	Core	4	42-14-0
WSW 181	Water planning and management	Core	3	42-0-0
WSW 145	Water Quality monitoring methods and analysis	Core	3	25-0-17
WSW 143	Water resources - Institutions and governance	Core	3	24-18-0
Course No.	**Course Title**	**Type**	**Number of**	**No. of L-T-P**

			Credits	
WSW 178	Applied geo-informatics for water resources	Core	3	28-6-16
WSW 186	Design of water supply and sanitation system	Core	4	42-14-0
WSW 147	Economic and financial evaluation of water infrastructure	Core	4	42-14-0
WSW 136	Irrigation water and drainage management	Core	4	42-14-0
WSW 173	Optimization techniques for water management	Core	4	42-14-0
WSW 179	Qualitative research methods and technical writing	Core	3	14-14-28
WSW 176	Water quality modelling and application	Core	4	42-0-28
WSW 101	Field trip on Water Management Practices	Core	1	2-2-20

Course No.	**Course Title**	**Type**	**Number of Credits**	**No. of L-T-P**
NRE 163	Groundwater Hydrology and Management	Elective	3	30-12-0
WSW 132	Industrial pollution control	Elective	3	28-14-0
WSW 177	Social, economic and health dimensions of water, sanitation and hygiene	Elective	3	42-0-0
WSW 153	Water law	Core	3	34-8-0
WSW 182	Water security and conflict management	Core	2	28-0-0
WSW 109	Minor Project in Water Resources Engineering and Management	Core	6	0-0-168
Course	**Course Title**	**Type**	**Number of**	**No. of L-T-P**

No.			**Credits**	
WSW 110	Major Project in Water Resources Engineering and Management	Core	16	0-0-448

M.Sc/PG Diploma/PG Certificate (Water Science and Governance)

The following programme outline has been approved w.e.f. AY 2020.

M.Sc.(WSG) - 4 Semesters; Total Credits: 83
PG Diploma (WSG) – First 2 Semesters only; Total Credits: 50
PG Certificate (WSG)- First Semester only; Total Credits: 26

Programme outline

Year	Courses	Credits	Duration*
First Year			
1st Semester	8 core courses	26	15 weeks
2nd Semester	Field trip	1	1 week
	7 core courses	23	15 weeks
Second Year			
3rd Semester	2 core courses + 2 electives and 1 Minor project	17	15 weeks
4th Semester	Major project	16	15 weeks

*Course coordinators shown below are provisional and subject to available of a faculty.

Course No.	Course Title	Type	Number of Credits	No. of L-T-P
WSW 167	Applied hydrology and meteorology	Core	3	29-13-0
NRE 111	Environmental statistics	Core	4	42-14-0
WSW 163	Gender, rights and equity perspective for sustainable water management	Core	3	22-20-0
WSW 131	Hydraulics	Core	3	30-18-0
WSW 169	Introduction to Geoinformatics	Core	4	34-10-24
WSW 181	Water planning and management	Core	3	42-0-0
WSW 145	Water Quality monitoring methods and analysis	Core	3	17-0-25
WSW 143	Water resources - Institutions and governance	Core	3	24-18-0
Course No.	**Course Title**	**Type**	**Number of Credits**	**No. of L-T-P**
WSW 154	Aquatic eco-system management	Core	3	28-14-0

WSW 147	Economic and financial evaluation of water infrastructure	Core	4	42-14-0
WSW 164	Integrated watershed and river basin management	Core	3	28-14-0
WSW 136	Irrigation water and drainage management	Core	4	42-14-0
WSW 179	Qualitative research methods and technical writing	Core	3	14-14-28
WSW 124	Water audit and demand management	Core	3	28-14-0
WSW 184	Water supply and sanitation	Core	3	42-0-0
WSW 101	Field trip on Water Management Practices	Core	1	2-2-20

Course No.	**Course Title**	**Type**	**Number of Credits**	**No. of L-T-P**
NRE 163	Groundwater Hydrology and Management	Elective	3	30-12-0
WSW 132	Industrial pollution control	Elective	3	28-14-0
WSW 177	Social, economic and health dimensions of water, sanitation and hygiene	Elective	3	42-0-0
WSW 153	Water law	Core	3	34-8-0
WSW 182	Water security and conflict management	Core	2	28-0-0
WSW 107	Minor Project in Water Science and Governance	Core	6	0-0-168
Course No.	**Course Title**	**Type**	**Number of Credits**	**No. of L-T-P**
WSW 108	Major Project in Water Science and Governance	Core	16	0-0-448

Enclosure 16

Revised Programme Outline : MSc (Geoinformatics)

Minimum credit requirement for the award of degree: 71
Semester wise break up of minimum credit requirement

Programme Outline			
First Year			
1st Semester	6 core courses of 2-4 credits each	16	15 weeks
2nd Semester	6 core courses of 2-4 credits each	19	15 weeks
Semester	Minor project	2	
Second Year			
3rd Semester	5 core and 1 elective courses of 3-4 credit each.	19	15 weeks
4th Semester	Major project	15	At the location of the project

Semester 1st

Course No	**Course Title**	**Type**	**Number of Credits**
NRE 113	Applied mathematics	Core	0
NRE 111	Environmental statistics	Core	4
NRG 106	Fundamentals of computers and programming	Core	2
NRG 102	Fundamentals of physics	Core	0
NRG 171	Principles of cartography	Core	3
NRG 176	Principles of GIS & GNSS	Core	4
NRG 178	Principles of remote sensing	Core	3
NRE 101	Technical Writing and Communication skills	Core	0

Semester 2nd

Semester 3rd

Course No	Course Title	Type	Number of Credits
NRG 172	Digital image processing and information extraction	Core	4
NRG 162	Law and policy for maps and remote sensing	Core	2
NRE 112	Multivariate data analysis	Core	3
NRG 170	Photogrammetry	Core	3
NRG 108	Programming in geoinformatics	Core	3
NRG 103	Project management	Core	0
NRE 173	Research methodology and thesis writing	Core	0
NRG 163	Spatial data modelling and its applications	Core	4

Course No	Course Title	Type	Credits
NRG 179	Advances in GIS and current trends	Core	4
NRG 181	Advances in remote sensing: Thermal, Hyperspectral, Microwave, LIDAR and UAV	Core	4
NRG 166	Applications of geoinformatics for atmosphere	Core	3
NRG 164	Applications of geoinformatics for land resources	Core	3
NRG 165	Applications of geoinformatics for water resources	Core	3
NRG 167	Geocomputation	Elective	3
NRE 167	Integrated watershed management	Elective	3
NRG 107	Minor project	Core	2
NRE 151	Wildlife conservation and management	Elective	3

Semester 4

Course No	Course Title	Type	Number of Credits

NRG 104	Major Project	Core	15

Enclosure 17

AMMENDMENT TO ELIGIBILITY CONDITIONS
M.Sc./PG Diploma/PG Certificate (Water Science and Governance)

Present Eligibility

M.Sc. (Water Science and Governance) & (PG Diploma/PG Certificate)
Graduate (B.Sc/B.A) or equivalent from any branch of Engineering, Environmental Science, Physics, Mathematics, Statistics, Chemistry, Geology, Atmospheric Science, Economics, Geography, Zoology, Botany, Anthropology, Agricultural Science.

Inclusion w.e.f AY 2020
The inclusion of 3year- B.Voc programme in the following disciplines as the eligibility criteria for the M.Sc./PG Diploma/PG Certificate (Water Science and Governance) has been approved.

- Industrial Waste Management
- Soil and Water Conservation
- Industrial Chemistry
- Industrial Waste Treatment Technology
- Sustainable Agriculture

Enclosure 18

Revised Programme outline: MA (PPSD)

The Master's in Public Policy and Sustainable Development (MA-PPSD) established in 2006 has accomplished the graduation of 11 Batches so far. In this backdrop, it must be mentioned that the current Programme was restructured based on the approval of the previous Academic Council Meetings (held on 5th July 2017 and 13th November 2017). The Programme has the following structure: -

Year	Courses	Credits	Duration
First Year			
First Semester	9	17	18 weeks
NGO Attachment		2	2 weeks
Second Semester	9	18	18 weeks
Second Year			
Third & Fourth Semester	Project Work	27	At the Participants workplace

The below-mentioned list is the Core Courses we are offering at present. As per the discussions based on the MPEC, the Board of Studies held on 17th June 2020 has approved for our request to remove the Course titled *Challenges of a Digital Economy* (PPS 136). It has been proposed to offer *Policy Perspectives on Water* (PPS 193) in the First Semester. *Policy Perspectives on Water* (PPS 193) is an existing Course currently offered in the Second Semester of the Programme. After due approval of these proposed changes the Programme outline will be as follows: -

Semester-I

S. No	Course No	Title	Credit
1.	NRE 165	Introduction to Sustainable Development	1
2.	PPS 133	Society and Development Policy	2
3.	PPS 127	Sustainable Consumption and Production	2
4.	PPS 183	India and the World	2
5.	PPS 134	Industrial Development and Sustainability	2
6.	PPS 135	Energy Policy and Sustainable Development	2
7.	PPS 153	Governance and Law	2
8.	PPS 193	Policy Perspectives on Water	2
9.	PPS 137	Policy Lab-I	2
		TOTAL	17

Title	Credit
NGO Attachment	2

Semester-II

S. No	Course No	Title	Credit
1.	PPS 191	Assessing Public Policy: Methods and Measurements	2
2.	PPS 192	Major Policy Issues: Education, Health and Infrastructure in India	2
3.	PPS 138	Policy Lab-II	2
4.	PPS 194	Public Policy Processes & Institutions	2
5.	PPS 195	Communities and Conservation	2
6.	PPS 196	Sustainable Urbanization	2
7.	PPS 197	Agriculture and Rural Development	2
8.	PPS 198	Public Management: Issues and Challenges with special reference to India	2
9.		Public Health and Governance	2
		TOTAL	18

Title	Credit
International Visit / Summer Project	2

Semester-III & IV

Title	Credit
Major Project	27