TERI SAS (Deemed to be University)

10, INSTITUTIONAL AREA, VASANT KUNJ, NEW DELHI

MINUTES

60th MEETING OF ACADEMIC COUNCIL

Meeting No. : 60th (Sixtieth))

Date : **24 December 2024 (Tuesday)**

Venue : **Conference Room, TERI School of Advanced Studies**

Time : **10.30 AM**

TERI SAS (Deemed to be University)
MINUTES FOR THE 60th MEETING OF THE ACADEMIC COUNCIL
24 December 2024 (10.30 AM ONWARDS)

ITEMS AT A GLANCE

Item No.	Particulars

Item No.60.1: Welcome and opening remarks by the Vice Chancellor

Confirmation of Minutes

Item No. 60.2: To confirm the minutes of the Fifty Ninth(59th) Meeting of the Academic Council held on 04 June2024.

Action Taken Report

Item No. 60.3: Action Taken Report on the 59th Academic Council Meeting.

Agenda items for Information

Item No. 60.4: Matters of information

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60.4.2 Closure of programmes
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60.4.5 Erasmus+ International Mobility with University of Graz
60.4.6 Increase in the seats for the Academic programs

Agenda items for Consideration

Item No. 60.5. Agenda Items

60.5.1 To consider in-principle approval for launching the proposed Four-Year Undergraduate Program (FYUP) and the Five-Year Integrated Post-Graduate Program (FYIPP) by the Department of Biotechnology in the Academic Year 2025-26
60.5.2 To discuss and approve the proposal of starting B.Tech (Energy Engineering) and its proposed course structure
60.5.3 To consider and approve six Course Outlines of the 2nd semester courses of M.Sc. (Energy Studies and Management) offered by the Department of Sustainable Engineering
60.5.4 To consider and approve one Course Outline of the 3rd semester course of M.Tech (Renewable Energy Engineering and management) offered by the Department of Sustainable Engineering
60.5.5 To consider and approve starting the one-year PG Diploma in Renewable Energy Management (PGDREM) in online mode and also approve the Programme Project Report (PPR)
60.5.6 To consider and approve shifting of courses in the semester of M.Sc. Environmental Studies and Resource Management (ESRM) programme of the Department of Natural and Applied Sciences
60.5.7 To consider and approve course framework for four years UG programme for Data Science (DS), and UG programme for Environmental Studies (ES) of the Department of Natural and Applied Sciences

60.5.8 To consider and approve nine Course Outlines and syllabus of the 4th semester undergraduate – Data Science and Environmental Studies programmes offered by the Department of Natural and Applied Sciences

60.5.9 To consider and approve the change in offering of the following courses in all the Masters' programmes (DoSE, DoPMS – less MBA (SM) of the Department

60.5.10 To consider and approve extension of time period for thesis submission

60.5.11 To consider and approve the new courses for the 4th semester BSc Economics Programme of the Department of Policy and Management Studies

60.5.12 To consider and review the eligibility criteria for admission for MSc-Economics and BSC-Economics Programmes

60.5.13 To consider and approve the introduction of 5-year integrated programme in Economics for BSc (Economics) programme from AY 2025-26 onwards

60.5.14 To consider and approve the new courses for the 2nd and 4th semester BBA programme of the Department of Policy and Management Studies

60.5.15 To consider and approve the revised courses for the LLM Programme as per the NHEQF Guidelines

60.5.16 To consider and approve the modification of the courses of MA SDP Programme of the Department of Policy and Management Studies

60.5.17 To consider and approve the courses of MA PPSD Programme of the Department of Policy and Management Studies

60.5.18 To consider and approve revised Ph.D. regulations

Item No. 60.6: Any other item with the permission of the Chair

60.6.1 Eligibility criteria of the programmes offered at TERI SAS

60.6.2 Extension for Ph.D. Scholars

TERI SAS (Deemed to be University)

MINUTES FOR THE 59th MEETING OF THE ACADEMIC COUNCIL 24 December 2024 (10.30 AM ONWARDS)

The Sixtieth meeting of the Academic Council was held on 24 December 2024 at 1030 hours. The following were present:-

Members Present

Prof Suman Kumar Dhar	Prof Suresh Jain
Prof Shreekant Gupta	Prof Vivek Suneja
Prof Chander Kumar Singh	Prof Sukanya Das
Prof Naqui Anwer	Dr Chaithanya Madhurantakam
Dr Ranjana Ray Chaudhuri	Dr Gopal Sarangi
Prof Anandita Singh	Prof Shaleen Singhal
Dr Sapan Thapar	Prof Shashi Bhushan Tripathi
Dr Shantanu De Roy	Dr Anand Madhukar
Dr Priyanka Arora	Dr Amit Singh
Dr Adwitiya Sinha	Col B Venkat

Prof Sagnik Dey, Prof P.S.N. Rao, Mr Sudhir Vadehra, Prof Ramakrishnan Sitaraman, Prof Arun Kansal, Dr Ramkishore Singh and Dr Shruti Sharma Rana were absent with prior information.

Item No 60.1: Welcome and opening remarks by the Vice Chancellor.

Professor Suman Kumar Dhar welcomed all the members to the meeting and thanked them for their presence. He briefly informed the Council that the academic session at TERI SAS had commenced with an increased number of students enrolled in various programs. He provided an outline of the agenda items for the meeting, which included the introduction of two new programs and the revision of the Ph.D. guidelines to align with the new UGC regulations. Professor Dhar mentioned that the suggestions and guidance of the Academic Council members would be sought to refine the program structure and to seek approval during the meeting.

Confirmation of Minutes

Item No. 60.2: To confirm the minutes of the Fifty Ninth (59th) Meeting of the Academic Council held on 04 June 2024.

The minutes of the Fifty Ninth Meeting of the Academic Council, held on 04 June 2024, were circulated to the members and no comments were received.

The Academic Council may, therefore, consider confirming the minutes, as circulated.

The Academic Council approved the minutes of Fifty Ninth (59th) Meeting of Academic Council held on 04 June 2024.

Action Taken Report on the 59thAcademic Council Meeting.

Item No.60.3: <u>Action Taken Report on the 59thAcademic Council Meeting</u>

Sr.No.	Agenda	Action taken
Item No.1	**59.5.1 To consider and approve restructuring of MSc (Geoinformatics), MSc (Climate Science and Policy) and MSc (Environmental Studies and Resource Management) programmes, realigning of the courses and**	**The same has since been implemented.**

	revision of Major & Minor project creditsin the Department of Natural and Applied Sciences 59.5.1.1. Review of the current programme structure of MSc Geoinformatics, MSc Climate Science and Policy (CSP) and MSc Environmental Studies and Resource Management (ESRM), in the context of aligning it to the National Higher Education Qualifications Framework (NHEQF) and the new proposed system of 20 credits per semester (minimum 80 credits for a 2-year PG programme). 59.5.1.2. Realigning of courses across from one semester to the other, changes in course types (credit/audit/core/elective), changes in course codes, removing certain courses (NRE 165 - Introduction to Sustainable Development, PPM 179 - Design Thinking, NRE105 Independent Study and NRE 102 Seminar Course in Global Change) and change in number of credits (NRG 178 - Principles of remote sensing. 59.5.1.3. Revision of Minor Project and Major Project credits, as per requirement of NHEQF. To increase the Minor project credits to 8 and add to 3rd semester credits. In addition, Major project credits to be revised to 20 in the 4th semester. **The Academic Council discussed, gave inputs and approved the agenda.**	
Item No.2	**59.5.2 To consider and approve review of the complete course framework for four years UG programme and approve third semester courses of Four-Year Undergraduate programmes in Environmental Studies and Data Science offered by the Department of Natural and Applied Sciences** 59.5.2.1 To consider and approve review of the complete course framework for four years Undergraduate programme for Data Science (DS) and Undergraduate programme for Environmental Studies (ES) offered by the Department of Natural and Applied Sciences. 59.5.2.2 To consider and approve below mentioned third semester courses of Four-Year Undergraduate programmes in Environmental Studies and Data Science. (i) Data Wrangling and Visualization (major for DS) (ii) Cybersecurity for Data Science (major for DS) (iii) Data Mining and Data Analysis	**The same has since been implemented.**

	(major for DS) (iv) Biodiversity Conservation (major for ES) (v) Soil Conservation and Management (major for ES) (vi) Sustainable Built Environment (major for ES) (vii) Conventional and Renewable Energy Resources (minor for ES) (viii) Environmental Statistics (MDC) (ix)Introduction to Geographic Information System (SEC) (x) Modern Indian Language 2 (AEC) **The Academic Council discussed, and proposed renaming the course - Cybersecurity for Data Science (major for DS) as Cybersecurity (major for DS) and approved the agenda.**	
Item No.3	**59.5.3 To consider and approve aligning the learning outcomes and credit requirements of following programmes as per NHEQF offered by the Department of Sustainable Engineering** (i) M.Tech (Renewable Energy Engineering and Management) – M.Tech REEM) (ii) M.Sc. (Energy Studies and Management) – M.Sc (ESM) (iii) P G Diploma in Renewable Energy Management – PGDREM (iv) M.Tech (Urban Development Management) –M.Tech (UDM) (v) P G Diploma in Urban Development Management – PGDUDM The Department of Sustainable Engineering offers five programmes. There are two PG Diploma, one M.Sc and two M.Tech programmes which falls at level 6, level 6.5 and level 7, respectively as per NHEQF (National Higher Education Qualification Framework-2023). As per NHEQF, each of these programmes requires minimum of 40 credits every year (which may spread over two semesters) to be earned by any individuals enrolled in the programmes. It is, therefore, required to align the programme structures to accommodate recommendations as per NHEQF so that the credit requirements and learning outcomes of all the programmes can be aligned accordingly. **The Academic Council discussed, proposed the following and approved the agenda-** **(a) Additional and niche' areas such as Carbon Credit, Energy storage system, Hydrogen Engineering & Electric vehicles be introduced as subjects to be taught as part of**	**The same has since been implemented. Involvement of Professors of Practice/Honorary distinguished professors is under consideration.**

	the credits. **(b) Present offering of courses as 01 credit be increased to minimum 02 to be seen as a viable learning.** **(c) Possibility of involving Professors of Practice / Honorary professors be explored for this niche' areas.**	
Item No.4	**59.5.4: To consider and approve five Course Outlines of the 1st semester courses of M.Sc. (Energy Studies and Management) offered by the Department of Sustainable Engineering** M.Sc (Energy Studies and management) [M.Sc (ESM)] is a new programme which shall be started from the session 2024-25. There are 8 core courses in the 1st semester. Out of 8 courses, the course outline of 3 courses doesn't require fresh approval. The remaining 5 new course are as listed below, which is presented for discussion and approval. (i) Introduction to Energy Resources, Systems and Technologies (ii) Energy System Infrastructure & Operations (iii) Energy Policy, Planning and Programmes (iv) Energy Conservation, Audit and Management (v) Energy Science Lab **The Academic Council discussed, gave inputs and approved the agenda.**	**The same has since been implemented.**
Item No.5	**59.5.5: To consider and approve three Course Outlines of the 1st semester courses of M.Tech (Urban Development Management)) offered by the Department of Sustainable Engineering** The M.Tech (UDM) programme has been restructured. One course of the 1st semester, listed below, is presented for discussion and approval. (i) Theories of Urbanisation and their application for urban development. Two courses of 1st semester of M.Tech (UDM) has been updated. Both the courses have been presented for discussion and approval. (ii) MEU 167 Urban Development Policies and Programmes. (iii) MEU 179 Geoinformatics for urban development management. **The Academic Council discussed, gave inputs and approved the agenda.**	**M.Tech (UDM) has been applied for closure to the regulatory body, AICTE.**
Item No.6	**59.5.6: To consider and approve including B.Sc in Energy and B.Voc in relevant stream as**	**The same has since been implemented.**

	eligibility criteria for admission to M.Sc (ESM) offered by the Department of Sustainable Engineering To expand the eligibility criteria for admission to M.Sc (ESM) programme, it is proposed that candidates with B.Sc degree in Energy domain and B.Voc in relevant stream be allowed to take admission in this programme. **The Academic Council approved the agenda.**	
Item No.7	**59.5.7 To consider and approve revision of programme structure of MSc (Water Science and Governance).** To consider and approve revision of programme structure of MSc (WSG), offered by the Coca Cola Department of Regional Water Studies to align the course structure with the National Higher Education Qualification Framework (NHEQF). **The Academic Council discussed, gave inputs and approved the agenda.**	**The program is not under offer from the Academic year 2025 -26.**
Item No.8	**59.5.8 To consider and approve revision of the programme outline of MSc Economics offered by the Department of Policy and Management Studies** 59.5.8.1 To align the programme outline of M.Sc Economics in line with the NHEQF guidelines, the proposal was that the Mathematical Methods of Economics (now offered in the 1st Semester) may be divided into two new courses: (a) 'Real Analysis and Optimization' and (b) 'Linear Algebra and Dynamic Optimization'. However, BoS members suggested that including both these courses in Semester 1 would be too heavy content wise, hence shall be spread across the Semesters. 59.5.8.2 To approve the following new courses for BSc Economics Programme for the third Semester. (i) Intermediate Macroeconomics 1 (ii) Intermediate Microeconomics 1 (iii) Intermediate Microeconomics 2 (iv) Introduction to Development Economics **The Academic Council discussed, gave inputs and approved the agenda.**	**The same has since been implemented.**
Item No.9	**59.5.9 To consider and approve revision of the course structure of MBA (SM) programme offered by the Department of Policy and Management Studies as per the AICTE Credit norms** Vide AICTE's Model curriculum for MBA dated Jan 2018, program structure and credits have been defined as follows-	**The proposal is under implementation for 2nd and 4th Semester presently.**

	(i) First year (I and II semester) – 54 credits of core courses (ii) Second year (III and IV semester) - 42 credits of electives (iii) Internship / Field work – 06 credits Total – 102 credits Further, one credit equals to 10 hours. It is proposed that the same be adopted for the MBA (SM) program and the courses be revised to be offered from the next semester commencing Jan / Feb 2025, with 06 credits for internship / field work be equated to the minor internship under offer at TERI SAS. **The Academic Council discussed, gave inputs and approved the agenda. It was unanimously agreed upon to explicitly state that one credit for teaching equates to 10 hours.**	
Item No.10	**59.5.10 To consider and approve review of the following two new core courses to be introduced in BBA Semester -3** (i) Marketing Management II (ii) Operation Management **The Academic Council discussed, gave inputs and suggested that Operation Management be changed to Operations Management. The Academic Council approved the agenda.**	**The same has since been implemented**
Item No.11	**59.5.11 To consider and approve revision of the course structure of LLM Programme as per the NHEQF Guidelines and increase the Credit value along with number of teaching and learning Hours in both the Semesters** NHEQF Guidelines for LLM Program recommend that one semester must carry 20 credits however current LLM structure indicates that the total credit size in each Semester is 16 credits per semester. It is proposed that based on the NHEQF Guidelines, credit size be increased to 20 credits per semester. Further, the contact hours for credit shall be as follows: 1 credit is equal to 15 hours of teaching and learning. Accordingly, necessary changes have been incorporated. **The Academic Council discussed and approved the agenda.**	**The same has been presented as an agenda in the current AC.**
Item No.12	**59.5.12 To consider and approve review the suggested modifications and additions in Four Courses of LLM First Semester** (i) MPL 101- Seminar/Clinic on Contemporary Issues in Infrastructure and Environment (From Zero Audit Course to 1 Credit Course)	**The same has since been implemented**

	(ii) MPL 141- Economic Foundations of Environmental and Infrastructure Law (From 1 Credit Course to 2 Credit Course) (iii) MPL 155- Environmental Law and Policy (From 2 Credit Course to 3 Credit Course) (iv) MPL 157- Infrastructure Law and Policy (From 2 Credit Course to 3 Credit Course) **The Academic Council discussed, gave inputs and approved the agenda.**	
Item No.13	**59.5.13 To consider and approve revision of the programme outline of MA (SDP) and align with the NHEQF** The MPEC, MA (SDP) Programme, in view of the institutional mandate of adhering to the National Higher Education Qualification Framework (NHEQF) as a part of the National Education Policy 2020 has suggested aligning the courses as per its guideline. Necessary changes in the credit assignments are done in the first Semester courses. BoS members agreed to the above agenda point considering the NEP requirements. **The Academic Council discussed, gave inputs and approved the agenda.**	**The same has since been implemented**
Item No.14	**59.5.14 To consider and approve the new credit alignment of Minor and Major Projects for MA (SDP)** It is proposed to have 8 credits for the minor project in the 3rd semester and 20 credits for the Major project in the 4th semester for MA (SDP). **The Academic Council discussed, gave inputs and approved the agenda.**	**The same has since been implemented**
Item No.15	**59.5.15 To consider and approve the revised core courses for the 1st Semester for MA (SDP)** The following courses of the 1st Semester were revised/modified as per the NHEQF requirements and presented below. (i) **Themes and Perspectives of development** (ii) **Law, society and Sustainable Development** (iii) **Principle of Economics** **The Academic Council discussed, gave inputs and approved the agenda.**	**The same has since been implemented**
Item No.16	**59.5.16 To consider and approve the new course outline of elective courses to be offered to 3rd Semester students for MA (SDP)** The following elective courses of the 3rd Semester were revised and presented below- (i) **Climate Change and Development** (ii) **Energy Economics, Policy and Finance** **The Academic Council discussed, gave inputs and approved the agenda.**	**The same has since been implemented**

Item No.17	**59.5.17 To consider and approve revision of the programme outline of MA (PPSD) and align with the NHEQF** The MPEC, MA (PPSD) Programme, in view of the institutional mandate of adhering to the National Higher Education Qualification Framework (NHEQF) as a part of the National Education Policy 2020 suggested aligning the courses as per its guideline. Necessary changes in the credit assignments in the first Semester courses are placed**.** **The Academic Council discussed, gave inputs and approved the agenda.**	**The same has since been implemented**
Item No.18	**59.5.18. To approve the new/revised core courses for the 1st Semester in MA (PPSD)** Following courses of the 1st Semester were introduced/revised/modified and the details are provided below- (i) **Public Policy: A Concise Exposure** (ii) **Social Policies & Sustainable Development** (iii) **Public Administration and Systems Management** (iv) **Research Methods & Tools for Public Policy and Administrative Decision Making** (v) **Globalisation and Changing Geopolitics: Implications for Economic & Foreign Policies** (vi) **Economics for Public Policy** (vii) **International Collaborative Studio on Public Policy** (viii) **Policy Lab – I: Sectoral Policy Scoping** Dr. Chandan Kumar, Programme Coordinator, addressed the queries related to the MA-PPSD Programme restructuring process and its requirements. He informed the AC members that from the upcoming Academic Session, the MA-PPSD Programme is also offering admissions to fresh graduate candidates, in addition to mid-career/senior professionals joining the Programme through DoPT or any non-governmental organizations. Hence, the courses have been modified and realigned in the Programme to cater for the requirements of all the stakeholders, including the feedback/suggestions received from the DoPT. **The Academic Council discussed, proposed to include think tanks also as part of stake holders and approved the agenda.**	**The same has since been implemented**
Item No.19	**59.5.19 To consider and approve aligning the credit requirement of M.Sc (Biotechnology) programme as per NHEQF**	**The same has since been implemented.**

	The BoS of the MSc (Biotechnology) Programme, in view of the institutional mandate of adhering to the National Higher Education Qualification Framework (NHEQF) as a part of the National Education Policy 2020 approved aligning the courses as per its guideline is placed. **The Academic Council discussed, gave inputs and approved the agenda.**	
Item No.20	**59.5.20 To consider and approve National Eligibility Test (NET) as an Entrance Test for Admission to Ph.D.** UGC vide their notification dated 28 March 2024, has informed that from the academic session 2024-25 onwards, the NET score may be used for admission to Ph.D. programmes in place of entrance tests conducted by the different universities / HEIs. At present the Ph.D intake at TERI SAS is based on NET (JRF & LS) qualification as well as its own Ph.D entrance test followed by interview. This is keeping into consideration the uniqueness of programs being offered in the domain of sustainability. In the light of recent UGC notification, TERI SAS proposes to use the National Eligibility Test (NET) scores/PhD entrance test for admission to Ph.D. Programs. **Guidelines for admissions to Ph.D. for academic session 2024-2025:** **1.** Based on the scores obtained in NET, the candidates will be eligible in three categories. **Qualified for JRF — Eligible for Assistant Professor — Ph.D. Admission** **Category-1:** Award of JRF & appointment as Assistant Professor — **Yes — Yes — Yes** **Category-2:** Appointment as Assistant Professor and admission to Ph.D. — **No — Yes — Yes** **Category-3:** Admission to Ph.D. only — **No — No — Yes** 2. Admission under JRF Category will be done as per UGC Notification dated 7. November, 2022 published in the Gazette of India: Extraordinary no. 544. 3. As per UGC Notification dated 27.03.2024, for students who qualify in Categories 2 and 3, 70% weightage will be given for test scores 30% weightage for the	**The same has since been implemented.**

	interview for admission to Ph.D. program. The Ph.D. admission will be based on the combined merit of NET marks and the marks obtained in the Interview. 4. The marks obtained in the NET by the candidates in Category 2 and 3 will be valid for a period of one year for admission to Ph.D. Programs. 5. The University may hold entrance examination for those Ph.D. programs where NET examination in the concerned subjects/disciplines are not conducted by UGC. 6. Entrance examination for applicants who have not cleared NET cat 1,2 and 3 but still would like to pursue the PhD program in any of the discipline (including disciplines covered under NET) that our Institute hosts. This will be followed by regular interview. 7. For Category 2 & 3, a minimum cut off to be set in the NET score for interview at department level. 8. Number of seats be defined for admission in Ph.D. programmes for NET qualified candidates and non-NET qualified candidates at department level. **Prof. Dhar provided a comprehensive overview of the recent UGC regulations concerning the National Eligibility Test (NET) as an entrance examination for Ph.D. admissions.** **The guidelines for admission to Ph.D. programs for the academic session 2024-2025, were discussed and approved by the Academic Council.**	
Item No.21	**59.5.21 To consider and approve preparedness for NEP 2020 in respect of UG / Integrated programmes.** Keeping into consideration of various guidelines and directives issued from UGC on preparedness and implementation of NEP 2020 (focussed on UG / Integrated), it is proposed that irrespective of the current status, each department shall plan to offer UG / Integrated programme(s) from the academic year 25 - 26. This further should be broadly aligned to the thematic areas of the respective departments so as to enable a smooth transition from more Masters oriented programmes to the UG / Integrated programmes. **Prof. Dhar informed that under the National Education Policy (NEP) framework, major emphasis has been given to undergraduate**	**The same has since been implemented.**

	programme and there will be a requirement to offer one-year Masters programs. **He further informed that Department of Biotechnology and Legal Studies are planning to launch UG level programmes from Academic Session 2025. The Academic Council approved the agenda.**	
Item No.22	**59.5.22 To consider and approve guidelines for nominating Honorary Distinguished Professor at TERI SAS.** TERI SAS offers academic programmes at UG and PG level both in the domain of sustainability. All the programmes offered have a unique blend infused as aligned to UN SDGs. To enable a greater exposure to faculty members and students alike, it is proposed that a retired Professor or Eminent Academic of repute of any University/Research/Academic Organization having an authoritative standing in a field of interest to a Department of TERI SAS may, on the recommendation of a duly constituted committee, be selected for appointment as Honorary Distinguished Professor. Proposed scheme for appointment of Honorary Distinguished Professor at the TERI SAS is placed. **Academic Council members discussed the need, detailed guidelines of proposed scheme for appointment of Honorary Distinguished Professor at the TERI SAS. Professor Dhar further highlighted that in addition to application-based selection, nominations of esteemed academicians and individuals of eminence by former/present Vice Chancellors, former/present Directors of National Institutes, Fellows of the National Academies shall be considered as Honorary Distinguished Professors at TERI SAS.** **Further, the scheme shall be notified as per the requirement.** **The Academic Council approved the agenda.**	**The Academic Council was informed that Professor Rakesh Bhatnagar has joined as Honorary Distinguished Professor in Department of Biotechnology.**
Item No.23	**59.5.23 To consider and approve recruitment of faculty members.** Recruitment of regular faculty members as proposed by various departments have been considered and the same shall be routed through a rationalisation committee (constituted at university level). The recommendations of the same with concurrence of Finance Committee shall be put up for consideration and approval in the Executive Council. **Considering the shortage of faculty members alongside a surge in admissions and the introduction of new courses for the upcoming academic session, the Academic Council discussed, gave inputs and approved the**	**The Academic Council was informed that regular faculty position for Economics, Data Science and Geoinformatics were announced and the selected candidates have joined or are in process of joining.**

	agenda regarding regular faculty recruitment across various departments as proposed.	
Item No.24	**59.5.24 To consider and approve 12 credits in the 3rd semester to fulfil a minimum of 20 credits norms per semester including a 8-credit minor project in alignment.** Dr. Chander Kumar Singh informed the members that an 8-credit minor project in alignment with the NHEQF guidelines is being proposed during the semester break between 2nd and 3rd semesters. Consequently, the students shall be undergoing only 12 credits in the 3rd semester to fulfill a minimum of 20 credits norms per semester. **The Academic Council members recommended that students be encouraged to take elective courses as per their schedule, beyond the 12-credit requirement during the 3rd semester. The programs should allow flexibility for students to manage their time according to their preferences, without imposing additional credit burdens.**	**The same has since been implemented.**

The Academic Council members noted the action taken on the various items mentioned above.

Agenda items for Information

Item No. 60.4: Matters of information

60.4.1 Admissions and commencement of the Academic Year 24 – 25 for UG and PG Programs.

The Academic session 24 – 25 commenced as follows:-

(a) 1st year PG. 12 August 24.
(b) 2nd year PG. 20 August 24.
(c) 1st year UG. 02 September 24.

Final admissions after the withdrawals in UG and PG for the Academic Year 24 - 25 are as follows:-

(a) UG. 67 students
(b) PG. 448 students

Ser. No	Name of the Programme	No. of student enrolled
PG Programs		
1	LLM	24
2	MBA-SM	84
3	M.Sc.-BT	39
4	MA–PPSD	48
5	MA-SDP	44
6	M.Sc.-CSP	28
7	M.Sc.-Eco	60
8	M.Sc.-ESRM	56
9	M.Sc.-GEO	39
10	M.Tech.-REEM	14

11	M.Sc. – ESM	12
	Total	**448**
UG/Integrated Programs		
1	Bachelor of Business Administration	9
2	Bachelor of Science (Data Science)	17
3	Bachelor of Science (Economics)	7
4	Bachelor of Science (Environmental Studies)	34
	Total	**67**

Four programmes – M.Tech. (WREM), M.Tech (UDM,) M.Sc. (WSG) and PGDREM were not offered in the current academic session.

The Academic Council noted the details provided.

60.4.2 Closure of programmes

Since the intake of students in the programes M.Tech (WREM), M.Tech (UDM) and M.Sc. (WSG) were very negligible over the last two years, it has been decided to close these programmes from the academic session 2025-26.

Accordingly, closure of M.Tech (WREM), M.Tech (UDM) have been applied for with the regulatory body, AICTE.

The Academic Council noted the matter.

60.4.3 Scholarship details

TERI SAS offers a limited number of scholarships to students joining the doctoral and masters' programmes. All grants to TERI SAS students are made on a competitive basis, with due consideration for both means and merit. The criteria for selection are such that they encourage students to continuously strive towards academic and professional excellence.

Hemendra Kothari Fellowship

TERI SAS with support from Hemendra Kothari Foundation, Wildlife Conservation Trust, Mumbai provides merit fellowship to 3rd semester MSc students of Environmental Studies and Resource Management (ESRM), Climate Science and Policy (CSP), Geo-informatics(GEO), Biotechnology (BT) and Water Science & Governance for initiating projects /research ideas that synergizes with the work areas of Hemendra Kothari Foundation and TERI SAS. The foundation extensively works for Wildlife Protection in India. The following students were awarded with this Fellowship:-

Ms. Pratha Mishra, MSc (Water Science and Governance)
Mr. Soumit Pandey, MSc (Economics)

Maneesh Manjunath Scholarship

TERI SAS announces Maneesh Manjunath Scholarship for the Fourth semester students. The scholarship is in the memory of TERI SAS alumnus Maneesh Manjunath (M.A SDP 2010-12) with support from Kaushal Rastogi (M.Tech 2010-12) and Pankaj Singh (M.Tech 2009-11). Proposals are invited for projects/ideas which aim towards sustainable development of the society. Scholarship of INR 30,000 is awarded to winning project proposal for implementation in a time frame of six months. The following students were awarded with this scholarship:-

Ms Nishtha Bhakta, MSc (Economics)
Ms Anusha Paul Choudhury, MSc (Economics)

The Academic Council noted the matter

60.4.4 Institutional jointly-supervised dual doctorate degree agreement

Under the Institutional jointly-supervised dual doctorate degree agreement with Deakin University, Australia, doctoral students Mr Manurbhav Arya and Ms. Ayushi Niranjan have been selected to undergo furtherance of their research at Deakin University, Australia for a minimum period of 6 months. The support by Deakin University, Australia shall be for a period of 04 years as per UGC JRF entitlement.

The Academic Council noted the matter.

60.4.5 Erasmus+ International Mobility with University of Graz

Vide the agreement with University of Graz for international mobility of students and staff, Ms. Jayati Gupta, M.Sc. Economics student has been selected for the Joint International Masters in Sustainable Development programme at University of Graz. The duration of the programme is five months and shall be commencing from Feb 2025 onwards.

The Academic Council noted the matter.

60.4.6 Increase in the seats for the Academic programs

Due to the increased interest of the students in some of the selected programs, the university took a decision to enhance the seats in the specified courses as mentioned below.

Ser No	Academic Program	Present available seats	Proposed seats
1.	M.Sc (Climate Science & Policy)	25	45
2.	M.sc (Economics)	60	90
3.	M.A (Sustainable Development Practice)	40	60
4.	M.A. (Public Policy & Sustainable Development)	30	60

The Academic Council noted the matter.

Agenda Items for Consideration

Item No. 60.5 Agenda items

60.5.1 To consider in-principle approval for launching the proposed Four-Year Undergraduate Program (FYUP) and the Five-Year Integrated Post-Graduate Program (FYIPP) by the Department of Biotechnology in the Academic Year 2025-26.

Department of Biotechnology proposes to launch Four-Year Undergraduate Program (FYUP) and the Five-Year Integrated Post-Graduate Program (FYIPP) from the Academic year 2025 – 26.

Details are placed as **Enclosure 1.**

Professor Shashi Bhushan Tripathi presented the detailed proposal for the Four-Year Undergraduate Program (FYUP) and the Five-Year Integrated Post-Graduate Program (FYIPP) to the Academic Council members. Professor Tripathi provided background information on the

launch of the programs, the proposed courses to be covered over the four years, and the credit requirements for students to attain the degree. The Academic Council members discussed the FYUP and FYIPP in detail. The Academic Council members approved the proposal for both the Four-Year Undergraduate Program (FYUP) and the Five-Year Integrated Post-Graduate Program (FYIPP), incorporating the suggested changes.

60.5.2 To discuss and approve the proposal of starting B.Tech (Energy Engineering) and its proposed course structure.

Department of Sustainable Engineering proposes to launch B.Tech (Energy Engineering) from the Academic year 2025 – 26.

Details are placed as **Enclosure 2.**

Dr. Naqui Anwer presented the detailed context, unique selling proposition (USP), and proposed program structure for the B.Tech (Energy Engineering) to be offered by the DoSE. The Academic Council members discussed the various courses being proposed and recommended the inclusion of topics on smart energy, as well as subjects related to electrical, mechanical, and chemical engineering, to enhance the program's focus on skills development and improve its job-oriented approach for graduates. Professor Anwer also outlined the infrastructure and manpower requirements necessary to apply for AICTE approval for launching this program.

The Academic Council members approved the proposal for the B.Tech (Energy Engineering), incorporating the suggested changes.

It was proposed that certain management specific courses be part of the program, to bring in an additional option of a minor.

In addition aspects of new gen technologies such as AI / ML be introduced across all the programs offered at both UG / PG level.

60.5.3 To consider and approve six Course Outlines of the 2nd semester courses of M.Sc. (Energy Studies and Management) offered by the Department of Sustainable Engineering

M. Sc (Energy Studies and management) has commenced from the academic session 2024-25. Following six core courses as given below are under offer in the 2nd semester.

The course outlines are placed as **Enclosure 3**.

(a) Firm and Dispatchable Energy – Resources, Technologies, Applications
(b) Variable Energy and Decentralized Systems – Resources, Technologies, Applications
(c) Building Energy Management and Green Building
(d) Energy Markets and Trading
(e) Energy Project Management
(f) Energy Systems Lab

For consideration and approval of the Academic Council please.

60.5.4 To consider and approve one Course Outline of the 3rd semester course of M.Tech (Renewable Energy Engineering and management) offered by the Department of Sustainable Engineering

.

A 3-credit course titled "Waste to Energy" is proposed to be included for the 3rd semester of M.Tech (Renewable Energy Engineering and Management). The course is placed as **Enclosure 4**.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.5 To consider and approve starting the one-year PG Diploma in Renewable Energy Management (PGDREM) in online mode and also approve the Programme Project Report (PPR)

To consider and approve starting one-year PG Diploma in Renewable Energy Management (PGDREM) in online mode offered by the Department of Sustainable Engineering along with Programme Project Report (PPR) is placed in **Enclosure 5**.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.6 To consider and approve shifting of courses in the semester of M.Sc. Environmental Studies and Resource Management (ESRM) programme of the Department of Natural and Applied Sciences

To shift the course NRE 144 Environmental Health and Risk Assessment (3 credits) from second semester to third semester and the course NRE 133 Environmental Management Systems (4 credits) from third semester to second semester of MSc Environmental Studies and Resource Management (ESRM) programme as approved by the BoS (both courses are offered as electives, and proposed changes will not impact the current minimum credits required per semester for the programme structure already approved as per the NHEQF).

The updated programme outline is placed in **Enclosure 6.** Furthermore, the proposed changes also to be reflected in all programme outlines where these courses are offered as electives.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.7 To consider and approve course framework for four years UG programme for Data Science (DS), and UG programme for Environmental Studies (ES) of the Department of Natural and Applied Sciences

The course framework for four years UG programme for Data Science (DS), and UG programme for Environmental Studies (ES) of the Department of Natural and Applied Sciences is placed as **Enclosure 7** for approval.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.8 To consider and approve nine Course Outlines and syllabus of the 4th semester undergraduate – Data Science and Environmental Studies programmes offered by the Department of Natural and Applied Sciences

To discuss course outlines and syllabus of fourth semester undergraduate – Data Science programme and Environmental Studies programme reviewed

by the BoS and approval of the Academic Council as placed in **Enclosure 8.**

(a) Environmental Policy, Law and Governance (ES)
(b) Global Climate Change (Minor)
(c) Network Science (DS)
(d) Open Source Programming (DS)
(e) Time Series Analysis in Data Science (DS)
(f) Environmental Laboratory – I (ES)
(g) Sustainable Natural Resource Management (ES)
(h) Water and Soil Pollution (ES)
(i) Spatial Data Modelling and Analysis (Minor)

The Academic Council discussed, gave inputs and approved the agenda.

60.5.9 To consider and approve the change in offering of the following courses in all the Masters' programmes (DoSE, DoPMS – less MBA (SM)) of the Departments

It is proposed to approve the change in offering of the following courses in all the Masters' programmes (DoSE, DoPMS – less MBA (SM)) of the Departments:-

(a) Design Thinking
(b) Introduction to Sustainable Development

It is proposed that university level courses such as 'Design Thinking' and 'Introduction to Sustainable Development' (currently offered as mandatory courses) be offered as elective courses for the students.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.10 To consider and approve extension of time period for thesis submission

Mr Tushaar Saxena, PhD candidate has submitted a request on 13th December 2024 for an extension of time duration for one semester for his thesis submission. He has provided the progress details justifying the case. The request was circulated between the SRC and DRC members for their information and input. Inputs received from the Officiating Supervisor and Co-supervisors and SRC members are placed in **Enclosure 9**.

The Academic Council noted the matter.

60.5.11 To consider and approve new courses for the 4th semester BSc Economics programme of the Department of Policy and Management Studies.

It is proposed to approve the following new courses for the 4th Semester BSc Economics programme of TERI SAS.

List of courses

(a) Intermediate Macroeconomics-II
(b) Intermediate Statistical methods for economics, and
(c) Economic History of India

Detailed outlines are placed in **Enclosure 10**.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.12 To consider and review the eligibility criteria for admission for MSc-Economics and BSC-Economics Programmes

It is proposed that for admission in Economics as a Major discipline under the BSc (Economics) programme at the TERI-SAS, following eligibility criteria be considered:-

Eligibility criteria for BSc (Economics)

(a) Senior Secondary School Leaving Certificate or Higher Secondary (12th Grade) Certificate obtained after successful completion of Grade 12 or equivalent from any discipline with Mathematics or Applied Mathematics in Grade 12.
(b) Applicants without a background in Mathematics/Applied Mathematics in Grade 12 may be considered eligible on successfully completing a Senior Secondary (equivalent to the 10+2 level) Mathematics course(s) at the National Institute of Open Schooling (NIOS).
(c) There is no upper age bar.

Eligibility criteria for MSc (Economics)

(a) The existing criteria for admissions may be continued.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.13 To consider and approve the introduction of 5-year integrated programme in Economics for BSc (Economics) programme from AY 2025-26 onwards

It is proposed to introduce 5-year integrated programme in Economics for BSc (Economics) from AY 2025-26 onwards.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.14 To consider and approve the new courses as per AICTE Model Curriculum for the BBA programme of the Department of Policy and Management Studies.

It is proposed to revise / modify BBA program under offer as per AICTE Model Curriculum. Towards this, approval for the following new courses as applicable for the 2nd and 4th Semester is placed:-

(a) Business Communication -II
(b) Human Behavior
(c) Business Economics
(d) Emerging Technologies and Business Application
(e) Marketing Management
(f) Media Literacy & Critical Thinking
(g) Human Resource Management
(h) Management accounting
(i) Management Information System
(j) Business Research Methodology
(k) Entrepreneurship
(l) Legal and ethical issues in business

Detailed outlines are placed in **Enclosure 11.**

The Academic Council discussed, gave inputs and approved the agenda.

60.5.15 To consider and approve the revised courses for the LLM Programme as per the NHEQF Guidelines.

It is proposed to review and approve the following revised courses for the LLM Programme as per the NHEQF Guidelines.

(a) Legal Aspects of Bidding and Public Private Partnership (Proposed to increase from 2 Credit Course to 3 Credit Course)
(b) Mining and Mineral Laws (Proposed to increase from 2 Credit Course at present to 3 Credit Course)
(c) Contract Law and Management (Proposed to increase from 2 Credit Course at present to 3 Credit Course)
(d) Forest Law and Policy (Proposed to increase from 2 Credit Course at present to 3 Credit Course)
(e) Competition Law and Policy (Proposed to increase from 2 Credit Course at present to 3 Credit Course)
(f) Urban Infrastructure Law and Management (Proposed to increase from 2 Credit Course to 3 Credit Course)
(g) Environmental Aspects of Business Activities (Proposed to increase from 2 Credit at present to 3 Credit Course)
(h) Climate Change and Law (Proposed to increase from 2 Credit Course at present to 3 Credit Course)
(j) Infrastructure Project Finance Law (Proposed to increase from 2 Credit Course to 3 Credit Course)
(k) Energy Law (Proposed to increase from 2 Credit Course at present to 3 Credit Course)

Detailed outlines are placed in **Enclosure 12**.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.16 To consider and approve the modification of the courses of MA SDP Programme of the Department of Policy and Management Studies.

It is proposed to approve the modification of the following courses of MA SDP Programme of the Department of Policy and Management Studies:-

S.No.	**Courses**	**Proposed changes**
1.	Gender in Development Practice (SEM-II).	Increase in credit from 2 to 3 in MPD 148
2.	Themes and Perspectives of Development (SEM-1)	Increasing the credit from 2 to 3 in MPD 139
3.	Management of Development Organization (SEM-II)	Modification has been done by rearranging two modules along with a minor change in evaluation pattern.

Detailed outlines are placed in **Enclosure 13.**

The Academic Council discussed, gave inputs and approved the agenda.

60.5.17 To consider and approve the courses of MA PPSD Programme of the Department of Policy and Management Studies

It is proposed to approve the following courses of MA PPSD Programme.

	Semester II	Credit
1.	Sustainable Urbanization	2
2.	Water and Sustainable Development: Policy Perspectives	2
3.	Energy and Sustainable Development: Issues, Challenges & Policy	2
4.	Digital Economy: Dividends, Disputes & Dimensions	2
5.	Infrastructure Development and Sustainability: Issues & Policy Perspectives	2
6.	Sustainable Industrial Development: Policies & Practices	2
7.	Climate Change and Cities: Policies & Practices	2
8.	Public Policy Assessment: Methods & Measurements	2
9.	Policy Lab - II: Developing a Policy Paper	3
	Semester III	
10.	Major Project – I	20
	Semester IV	
11.	Major Project – II	20

Detailed outlines are placed in **Enclosure 14**.

Revised programme structure of MA PPSD programme is as per **Enclosure 15**.

The Academic Council discussed, gave inputs and approved the agenda.

60.5.18 To consider and approve revised Ph.D. regulations

The revised Ph.D. regulations of TERI SAS is placed as **Enclosure 16** for consideration and approval of the Academic Council

Dr Gopal Sarangi presented and highlighted the proposed changes in the TERI School of Advanced Studies Ph.D. Rules-2024.

The Academic Council members deliberated on the points and approved the enclosed policy.

Item No. 60.6: Any other item with the permission of the Chair

60.6.1 Eligibility criteria of the programmes offered at TERI SAS

Dr Chander Kumar Singh presented the eligibility qualifications criteria for admission to various programmes being offered by the Institute as placed in **Enclosure 17.**

The Academic Council members noted the details presented and approved the agenda item.

60.6.2 Extension for Ph.D. Scholars

Dr Chander Kumar Singh informed that Ms Anjulata Singh, Gurbir Kaur Sidhu and Gurdeep Kaur, Ph.D. scholars of DBT are in the final stages of their thesis submission and are being given one last extension of one semester for submission of thesis with all prescribed formalities as per PhD regulations.

Mr Jeevan Jethani from DoPMS is also given one semester extension beyond which no further extension would be given.

The Academic Council members approved the extension.

Enclosure 1

Overview and outlines of the proposed Four-Year Undergraduate Program (FYUP) and the Five-Year Integrated Post-Graduate Program (FYIPP) in Biotechnology

Department of Biotechnology, TERI SAS

Submitted for consideration to the Academic Council, TERI School of Advanced Studies

December 2024

Prepared by

The FYUP/FYIPP program formulation committee, Department of Biotechnology

Chairperson - Prof. Ramakrishnan Sitaraman

Implementation- Prof. Shashi Bhushan Tripathi, Dr. Souren Paul

Members- Prof. Anandita Singh, Dr. Chaithanya Madhurantakam

Senior Advisor- Prof. Suman K. Dhar, Vice-chancellor

Requirement for an FYUP and FYIPP in biotechnology at TERI SAS

The National Biotechnology Development Strategy (2021-2025)[1] has emphasized that biotechnology will emerge as a key driver of a knowledge-based economy. According to the Indian Bioeconomy Report of 2024[2], India's bioeconomy was valued at USD 151 billion, while the cumulative total of start-ups reached 8,531. It is projected that the Indian bioeconomy will be worth USD 300 billion, reflecting a CAGR of 12.3%. The share of the bioeconomy in total GDP currently stands at 4.25% and is projected to be a key contributor to the economy. In addition to economic aspects biotechnology, through its contributions to the biomedical, pharmaceutical, agricultural and industrial sectors, has emerged as an indispensable and strategic enabler in the quest for national self-reliance (*Atma-nirbhartA*), environmental sustainability and the attainment of the sustainable development goals (SDGs) detailed by the United Nations[3]. This year (2024) the Department of Biotechnology, Government of India has recognized the potential of biomanufacturing for economic growth, employment generation and environmental protection in the national BioE3 policy[4]. One of the pillars of the BioE3 policy is 'nurturing a cohort of highly skilled workforce.'

The very first of the key strategies listed by the National Biotechnology Development Strategy (2021-2025) document for developing the bioeconomy is "building capacities – a skilled workforce and strengthened state-of-the-art infrastructure[5]." Given the collective expertise of both TERI SAS and TERI in biotechnology and sustainability studies, TERI SAS is uniquely poised to contribute to inter-disciplinary capacity building in both fields as well as to National Missions of critical sectoral and inter-sectoral importance such as:

1. POSHAN Abhiyan (Development of biofortified and protein rich wheat)[6]
2. National Action Plan on Anti-microbial Resistance[7]
3. IndCEPI (Coalition for Epidemic Preparedness Innovations – a mission to develop affordable vaccines against emerging infectious diseases)[8]
4. National Biopharma Mission[9]
5. Clean Energy Mission[10]

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[1] *National Biotechnology Development Strategy (2021-2025): Knowledge- and Innovation-driven Bioeconomy.* Published by the Department of Biotechnology, Ministry Of Science And Technology, Government of India. URL: https://tinyurl.com/44dp93tz

[2] Suresh N, Chandan, S.R. & Krishnan G.S. *India BioEconomy Report 2024*. Published by the Association of Biotechnology Led Enterprises (ABLE) for the Make In India Facilitation Cell for Biotechnology of the Biotechnology Industry Research Assistance Council (BIRAC), Government of India.
URL: https://tinyurl.com/bdznctc8

[3] URL: https://tinyurl.com/2s4cuzh4

[4] URL: https://tinyurl.com/yhz7vz42

[5] *Op. cit.* pp. 9-11.

[6] URL: https://tinyurl.com/en733wr4

[7] URL: https://tinyurl.com/8auesudr

[8] URL: https://tinyurl.com/3bem3z6c

[9] URL: https://tinyurl.com/358dzrsw

[10] URL: https://tinyurl.com/23mphs84

6. Swacch Bharat[11]
7. Svasth Bharat[12]
8. GARBH-Ini (A mission to promote maternal and child health, and develop prediction tools for pre-term birth)[13]
9. National program on nanoscience and technology (formerly Nano Mission)[14]
10. Atmanirbhar Bharat (National self-reliance)[15]

The specific reasons for TERI SAS initiating an integrated 5-year integrated Master's program in Biotechnology may be summarized as follows:

1. Development of skilled human resources in a field of economic and strategic importance nationally and global.
2. Leveraging existing capacities at TERI SAS and TERI to align with national policy decisions and national missions promoting biotechnology-related research and industries.
3. Organization-wide directive to adapt to the impending nation-wide re-structuring of tertiary educational programs that are anticipated to significantly reduce the student intake of stand-alone two-year Master's level programs.

TERI SAS aims to create a skilled cadre of biotechnology professionals, while maintaining quality parameters at par with current requirements in academia, industry and allied professions. The proposed program leading to an integrated Masters's degree aims to provide students with an understanding of advanced concepts and techniques in biotechnology, while promoting inter-disciplinary and holistic skill development and learning that contributes to the attainment of SDGs[16].

Overall guiding principles of the proposed integrated program based on NEP 2020[17]:

Removal of disciplinary barriers to entry, while maintaining the rigor of disciplinary requirements.

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[11] URL: https://tinyurl.com/2exb2vh6
[12] URL: https://tinyurl.com/3utrdwrk
[13] URL: https://www.garbhinicohort.in/
[14] URL: https://tinyurl.com/8ys3n36z
[15] URL: https://manodarpan.education.gov.in/
[16] IMPORTANT NOTE:
-The success of the proposed integrated Master's program in biotechnology is critically dependent on its receiving the following types of support from TERI SAS authorities:
1. Timely recruitment of additional faculty members with diverse areas of expertise.
2. Expansion of physical laboratory infrastructure in the 2024-25 academic year.
3. Ensuring that the Ph.D. program in Bioresources and Biotechnology is strengthened, and doctoral students incentivized with paid teaching assistantships in accordance with the mandate of NEP 2020.
4. Allocation of monetary resources and assurance of timely procurement for laboratory-based courses and projects.
5. Establishing MoUs with industry-focused finishing schools such as Biocon Academy.
[17] https://tinyurl.com/4knkadu6

Provision of multidisciplinary and interdisciplinary learning opportunities for students by integrating minors in other fields of study available at TERI SAS.

Emphasis on inclusive, barrier-free entry options at all levels to provide credit- and/or degree-earning opportunities not only for regular students but also for members of the general public who aspire to be lifelong learners.

Operational guidelines for implementation

The proposed program structures are based on the recommendations of the following UGC guidelines:

1. Curriculum and Credit Framework for Undergraduate Programs, 2022[18].
2. Curriculum and Credit Framework for Postgraduate Programs, 2024[19].

In the case of the proposed FYUP and FYIPP programs in biotechnology, the coverage of biotechnology/biology-related courses will be informed by the syllabus[20] prescribed by the Council of Scientific and Industrial Research, Human Resource Development Group (CSIR-HRDG) for the National Eligibility Test (NET) for Junior Research Fellowship and Lecturer-ship.

Features common to the proposed FYUP & FYIPP programs

1. Open to all students who have passed class XII (or its equivalent abroad). No disciplinary barriers.

2. Multiple exit options with skill enhancement-based training as prescribed by UGC.

3. Multiple entry options provided as follows:

A. May enter in any semester, starting with semester 2, with no disciplinary barriers, after certification of eligibility by the Departmental Program Executive Committee.

B. Entry contingent on having completed one (or more, as applicable) entire semester(s) in a bachelor's degree program, provided the said program follows the UGC-prescribed structure and distribution of courses. (Incidentally, this facilitates re-entry for dropouts).

C. Conferment of degree is contingent on completing the required credits in terms of Major, elective, and other types of courses as prescribed by the UGC. Therefore, students utilizing lateral entry will be given the opportunity to stay back and complete credit requirements for earning their degree/diploma/certificate by choosing appropriate courses, if required.

5. The structure and contents of the proposed FYUP will be aligned with the existing master's program such that semester 7 will be the same as semester 1 of the existing two-year Master's program in terms of Major biotechnology-specific courses.

6. The FYUP in Biotechnology program will award a B.Sc. (Hons.) with a major in Biotechnology (with 50% of total credits in the major subject) and a single minor (32 credits)

[18] https://tinyurl.com/bdcpuzw3
[19] https://tinyurl.com/ypy7fd27
[20] https://tinyurl.com/yszpntj

in Environmental Studies/Business Administration/Data Science. Other minors will be added as and when TERI SAS diversifies its FYUP offerings.

7. All the major courses offered in the FYUP in Biotechnology may be counted towards fulfilment of credit requirements for a minor subject in other FYUPs offered at TERI SAS based on their requirements.

8. Semester 8 involves both theory and minor project work. For this, it is strongly recommended that TERI SAS conclude an MoU with a finishing school (e.g. Biocon Academy) so that students can gain substantial industrial exposure as well as skills required by the market (see for example: BITS Biocon Certificate Program in Applied Industrial Microbiology[21]). Doing so would also serve to attract larger numbers of motivated students over time and build long-term links with industry. If this is done, semester 8 can be conducted in a modular form for students exiting after year 4 as well as for diploma-seeking students. The theory courses will be completed first before shifting to Biocon Academy for the rest of the semester so that the attendance requirements of the UGC are met.

[21] URL: https://tinyurl.com/346dysyx

Eligibility and selection criteria (Entry options)

Program	Eligibility criteria	Selection criteria
Four-year Undergraduate Program (FYUP) in biotechnology	Senior Secondary School (10 + 2) Certificate in science or equivalent, from a recognized Board of Education with at least 50% marks in aggregate (best of 3 subjects + English)..	Aggregate marks obtained in the qualifying Senior School Certificate Examination, followed by interaction/counselling or CUET-UG score in specific subjects or the general test/NEET score/JEE mains score (see appendix 1 for CUET-UG subject list).
Five-year Integrated PG Program (FYIPP) in biotechnology with specialization in plant/microbial biotechnology	Senior Secondary School (10 + 2) Certificate in science or equivalent, from a recognized Board of Education with at least 50% marks in aggregate (best of 3 subjects + English).	Aggregate marks obtained in the qualifying Senior School Certificate Examination, followed by interaction/counselling or CUET-UG score in specific subjects or the general test/NEET score/JEE mains score (see appendix 1 for CUET-UG subject list).
Two-year PG Program with specialization in plant/microbial biotechnology	Three-year B.Sc. Degree in Science / Technology or equivalent from a recognised University	Aggregate marks /CGPA of qualifying B.Sc. Degree, followed by interaction/counselling or CUET-UG score in specific subjects or the general test/NEET score/JEE mains score (see appendix 1 for CUET-UG subject list).
One-year PG Program in biotechnology	Four-year B.Sc. (Honours/ Honours with research) Degree or equivalent from a recognized University	Aggregate marks /CGPA of qualifying B.Sc. Degree, followed by interaction/counselling or CUET-PG CUET-UG score in specific subjects or the general test/NEET score/JEE mains score (see appendix 1 for CUET-UG subject list).

Exit options

Program	Year1	Year2	Year3	Year4	Year5
Four-year Undergraduate Program	UG Certificate	UG Diploma	B.Sc. Degree	B.Sc. (Honours/Honours with research)	NA
Five-year Integrated PG Program	UG Certificate	UG Diploma	B.Sc. Degree	B.Sc. (Honours/Honours with research)	PG Degree
Two-year PG Program	PG Diploma	PG Degree	NA	NA	NA
One-year PG Program	PG Degree	NA	NA	NA	NA

NOTE: Students can re-enter within three years to complete the degree program. The total duration for completing the programme shall not exceed 7 years.

Detailed semester-wise list of major and minor courses of study

NOTES:

1. All students entering the FYUP/FYIPP will be required to opt for a minor subject from **one of three choices** at the time of registration in the first semester: Environmental Studies, Data Science and Business Administration. Based on their choice of minor, courses in the selected minor will be allotted to them as listed to fulfil credit requirements as specified by prevailing regulations.

2. Course titles are tentative and subject to change.

3. Courses without complete codes are yet to be formulated and/or approved.

4. Key terms:

Major – course required for degree/diploma in biotechnology

Minor – course required for minor in selected subject

MDC – multi-disciplinary course

AEC – ability enhancement course

SEC – skill enhancement course

VAC – value-added course

5. Colour codes for minor subjects: Blue – Data Science; Yellow – Business Administration; Green – Environmental Studies

6. Credit requirement for major subject in FYUP – 80.

7. Credit requirement for minor subject in FYUP – 32. The credit requirement for the minor subject is assigned in accordance with UGC guidelines[22] that mandate providing sufficient credits to students to support their applications doctoral programs in the minor subject as well.

[22] https://tinyurl.com/bdcpuzw3

Semester-wise list of courses

Semester	Course No.	Course Title	Type	Number of Credits
Sem 1	New	Origin and diversity of Life	Major	2
Sem 1	New	Biological chemistry	Major	4
Sem 1	New	Cell and molecular biology	Major	2
Sem 1	New	Biotechnology laboratory 1	Practical	2
Sem 1	AEC 101	Communications skills and technical writing	AEC	2
Sem 1	SEC 101	Fundamentals of Computers and Programming	MDC	2
Sem 1	BBP XXX	Ethics and Values in Life Sciences	Elective	2
Sem 1	VAC 102	Ancient Indian Sustainable Practices	VAC	2

Courses for the Data Science minor

Sem 1	MDC 103	Data Science Fundamentals	Minor/Data Science	2
Sem 1	UDS 101	Statistics for Data Science	Minor/Data Science	4
Sem 1	UDS 103	Mathematics for Data Science	Minor/Data Science	4

Courses for the Environmental Studies minor

Sem 1	UES 102	Introduction to Environmental Physics	Minor/ES	3
Sem 1	UES 106	Introduction to Environmental Chemistry	Minor/ES	3

Courses for the Business Administration minor

Sem 1	UBA 101	Financial Accounting	Minor/BBA	4
Sem 1	UBA 103	Principles of Management	Minor/BBA	4
Semester	**Course No.**	**Course Title**	**Type**	**Number of Credits**

Sem 2	New	Essentials of Bioinformatics	Major	2
Sem 2	New	Molecular and cellular physiology	Major	4
Sem 2	New	Gene expression and regulation	Major	2
Sem 2	New	Biotechnology laboratory 2	Practical	2
Sem 2	BBP XXX/ NRE 113	Introductory Mathematics/ Applied Mathematics	MDC	3
Sem 2	UDS 102	Problem-Solving and Python Programming	SEC	3
Sem 2	BPB 120	Constitutional Values and Fundamental Duties	VAC	2

Courses for the Data Science minor

Sem 2	UDS 102	Problem-Solving and Python Programming	Minor/Data Science	3
Sem 2	UDS 104	Fundamentals of Information Technology	Minor/Data Science	3
Sem 2	UDS 106	Database Management System	Minor/Data Science	3

Courses for the Environmental Studies minor

Sem 2	UES 101	Ecology and Ecosystems	Minor/ES	4
Sem 2	UES 103	Earth and Earth Surface Processes	Minor/ES	4

Courses for the Business Administration minor

Sem 2	UBA 102	Marketing management I	Minor/BBA	4
Sem 2	UBA 104	Organisational Behaviour	Minor/BBA	4

Semester	**Course No.**	**Course Title**	**Type**	**Number of Credits**
Sem 3	New	Evolutionary Biology	Major	2

Sem 3	New	Structural biology, informatics and AI	Major	4
Sem 3	New	Statistics for The Life Sciences-1	Major	2
Sem 3	New	Biotechnology laboratory 3	Practical	3
Sem 3	MDC 101	Environment and Society	MDC	2
Sem 3	BPB 213	Data analysis and spreadsheet modelling	SEC	3
Sem 3	VAC 101	Basic concepts of sustainable development	VAC	2

Courses for the Data Science minor

Sem 3	UDS 201	Data Wrangling and Visualization	Minor/Data Science	3
Sem 3	UDS 203	Cybersecurity for Data Science	Minor/Data Science	3
Sem 3	UDS 205	Data Mining and Data Analysis	Minor/Data Science	3

Courses for the Environmental Studies minor

Sem 3	UES 201	Sustainable Built Environment	Minor/ES	3
Sem 3	UES 203	Biodiversity Conservation	Minor/ES	3
Sem 3	UES 205	Soil Conservation and Management	Minor/ES	3

Courses for the Business Administration minor

Sem 3	UBA201	Marketing management II	Minor/BBA	4
Sem 3	UBA203	Operations Management	Minor/BBA	4

Semester	Course No.	Course Title	Type	Number of Credits
Sem 4	New	Genetic engineering and recombinant DNA technology- Part 1	Major	2
Sem 4	New	Microbiology and infectious diseases	Major	4
Sem 4	New	Mammalian cell culture and Animal Biotechnology	Major	2
Sem 4	New	Biotechnology laboratory 4	Practical	3
Sem 4	New	Sustainable agriculture: Biofertilizers and biopesticides	DSE	2
Sem 4	New	Presentation and public speaking	AEC	3
Sem 4	UDS 106	Database Management System	SEC	3

Courses for the Data Science minor

Sem 4	UDS XXX	Network Science	Minor/Data Science	4
Sem 4	UDS XXX	Time Series Analysis	Minor/Data Science	4
Sem 4	UDS XXX	Open Source Programming	Minor/Data Science	4

Courses for the Environmental Studies minor

Sem 4	UES XXX	Natural Resource Management and Sustainability	Minor/ES	4
Sem 4	UES XXX	Environmental Policy, Law and Governance	Minor/ES	4
Sem 4	UES XXX	Water and Soil Pollution	Minor/ES	4

Courses for the Business Administration minor

Sem 4	BPB202	Human Resource Management	Minor/BBA	4
Sem 4	BPB204	Management Accounting	Minor/BBA	4
Sem 4	BPB204	Economic, environment and Business implication	Minor/BBA	4
Sem 4	BPB206	Business law	Minor/BBA	4

Semester	Course No.	Course Title	Type	Number of Credits
Sem 5	New	Introduction to Nanobiotechnology	Major	2
Sem 5	New	Plant tissue culture, transformation and genome editing	Major	3
Sem 5	New	Immunology and Cancer Biology	Major	3
Sem 5	New	Biotechnology laboratory 5	Practical	6
Sem 5	New	Research methods in cell and molecular biology	DSE	2
Sem 5	New	Scientific writing	AEC	3
Sem 5	MDC 103	Fundamentals of Data Science	MDC	2

Courses for the Data Science minor

Sem 5	UDS XXX	Predictive Modelling and Analytics	Minor/Data Science	4
Sem 5	UDS XXX	Cloud Computing and Big Data	Minor/Data Science	4
Sem 5	UDS XXX	Blockchain Security	Minor/Data Science	4

Courses for the Environmental Studies minor

Sem 5	UES XXX	Solid and Hazardous Waste Management	Minor/ES	4
Sem 5	UES XXX	Contemporary Environmental Issues	Minor/ES	4
Sem 5	UES XXX	Environmental Economics	Minor/ES	4

Courses for the Business Administration minor

Sem 5	BPB301	Entrepreneurship and startup ecosystems in India	Minor/BBA	4
Sem 5	BPB303	Design thinking and critical analysis	Minor/BBA	4
Sem 5	BPB305	Operations Research	Minor/BBA	4

Semester	Course No.	Course Title	Type	Number of Credits
Sem 6	New	Stem cells, regenerative and molecular medicine	Major	3
Sem 6	New	Molecular genetics and epigenetics	Major	3
Sem 6	New	Systems Biology and Omics	Major	3
Sem 6	New	Biotechnology laboratory 6	Practical	6
Sem 6	New	Non-coding RNAs -biology and applications	DSE	2
Sem 6	New	Artificial intelligence in sustainable agriculture	DSE	2
Sem 6	New	Enzyme technology	DSE	2

Courses for the Data Science minor

Sem 6	UDS XXX	Machine Learning & NLP	Minor/Data Science	4
Sem 6	UDS XXX	Digital Marketing Analytics	Minor/Data Science	4
Sem 6	UDS XXX	Performance Evaluation of Computing Systems	Minor/Data Science	4

Courses for the Environmental Studies minor

Sem 6	UES XXX	Air and Noise Pollution	Minor/ES	3
Sem 6	UES XXX	Environmental Convention and Treaties	Minor/ES	3
Sem 6	UES XXX	Natural Hazards and Disaster Risk Reduction	Minor/ES	4

Courses for the Business Administration minor

Sem 6	BPB302	Financial Management	Minor/BBA	4
Sem 6	BPB304	Business Research Methods	Minor/BBA	4
Sem 6	BPB306	Supply Chain Management	Minor/BBA	4

Semester	Course No.	Course Title	Type	Number of Credits
Sem 7	BBP 111	Advanced Bioanalytical techniques	Major	3
Sem 7	BBP 158	Conceptual foundations of molecular biology	Major	2
Sem 7	BBP 161	Advanced Biochemistry and Biophysics	Major	2
Sem 7	New	RNA biology: Concepts, methods and applications	Major	2
Sem 7	BBP 105	Biotechnology laboratory 7	Practical	7
Sem 7	New	Algal biotechnology	DSE	2
Sem 7	New	Bioremediation and pollution control	DSE	2
Sem 7	New	Biofuels for sustainability	DSE	2
Sem 7	BPB 301	Entrepreneurship and start-up ecosystems in India	Elective	
Sem 7	BPB 403	Entrepreneurship development and SME	Elective	3
Sem 7		Sustainability reporting	Elective	2
Sem 7	BPB 403	Entrepreneurship development and SME	Elective	4
Sem 7	NRE 123	Biodiversity Assessment and Conservation	Elective	3
Sem 7	NRE 168	Food Security and Agriculture	Elective	3

Courses for the Data Science minor

Sem 7	UDS XXX	Spatial Data Modelling	Minor/Data Science	4
Sem 7	UDS XXX	Software Engineering and Project Management	Minor/Data Science	4
Sem 7	UDS XXX	Soft - Computing	Minor/Data Science	4

Courses for the Environmental Studies minor

Sem 7	UES XXX	Climate Science and Policy	Minor/ES	4
Sem 7	UES XXX	Integrated Watershed Management	Minor/ES	4
Sem 7	UES XXX	Environmental Health and Risk Assessment	Minor/ES	4

Courses for the Business Administration minor

Sem 7	BPB 401	Strategic management	Minor/BBA	4
Sem 7	BPB 403	Entrepreneurship development and SME	Minor/BBA	4
Sem 7	BPE 403	Research methodology	Minor/BBA	4

Semester	**Course No.**	**Course Title**	**Type**	**Number of Credits**
Sem 8	BBP 144	Conservation Genetics and Genomics	Major	2
Sem 8	BBP 146	Genome Structure and Diversity: Concepts and Methodologies	Major	3
Sem 8	BBP 114	Molecular Cell Biology - From Genes to Communities	Major	2
Sem 8	BBP 131	Molecular Microbiology and Immunology	Major	2
Sem 8	New	Recent advances in biotechnology (Seminar and term paper)	Major	2
Sem 8	BBP 106	Biotechnology Laboratory 8	Practical	7
Sem 8	BBP 115	Applied Nanobiotechnology	DSE	2
Sem 8	BBP 145	Microbial Pathogenesis	DSE	2
Sem 8	BBP 116	Molecular Plant Physiology and Metabolism	DSE	2
Sem 8		Fundamentals of Environmental, Social, and Governance (ESG) Principles	Elective	
Sem 8	New	Research Project	Research Project	12

Semester	Course No.	Course Title	Type	Number of Credits
Sem 9	BBP 174	Advanced Bioinformatics and computational biology	Major	2
Sem 9	BBP 155	Genetic engineering and recombinant DNA technology- Part 2	Major	3
Sem 9	BBP 162	Statistics for The Life Sciences-2	Major	3
Sem 9	BBP 163	Gene Expression Analysis and Transcriptomics	Major	2
Sem 9	NRE 165	Proteomics and Protein Engineering	Major	3
Sem 9	BBP 147	Biotechnology Laboratory 9	Practical	7
Sem 9	BBP 112	Bioprocess Engineering and Environmental Biotechnology	DSE	3
Sem 9	BBP 141	Molecular Genetics for Plant Functional Genomics: Principles and Practice	DSE	3
Sem 9	BBP XXX	Biotechnology for Sustainable Agriculture	DSE	2
Sem 9	BBP 103	Bioethics, IPR and Regulations in Biotechnology	DSE	3

Semester	Course No.	Course Title	Type	Number of Credits
Sem 10	BBP 108	Major Project	Major Project	20

Appendix 1 – Qualifying CUET-UG Examination List

NTA code	Subject
302	Agriculture
304	Biology/Biological Studies/Biotechnology/Biochemistry
306	Chemistry
307	Environmental Studies
308	Computer Science/Informatics Practices
315	Home Science
319	Mathematics / Applied Mathematics
322	Physics
327	Teaching Aptitude
501	General Test

Note: Any subject(s) may be chosen from the above. The highest percentage score among the chosen subjects will be considered for admission purposes.

Enclosure 2

To discuss and approve the proposal of starting B.Tech (Energy Engineering) and its proposed course structure

1.1 Context

With the urgent need to combat climate change, energy programmes focussed on sustainable and green energy sources enriched with existing as well as new technological advancements aiming to reduce carbon footprints and achieve net-zero emissions is need of the hour. The energy sector is rapidly evolving with advancements in energy storage, smart grids, and energy-efficient technologies. Programmes with courses on cutting-edge technologies and their applications will serve the purpose of imparting structured knowledge and create cadre of professionals. Energy engineering programmes having interdisciplinary approach which integrate knowledge from various fields such as mechanical, electrical, chemical and environmental engineering is crucial for developing comprehensive solutions to energy challenges. A significant portion of the Indian population still lacks reliable access to electricity. Programmes focus on developing affordable and sustainable energy solutions can bridge this gap. India has set ambitious targets for renewable energy, aiming for 500 GW of non-fossil fuel capacity by 2030 and achieving net-zero carbon emissions by 2070. This drives the need for skilled professionals in energy technologies and their deployment. There is a strong emphasis on R&D to innovate and improve energy systems. Therefore, it is the right time to introduce programmes providing opportunity to the students to be engaged in projects that address real-world energy problems, often in collaboration with industry partners.

Against this background, the industry and market need a set of professionals who can rise to this challenge to address global energy demand and associated environmental challenges like climate change and pollution that requires a paradigm shift in imparting industry-ready and practical courses that is capable of interconnecting energy and its allied areas. B.Tech. in Energy Engineering is an endeavour in this direction to produce engineers, technocrats and managers in the domain of energy and allied areas. Overall, the proposed B.Tech in Energy Engineering prepares students to tackle global energy challenges and prepares students to contribute to the country's energy transition by equipping them with the necessary technical, analytical, and managerial skills. TERI (The Energy and Resources Institute) being parent organization of TERI School of Advanced Studies (TERI SAS) has demonstrated its global leadership the fields of energy, environment and sustainability. The Department of Sustainable Engineering (erstwhile Department of Energy and Environment) at TERI SAS has a stronghold in the domain of Energy and offering M.Tech (REEM) for last 15 years. The department also started M.Sc. (Energy Studies and Management) from the academic session 2024-25. Universities are nearly on a mandate to offer UG programmes after the implementation of NEP 2020. In line with NEP 2020, TERI SAS has ventured into UG programmes from the last academic session with BBA & B.Sc programmes from the DoPMS and DoNAS. In continuation to strengthening UG programmes, the DoSE proposes to start offering the programme **B.Tech (Energy Engineering**).

1.2 USP of the proposed programme

1. **Interdisciplinary Curriculum:** Combining engineering, environmental science, economics, and policy to provide a comprehensive understanding of the energy sector.
2. **Hands-on Experience:** Opportunities for internships, lab work, and field projects with leading energy companies and research institutions.
3. **Sustainability Focus:** Emphasis on renewable energy technologies and sustainable practices to address global energy challenges and Indian energy transition scenerio.

4. **Industry Collaborations:** Strong partnerships with industry leaders, offering students networking opportunities, mentorship, and potential job placements.
5. **Career Support:** Dedicated career services to help students navigate the job market and secure positions in the energy sector.
6. **Innovation and Entrepreneurship:** Encouragement and support for students to develop innovative solutions and start their own ventures in the energy field.

1.3 Programme intake, Fee Structure, eligibility for admission and NCrF Level

1.3.1 Programme Intake : 60

1.3.2 The eligibility criteria for admission:

Sl. No.	Programme	Duration	Eligibility	NCrF Level
1	B.Tech (Energy Engineering)	4 years	• Passed 10+2 examination with Physics, Mathematics and Chemistry. • Obtained at least 60% marks (55% marks in case of candidates belonging to reserved category) in the above subjects taken together. OR • Qualifying any national/state engineering entrance exam such as JEE (Main), UPSEE, WBJEE, VITEEE, BITSAT etc.	4.0
2	B.Tech (Energy Engineering) (Lateral Entry to Second year)#	3 years	• Passed Minimum THREE years / TWO years (Lateral Entry) Diploma examination with at least 45% marks (40% marks in case of candidates belonging to reserved category) in ANY branch of Engineering and Technology. OR • Passed B.Sc. Degree from a recognized University as defined by UGC, with at least 45% marks (40% marks in case of candidates belonging to reserved category) and passed 10+2 examination with Mathematics as a subject. OR • Passed B.Voc/3-year D.Voc. Stream in the same or allied sector.	4.5
3	B.Tech (Energy Engineering) (Lateral Entry to Final year)#	1 year	• B.Voc. in relevant discipline	5.5

Admission as per these criteria shall be made in subsequent years when the 1st admitted batch will reach to these years.

1.4 Programme Structure: [4 years – 8 semesters]

Semester 1	Credits
Engineering physics	3
Mathematics for engineers-I	3

Semester 2	Credits
Industry collaborative field visit	1
Engineering chemistry	3

Energy, environment and climate change	3
Introduction to energy engineering	3
Introduction to programming languages	2+1^
Fundamentals of electrical engineering	2+1^
Physics laboratory	3

Chemistry laboratory	3
Mathematics for Engineers-II	3
Communication skills and technical writing	3
Network analysis	2+1^
Engineering Thermodynamics	3

^ Laboratory component

Semester 3	**Credits**
Fluid and solid mechanics	3
Heat and mass transfer	3
Power system engineering	3
Energy policies and regulations	3
Analog and digital electronics	2+1^
Introduction to AI and ML	3
Electrical machines	3

Semester 4	**Credits**
Hydro Power : Resources & Technologies	2+1^
Nuclear power : Resources & Technologies	3
Oil and gas : Resources & Technologies	3
Coal : Resources & Technologies	3
Power plant engineering	3
Power Electronics	3
Seminar / Independent Study	3

^ Laboratory component

Semester 5	**Credits**
Bio Energy : Resources & Technologies	3
Wind Energy : Resources & Technologies	3
Solar Energy : Resources & Technologies	3
Remote sensing & GIS	3
Control systems and automation	2+1^
Industry internship / Energy Project - I	6

Semester 6	**Credits**
Data analytics in energy	3
Solar energy project development	3
Wind energy project development	3
Energy storage	3
Energy conservation and management	3
Energy Lab	3
Elective-I	3

^ Laboratory component

Semester 7	**Credits**
Hydrogen energy	3
Electric Vehicles	3
Green Buildings	3
Innovative energy lab	3
ESG (Environmental, Social and Governance) reporting	3
Energy economics and finance	3
Elective-II	3

Semester 8	**Credits**
Energy project – II	20

Elective-I (Any one)	**Credits**
Energy materials	3
Smart Grids	3
Carbon capture & utilization	3
Emerging energy technologies	3

Elective-II (Any one)	**Credits**
Energy & carbon markets	**3**
Entrepreneurship development	3
Life cycle assessment	3
Circular economy	3

Enclosure 3

Course title: Firm and Dispatchable Energy – Resources, Technology, Applications			
Course code: ESM XYZ	**No. of credits:** 3	**L-T-P:** 37-08-00	**Learning hours:** 45
Pre-requisite course code and title (if any):			
Department: MSc (Energy Studies & Management)			
Course coordinator: Prof. Naqui Anwer		**Course instructor:** Prof. Naqui Anwer	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description:
The firm and dispatchable power are very much essential for the stability of the grid. In view of the increased penetration of variable renewable energy resources like wind power and solar power, the role of the firm and dispatchable power has increased considerably. This course introduces a mix of renewable and conventional energy that fall under the category of firm and dispatchable power. The students in this course will be able to appreciate the resources, technologies, and applications surrounding these sources of energy.

Course objectives:
- To familiarize students with the concept and need of firm and dispatchable power
- To understand the resources, technology, and applications of firm and dispatchable power.
- To understand the global and Indian scenarios of these resources
- To impart knowledge about dispatchable renewable energy
- To understand fossil fuels as well as nuclear energy

Course content

Module	Topic	L	T	P
1.	**Fossil Fuels** • Coal: Properties of coal, formation of coal, calorific value of coal • Natural Gas: Properties of natural gas, Natural gas resources in India • Coal-based power plant • Natural Gas based power plants	8	2	0
2.	**Nuclear Energy** • Fundamentals of Nuclear Energy • Nuclear Fission • Nuclear energy scenario: Global and India • Classification of nuclear reactors: Fast breeder reactors, thermal reactors • Components of nuclear reactor • Nuclear Reactors • CANDU reactor (Pressurized heavy water reactor)	7	2	0
3.	**Biomass** • Biomass resources • Classification of biomass resources • Biomass resource assessment • Combustion, pyrolysis, Gasification • Biomass processing • Stoves	8	2	0
4.	**Hydro Power** • Hydro resource and assessment • Hydropower turbines: Pelton wheel, Francis turbines and Kaplan turbines • Components of micro-hydro power plant	7	2	0
5.	**Geothermal Energy** • Geothermal resources • Classification of geothermal resources	7	0	0

	• Geothermal energy in India • Advantages and disadvantages of geothermal energy over other energy forms • Gysers, Hot spring, Fumarole • Geothermal power plants			
	Total	37	08	00

Evaluation criteria
Minor Test 1: Assignment (after completion of modules 1, 2 and 3)- 20%
Minor Test 2: Written test (after completion of modules 1, 2, 3 and 4)- 25%
Minor Test 3: Written test/ Case Study Presentation (after completion of modules 5 and 6)- 25%
Major Test: Written test/ Presentation (after completion of all modules) - 30%

Learning outcomes

- Appreciate the distinction between dispatchable and non-dispatchable energy
- Understand the significance of firm and dispatchable power
- Understand technology and applications of firm and dispatchable power

Pedagogical approach
A combination of class-room interactions, tutorials, group discussions assignments, expert talks / site visits

Materials:
Text Books:

- Mehmet Kanoglu, Yunus A. Cengel and John M. Cimbala: **Fundamentals and applications of Renewable Energy** (McGraw Hill, 2020).
- P K Nag: **Power Plant Engineering** (McGraw Hill, 2017).

Reference Books:
V.V.N. kishore: **Renewable Energy Engineering and Technology** (Routledge, 2017)

Websites:

Additional information (if any): N.A.

Student responsibilities
Attendance, discipline, feedback as per TERI SAS rules

Course reviewers:

Prof. Sadhan Mahapatra, Tejpur University

Prof. Ramesh Narayanan, IIT Delhi

Course title: Variable Energy and Decentralized Systems– Resources, Technologies, Applications			
Course code: ESMXXX	**No. of credits: 3**	L-T-P:39-6-0	**Learning hours:**45
Pre-requisite course code and title (if any): NA			
Department: Department of Sustainable Engineering			
Course coordinator:		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course description:

This course has been designed to inculcate the design and assessment principles used for variable energy systems and technologies and their applications. Further, students will be taught about different energy conversion procedures and address the difficulties arising due to variable nature of energy sources and its impact on economic viability. Also, students will be made aware of recent advances on the conversion technologies and future prospective.

Course objectives:

- To get students understand and familiarize with energy resource assessment procedure for different variable energies and their potential.
- To inculcate skills required for designing the technologies to harness and utilize variable energy sources.
- To introduce students with different thermal and power applications of variable energy conversion technologies and systems.

Module	Topic	L	T	P
1.	**Solar Energy resources and measurements** • Solar energy resources: Availability, Sun-Earth relationship, Solar time, Solar radiation on horizontal and tilted surfaces, Solar radiation measurement instruments	4		
2.	**Solar thermal Energy Conversion:** • Flat Plate collectors Modelling and performance improvement • Designing process of Solar Compound Parabolic Concentrators • System sizing methodology and heating and cooling applications of solar thermal conversion technologies, low and medium temperature applications • Impact of variable nature of energy source on design and costs	6	2	
3.	**Concentrating Solar Thermal Power Generation:** • Solar concentrator and CSP systems, • Principles and limitations of CSP systems, • Solar thermal power plant technologies and applications	4		
4.	**Fundamentals of semiconductors and solar cells:** • Introduction to semiconductors, Charge carriers in semiconductors, carrier concentration and distribution, Generation of charge carriers, PN junction and space charge region, Energy band diagram and junction potential, Quantitative analysis of PN junction, PN junction under illumination, Manufacturing process of crystalline and multi-crystalline silicon PV cell, Solar cell design and characterisation, STC and NOCT, Effect of temperature and radiation on cell performance	8		
5.	**Photovoltaics technologies and applications:** • Cell to module design • Components of balance of system (i.e. inverter, mounting structure, storage etc.) • Solar PV plant designing and safety measures (e.g. earthing, surge and lighting arrester) • Grid tied system and net metering • Standalone PV plant design considerations • Design recommendations and costs	5	2	
6.	**Wind Energy resources, Conversion Processes and Technologies:** • Wind energy resource: Assessment, Global wind system,	8	2	

	Physics of wind, wind speed measurement and distribution, Spatial wind resources assessment tools, • Overview of vertical and horizontal axis wind turbines • Wind turbine aerodynamics: Momentum models, vortex models, hybrid models, limitations of different models, • Wind turbine structural dynamics considerations • Peak power limitation • Modern Turbine subsystems • Applications of wind power and energy • Impact of variable nature on the design and cost of the system			
7.	**Tidal power and wave energy resources, Conversion Processes and Technologies:** • Tidal phenomenon, Principles of tidal barrage design and operation, extracting energy from tidal currents • Ocean wave energy: Principle of ocean wave generation, Shore and near shore waves energy converters, Offshore wave energy conversion devices `	2 2		
	Total	39	6	

Evaluation criteria
Assignment1: 10% (after Module 4)
Assignment 2: 10% (after Modules 6)
Minor test 1: 10% (after Module 4)
Minor test 2: 10% (after Module 6)
Major test: 60% (after all module)

Learning outcomes:
This course inculcates the skills that shall make the students to:
- be able to assess the resources of energy potential of variable energies sources i.e. solar, wind, tidal and wave energies
- be able to understand essential design principles used for developing the systems and technologies required for harnessing variable energy resources.
- be able to assess the performance of variable energy conversion and utilization system and technologies.
- be able to identify the applications of solar thermal collectors, solar PV systems and wind turbines
- be able to design and implement the system and devices used for converting wave and tidal power into electrical energy.

Pedagogical approach
A combination of class-room interactions, tutorials, practical and assignments.

Materials
Recommended readings
Text Books
- *Energy Conversion. 2nd edition (2017). Edited By D. Yogi Goswami, Frank Kreith, CRC Press*
- *Renewable Energy Focus Handbook (2009) by Gianfranco Pistoia, Preben Maegaard, Bent Sorensen, Mukesh Doble, Shang-Tian Yang, Harsh K. Gupta, Aldo Vieira da Rosa, Paul Breeze, Truman Storvick, Soteris Kalogirou, Roy Sukanta. Academic Press*
- *Solar Photovoltaics – Fundamentals, Technologies and Applications. (2011). C. S. Solanki, 2nd ed. PHI Learning*
- *GSES Manual. (2013). Grid connected PV Systems Design and Installation. Global Sustainable Energy Solutions Pty. Ltd, GSES India Sustainable Energy Pvt. Ltd.*

Reference Books
1. *Renewable Energy Engineering and Technology – A Knowledge Compendium, ed. VVN Kishore (TERI Press, 2008).*
2. *S Sukhatme and J Nayak, "Solar Energy: Principles of Thermal Collection and Storage", Third Edition (Tata McGraw Hill, 2008)*
3. *Handbook of photovoltaic science and engineering, ed. A. Luque and S. Hegedus (John Wiley and Sons, 2010)*
4. *Photovoltaic system engineering, R. A. Messenger and A. Abtahi, 3rd ed. (CRC Press,*

2010)

5. *TERI Energy Data Directory (TEDDY) 2020-21 (TERI Press, 2021)*

Journals

- Applied Energy
- Renewable and Sustainable Energy Reviews
- Solar Energy
- Solar Energy compass
- Applied Solar Energy
- Journal of Energy Resources Technology
- Nature Energy
- Renewable Energy

Additional information (if any): NA

Student responsibilities:
Attendance, feedback, discipline: as per university rules

Course Reviewers

1. Prof. Atul Sharma
   RGIPT Jais, Amethi U.P.

2. Dr. Siva Reddy V
   Director (Technical)
   National Institute of Solar Energy (NISE)

3. Dr. Anish Modi
   Associate Professor
   Department of Energy Science and Engineering
   Indian Institute of Technology Bombay

Course title: Building Energy Management and Green Building			
Course code: ESMXXX	**No. of credits: 3**	L-T-P:39-6-0	**Learning hours:**45
Pre-requisite course code and title (if any): NA			
Department: Sustainable Engineering			
Course coordinator:		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course description:

This course has been designed to make the students versed about building energy consumption nationally and globally, its impact on the climate change and vice-versa, passive and active energy reducing strategies and systems, building energy management smart solutions. Further, students will learn about Energy conservation building codes and its recommendation for improving energy efficiency of the buildings, Green Buildings rating tools and procedure for developing green buildings

Course objectives:

- To get students learn and remember about the energy consumption in different process in the buildings.
- To learn, understand the passive and active strategies and system as well as be able to apply for lowering building energy use in buildings.
- To evaluate the impact of embodied energy of construction materials on the overall building energy consumption and indoor thermal comfort.
- To learn and understand the procedure for applying to quantify energy savings in buildings.
- To understand green building rating tools and to implement strategies for creating/achieving the green building status.

Module	Topic	L	T	P
1.	**Introduction to Energy Use in Buildings** • Role of buildings in global and national energy use • Demand for different energy services in buildings and their drivers • Indirect energy use from activities in buildings: Using life cycle approach • Impact of a changing climate on building energy service demand • Specific sustainability challenges related to energy services in buildings	4		
2.	**Climate and Solar radiation** • Factors affecting climate • Climatic zones and their characteristics • Sun-earth geometric relationship • Angle of incidence • Sun path diagram • Solar radiation on different surfaces of buildings • Solair temperature	4		
3.	**Human comfort** • Human body and environmental conditions • Parameters of thermal comfort • Heat exchange between human body and environment • Thermal comfort indices • Visual comfort: Basics of light; Visual comfort factors • Acoustic comfort: Principles of sound; Effect of noise; sound transmission	3		

4.	**Introduction to Building Physics** • Purpose of the buildings • Basic principles of heat transfer • Design conditions for heating and cooling in buildings • Heat transfers through walls, roof and fenestration • Heat loss from basement walls, floors and crawl spaces • Infiltration and ventilation heat loads • Energy and Thermal performance of the buildings: Energy and heat exchange in buildings • Estimation of indoor temperature and air conditioning load • Visual performance of the buildings	6	4	
5.	**Reducing Energy Use in Building: Passive strategies, systems and construction materials** • Building Shape, Form and Orientation • Improving skin insulation: Using Degree days and balance point temperature • Improving ventilation heat transfer • Internal and external shading devices • Ventilation, Evaporative cooling • Earth–air tunnel • Sky-therm system • Solar chimney-based hybrid system • Desiccant Cooling and Dehumidification • Natural ventilation • Direct evaporative cooling using drip-type (desert) coolers • Efficient and dynamic fenestrations • Low embodied energy materials	6		
6.	**Reduction in Energy Use in Building: Active systems** • District Heating and Cooling • Improving heating and cooling systems' efficiency • Energy efficient appliances • Energy efficient lighting • Smart energy management systems	4	2	
7.	**Quantification of energy savings** • Energy models • Embodied energy of buildings • Energy levelling for appliances • Testing the building for energy saving opportunities • Building energy modelling • Smart metering	6		
8.	**Building energy codes and green building ratings** • Energy conservation building codes and recommendation for existing and new buildings • Energy efficient, net zero, green and sustainable buildings • Green building rating systems: LEED, GRIHA, BREEAM etc. • Role of green buildings on the sustainability of the society	6		
Total		39	6	
Evaluation criteria Assignment1: 10% (after Module 1-4)				

Assignment 2: 10% (after Modules 5-7)
Minor test 1: 15% (after Module 3)
Minor test 2: 15% (after Module 6)
Major test: 50% (after all module)

Learning outcomes:

This course inculcates the skills that shall make the students to:

- be able to understand, analyse the buildings energy consumption and impact on climate change.
- learn and remember about the factors that affect human comforts and ensuring indoor comfort conditions.
- be able to evaluate energy and heat transfer from different components of buildings.
- be able to understand and create/implement the passive and active techniques for reducing energy consumption in buildings.
- be able to evaluate and quantify the energy saving potential in buildings.
- learn recommendations and mandatory requirement for energy conservation through energy conservation codes and their implementation
- learn about green rating tools and their implementation procedure and creating green buildings.

Pedagogical approach

A combination of class-room interactions, tutorials, practical and assignments.

Materials

Recommended readings

Text Books

- *Bob Everett and Horace Herring and team. (2007). Energy saving in buildings, The Open University, UK*
- *Chapter 16: HEATING AND COOLING OF BUILDINGS, Yunus A. Cengil and Afshin Ghajar. Heat and Mass Transfer: Fundamentals and Applications. 6th Edition, McGraw-Hill*
- *Fergus Nicol, Hom Bahadur Rijal, Susan Roaf. Handbook of Resilient Thermal Comfort. Routledge; 1st edition (29 November 2024)*
- *Global Energy Assessment Writing Team. Global Energy Assessment: Toward a Sustainable Future. Cambridge University Press; 2012*
- *Koenigsberger, Ingersoll, Mayhew and Szokolay. (1975). Manual of tropical housing and building. Part 1: Climate design, Orient Longman Limited.*

Reference Books

1. Sustainability Through Energy Efficient Buildings. (2018). Edited by Amritanshu Shukla and Atul Sharma. CRC Press
2. Wen hong, Madelaine Steller Chiang, Ruth A. Shapiro, Mark L. Clifford. (2007). Building Energy Efficiency, The Asia Business Council
3. Pieter de Wilde.2018. Building Performance. Analysis. John Wiley & Sons Ltd.
4. Ursula Eicker, 2009, Low Energy Cooling for Sustainable Buildings, Willey
5. Minke, G., 2006. Building with Earth: design & technology of a sustainable architecture, SpringerLink
6. Givoni, B., 1998. Climatic Considerations in Buildings and Urban Design, John Wiley & Sons, Canada
7. N. K. Bansal, Gerd Hauser, Gernot Minke, 1994. Passive building design: a handbook of natural climatic control, Elsevier Science
8. B.V. Krishnan, A., Baker, N., Yannas, S., Szokolay, S., (Eds) 2001. Climate Responsive Architecture- A Design Handbook for Energy Efficient Buildings, Tata McGraw-Hill, New Delhi

9. Givoni, B., 1994. Passive and Low Energy Cooling of Buildings, John Wiley &Sons Inc., New York
10. Santamouris, M., 1996. Passive Cooling of Buildings, James & James (Science Publishers) Ltd., London
11. Karlen, M and Benya, J., 2004. Lighting Design Basics, John Wiley &Sons Inc., New York
12. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE): Fundamentals, Equipment Indian Society of Heating, Refrigerating and Air-Conditioning Engineers (ISHRAE) Standards
13. Richard R Janis and William K Y Tao, 2008. Mechanical and Electrical Systems in Buildings, Prentice Hall
14. Vedavarz, A., Kumar, S. and Hussain, Md., 2007. HVAC: Heating, Ventilation and Air-Conditioning Handbook for design & Implementation, Industrial Press, New York
15. Jan F. Kreider, Peter S. Curtiss and Ari Rabl, 2010. Heating and Cooling of Buildings- Design for efficiency, revised second edition, CRC Press, USA
16. BEE, 2007. Energy Conservation Building Code http://www.usgbc.org/,
17. United States Green Building Council, USA http://www.igbc.in ,Indian Green Building Council, LEED India http://www.grihaindia.org/
18. BREEAM. https://breeam.com/
19. GRIHA Website, India TERI, 2004. Sustainable Building Design Manual, Vols 1 & 2.
20. Our World in Data**. https://ourworldindata.org/renewable-energy**
21. https://ibpsa.org/publications/
22. https://www.youtube.com/@IBPSAUniversity

Journals

- Journal of Building Performance Simulation
- Energy and Buildings
- Building and Environment
- Sustainable Cities and Society
- Applied Energy

Additional information (if any): NA

Student responsibilities:
Attendance, feedback, discipline: as per university rules

Course Reviewers

Prof. Athanasios "Thanos" Tzempelikos
Lyles School of Civil and Construction Engineering,
Purdue University, USA

Prof. Dharam Buddhi
Vice Chancellor, Uttaranchal University, Dehradun India
Ex-Professor, School of Energy and Environmental Studies,
DAVV Indore India

Prof. Pieter de Wilde
Division of Energy and Building Design
Lund University, Sweden

Course title: Energy Markets and Trading			
Course code: DSE XXX	**No. of credits: 3**	**L-T-P: 40**-05-00	**Learning hours: 45**
Pre-requisite course code and title (if any): NA			
Department: Department of Sustainable Engineering			
Course coordinator: Dr Sapan Thapar		**Course instructor(s): Dr Sapan Thapar**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course description

Energy is at crossroads of being transitioned from a public merit good to a commodity. Energy markets are platforms for buying and selling of energy, in different formats

The course offers students an understanding of the energy market structure and the governing principles, focusing on India. It encompasses evolution of the Indian energy sector, key regulations, sectoral stakeholders, pricing mechanisms and procurement modes. Discussions will include electricity as well as non-electric formats (oil, gas, coal), crisscrossing conventional (coal, oil, gas) and renewables (solar, wind, biomass, hydro). A significant part of the syllabus encompasses energy security dimensions, besides providing overview on evolving market products and services.

Course objectives

The course provides an in-depth understanding on various dimensions of the energy markets in India.

Key objectives are -

- Overview on the Indian energy / power Sector
- Understand planning & operational Aspects of Indian Power System
- Understand working of a Power Exchange
- Understanding sourcing and Pricing of Coal, Oil and Gas
- Exposure to energy diplomacy
- Awareness on evolving market products

Course contents

Module	Topic	L	T	P
1	**Overview- Indian Energy & Power Sectors** • Energy - Sources, Supply & Demand Scenario • Trends - Energy Production, Imports, Sales • Institutions & Governing Structure • Policy and regulations • Sectoral Stakeholders – Thermal, Hydro, Renewables, Oil, Gas, Coal • Energy Transition	6	0	0
2	**Power Sector - Planning & Operational Aspects** • Power Procurement Planning • Resource Adequacy, Demand and Supply, Load Forecasting • Tariff Determination - Generation, Transmission, Distribution • Procurement Modes (Cost Plus, Bidding, open access, Captive) • Consumer Types and Tariffs • Merit Order Despatch • Role of Regulator/ Government agencies • Power Distribution Reforms	8	2	0
3	**Power Markets** • Open Access – Concept, Modes, Charges	8	2	0

	• Green Energy Open Access • Types of trading platforms • Power Exchange – Operations & Instruments • Congestion Management • Green Power Trading • REC, ESCerts, Carbon Certificates, I-REC • Grid Management & DSM regulations • Role of RLDC, SLDC, REMC, QCA • Cross Border Power Trading • International Best Practices • Simulating Power Trading (Group Activity)			
4	**Coal, Oil and Natural Gas (including LNG)** • Resource Availability • Domestic Production and Imports • Procurement – Modes, Pricing, Taxes and duties • Oil Refining -Products and Pricing • Natural Gas Grid, LNG Imports, Pricing • Indian Gas Exchange – Operations & Instruments • Hydrogen based energy systems • Sale & Pricing Norms • Role of Regulator/ Government agencies	8	0	0
5	**Energy Security Dimensions** • Energy Diplomacy • critical minerals – availability, policies • National Schemes (PLI, SPR) • Resilience Against Climate Risks • Regional Grids & Energy Markets • Geopolitical Trends • Case Study	4	1	0
6	**Evolving Concepts** • Digital & Advanced Metering Technologies • Security Constrained Economic Despatch • Energy Derivatives • Ancillary Services • Net-Metering / P2P • Energy Storage Systems • Demand Response • Hydrogen Energy	6	0	0
		40	**5**	0

Evaluation criteria

Test 1:	20% (in form of assignment –power sector assessment)
Test 2:	20% (in form of assignment –coal, oil and gas sector assessment)
Case Study	20% (Global best practices/ business models)
Test 3	40% (after completion of all modules)

Learning outcomes

- Broad understanding of Indian power markets
- Working of a power exchange
- Pricing of coal, oil and gas
- Role of energy diplomacy in energy security and access

- Exposure to evolving energy market products and services

Pedagogical approach
A combination of class-room interactions, group discussions, tutorials, assignments, case studies with industry expert interaction

Suggested Readings
- India 2020 Report, IEA
- Integrated Energy Policy, Niti Aayog
- Annual Reports on Short-term Power Market, CERC
- Petroleum and Natural Gas Reports, PPAC

Websites
CEA (http://cea.nic.in/)
CERC (http://www.cercind.gov.in/)
Web Portals of Exchanges- IEX, PXIL, HPX
Web Portals of SERCs, RLDCs, SLDCs, RPCs
Ministry of Power (https://powermin.nic.in/)
Grid Controller of India (https://posoco.in/en/)
Ministry of New & Renewable Energy (https://mnre.gov.in/)
Ministry of Petroleum and Natural Gas (https://mopng.gov.in/en)
Petroleum and Natural Gas Regulatory Board (https://pngrb.gov.in/eng-web/)
Petroleum Planning and Analysis Cell (https://ppac.gov.in/)
Ministry of Coal (https://coal.nic.in/)

Additional information (if any): N.A.

Student responsibilities: Attendance, feedback, discipline: as per university rules.

Course reviewers:
Mr Prashant Singh, Chief General Manager, ONGC
Ms Sneh Daheriya, VP, PTC India Limited
Mr Mithun Dubey, VP, RE-Connect Energy

Course title: Energy Project Management

Course code: DSE XXX	**No. of credits:** 3	**L-T-P**: 40-05-00	**Learning hours:** 45
Pre-requisite course code and title (if any):			
Department: Department of Sustainable Engineering			
Course coordinator: Dr. Sapan Thapar		**Course instructor(s):** Dr. Sapan Thapar	
Contact details: sapan.thapar@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 2	

Course description

The course is designed for provide an insight to students on various aspects of energy management, encompassing electric (power, renewables) as well as non-electric sectors (coal, oil, gas). Students will be exposed to the various stages of an energy project (pre-implementation to completion), its techno-commercial assessment, contract management, besides the different procurement cum pricing options. They shall further be acquainted with green finance and the enviro-social aspects of energy projects.

Course objectives

- Understand relevance of Project Management in an energy project
- Learn about project lifecycle stages
- Undertake Techno-Commercial Assessment
- Learn about PPA & EPC, ESIA
- Exposure to green finance & Project Management Techniques

Course content

Module	Topic	L	T	P
1	**Understanding Energy Projects** Lifecycle Assessment (Upstream, Midstream, downstream) • Coal, Oil and Gas based projects • Power Sector • Renewable Energy Projects • Policy & Regulatory Aspects	4	0	0
2	**Project Development** • Definition, Need • Project vs routine production • Project planning matrix • Stages of Project • Role of stakeholders	8	0	0
3	**Techno-Economic Assessment** • Market Analysis • Technical Assessment • Financial Feasibility (LCOE, NPV, IRR, payback) • Project Appraisal • Risk Analysis & Management	7	2	0
4	**Contract Management** • Supply chain management • Contract selection/ tendering • Power Purchase Agreements (PPAs) • Engineering, Procurement, Construction (EPC) • Escrow Account/ Tripartite Agreement • Development of DPR	7	2	0

5	**Procurement & Pricing Options** • Energy markets – Global, Regional, National, Local • Procurement – Long- term/ short-term/ Spot markets • Government Regulations • Contribution to exchequer (taxation/ subsidies)	4	0	0
6	**Project Management Techniques** • PERT, CPM • Gantt Chart • ISO • Data Analytics	2	1	0
7	**Green Finance** • Concept of Project Finance • Climate Finance Instruments • Multilateral funding Support • Domestic & International Institutions • New Instruments - Carbon Credits, Green bonds • Introduction to Currency Hedging	4	0	0
8	**Enviro-Social Aspects** • Rules/ Regulations • Concept of ESIA • End of Life Assessment (circular Economy) • Impact on local economy (jobs, infrastructure)	4	0	0
		40	**05**	**0**

Evaluation criteria

Test 1 20%
Test 2 20%
Assignment 20%
Test 3 40%

Learning outcomes

After completing this course, students would be able to assess:

- Lifecycle/ stages of an energy project
- Techno-commercial assessment of an energy project
- Modes of energy procurement and implementation models
- Project Management techniques, including ESIA
- Sources and types of climate finance

Pedagogical approach

The course will be delivered through classroom lectures. Relevant case studies shall be discussed in class to expose students on the latest project management techniques

Materials Textbooks

- Prasanna, C. (2008). *Projects, Planning, Analysis, Selection, Financing, Implementation and Review*. Tata McGraw-Hill Publishing Company Limited.
- Finnerty, J. D. (2013). *Project financing: Asset-based financial engineering*. John Wiley & Sons.
- Frigenti, E., & Comninos, D. (2002). *The Practice of Project Management: a guide to the business-focused approach*. Kogan Page Publishers.

- Lewis, J. P. (2002). *Fundamentals of project management: developing core competencies to help outperform the competition*. AMACOM Div American Mgmt Assn.
- Scott, B. (2005). The Art of Project Management. *California USA. O'Relly Media Inc*.
- Thapar S. (2024). *Renewable Energy: Policies, Project Management and Economics*. Springer

Suggested readings
SECI Tenders
Energy Sector Regulations (MoP/ MNRE/ MoPNG/ CERC)

Journals
Project Management Journal
International Journal of Project Management

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 Atul Kumar, Director, JNU
Ms Avantika Garg, Manager, Indian Oil Corporation
Mr Mudit Jain, Head-Research, Tata Cleantech Capital

Course title: Energy Systems Lab			
Course code: XYZ	**No. of credits:** 3	**L-T-P:** 17-00-56	**Learning hours:** 73
Pre-requisite course code and title (if any):			
Department: Department Sustainable Engineering			
Course coordinator: Prof. Naqui Anwer		**Course instructor:** Prof. Naqui Anwer	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description:
Laboratory experiments help in better understanding of the subjects discussed in the classes. The experiments based on science/engineering principles stimulate students for further investigation. This course is designed to provide a comprehensive understanding of energy technologies and their practical applications. It combines theoretical knowledge with hands-on laboratory work to prepare students for careers in the energy sector.

Course objectives:

- To provide hands-on experience on experimental setups related to solar radiation measurement
- To provide practical learning about the basic operation of solar thermal collector
- To provide hands-on experience on experimental setups related to box type solar cooker
- To provide practical learning about the biomass for energy

Course content

Module	Topic	L	T	P
1.	**Solar radiation measurement** Measurement of total and diffuse solar radiation on a horizontal surface at different hours (different incident angles)	2	0	4
2.	**Solar radiation measurement** Measurement of beam and total solar radiation on inclined plane at different tilt angle.	1	0	4
3.	**Box type solar cooker** To determine the top heat loss factor of a box type solar cooker and determination of first and second figure of merit.	1	0	4
4.	**Paraboloid concentrator solar cooker** Water boiling test on paraboloid solar concentrator. Estimation of conversion efficiency of the solar concentrator during water boiling test.	1	0	4
5.	**Solar Thermal Collector** Determination of heat loss factor F'UL of solar flat plate collector.	1	0	4
6.	**Solar PV module characteristics** I-V characterization and spectral response of solar cells under illumination.	2	0	4
7.	**Solar PV module characteristics** I-V and P-V characteristics of solar PV modules under variable radiation and temperature condition.	1	0	4
8.	**Power flow calculation for a stand-alone PV** Power flow calculation for a stand-alone PV system with DC load.	1	0	4
9.	**Power flow calculation for a stand-alone PV** Power flow calculation of stand- alone battery with DC load.	1	0	4
10.	**Power flow calculation for a stand-alone PV** Power flow calculation of stand-alone PV system with DC load, battery and Charge controller in circuit loop.	1	0	4
11.	**Power flow calculation for a stand-alone PV** Power flow calculation of stand-alone wind turbine with DC load, battery and Charge controller in circuit loop.	1	0	4
12.	**Biomass for energy** Estimation of volatile matter and fixed carbon in biomass sample.	2	0	4
13.	**Biomass for energy**	1	0	4

	Estimation of calorific value of solid fuels.			
14.	**Biomass for energy** Energy and environment performance testing of cook stove: Water Boiling Test (WBT) and Kitchen Performance Test (KTP).	1	0	4
	Total	17	0	56

Evaluation criteria
Test 1: Performance during experiments - 30%
Test 2: Viva-voce (at the end of the semester) - 30%
Test 3: Practical Exam (at the end of the semester) - 20%
Test 4: Practical Records (spread over the entire semester) - 20%

Learning outcomes

After completing this course, students would be able to:

- Measure solar radiations and test the performance of different solar thermal applications
- Characterize solar cells and analyse different parameters such as power flow, efficiency of different components such PV module, battery, inverter and PV system
- Characterize the properties of solid biofuels along with performance testing of cook stove

Pedagogical approach
Students complete a procedure given in the laboratory manual to determine the behaviour of the equipment/prototypes/experimental setups and produce the expected characteristics

Materials:

- Garg, H. P., and Kandpal, T. C. (1999). Laboratory manual on solar thermal experiments. Narosa Publishing House, New Delhi
- Solanki, Chetan S.; Arora, Brij M.; Vasi, Juzer; (2012-reprint 2022) Solar Photovoltaics: A Lab Training Manual, Cambridge University Press, India

Additional information (if any): N.A.

Student responsibilities
Attendance, discipline, feedback as per TERI SAS rules

Course reviewers:

Dr Sunanda Sinha, Assistant Professor, MNIT Jaipur

Dr Rhythm Singh, Assistant Professor, IIT Roorkee

Enclosure 4

Course title: Waste to Energy			
Course code: ENR XXX	**No. of credits: 3**	**L-T-P: 30-15-00**	**Learning hours: 45**
Pre-requisite course code and title (if any): NA			
Department: Sustainable Engineering			
Course coordinator: Dr. Lakshmi Raghupathy		**Course instructor:** Dr. Lakshmi Raghupathy	
Contact details: lakshmi.raghupathy@terisas.ac.in			
Course type: Elective		**Course offered in:** Semester 3	

Course description

The objective of the course is to provide insights into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production. This course is designed to provide an understanding of the various aspects of Waste to Energy. The various sources of waste generation is analyzed with a focus on its potential for energy production. The need for characterization of wastes will be discussed along with the existing norms for waste utilization for alternate energy source. Various Technological options biological, chemical and thermal available for the production of energy form waste will delineated along with economics of using alternate sources. The advances in technologies with Case studies will be discussed to provide a better understanding of the concepts of "**Waste to Energy"** in the Indian context.

Course objectives

- To enable students to understand of the concept of Waste to Energy.
- To link legal, technical and management principles for production of energy form waste.
- To learn about the best available technologies for converting waste to energy.
- To analyze of case studies for understanding success and failures.
- To facilitate the students in developing skills in the decision making process.

Course contents

Module	Topic	L	T	P
1	**Introduction** • What is waste? The Principles of Waste Management and Waste Utilization. Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle. Waste as a Resource and its potential as energy source. Towards sustainable development and reducing the waste going to landfill.	**2**		
2	**Waste Sources & Characterization** • Waste production in different sectors such as domestic, industrial, agriculture, post- consumer, waste etc. Classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous). • Characterization of waste for energy utilization. Waste Selection criteria. • Quality parameters of different wastes for sustainable energy production, physical, chemical, calorific value. Energy efficiency parameters 3Ts, CE, DRE.	**2**	**2**	
3	**Technologies for Waste to Energy** • Biochemical Conversion – Energy production from organic waste through anaerobic digestion and fermentation. • Thermo-chemical Conversion – Combustion, Incineration and heat recovery, Pyrolysis, Gasification and Pyrolysis; Plasma Arc Technology and other newer technologies. • Bio-chemical process, thermochemical process gasification and pyrolysis, Material and Energy balance.	**4**	**5**	

4	**Waste to Energy Options & pre-processing** • Landfill gas, collection and recovery. • Refuse Derived Fuel (RDF) – fluff, briquettes, pellets. • Alternate Fuel Resource (AFR) – production and use in Cement plants, Thermal power plants and Industrial boilers. • Conversion of wastes to fuel resources for other useful energy applications. • Energy from Plastic Wastes – Non-recyclable plastic wastes for energy recovery. Energy Recovery from waste plastics and optimization of its use, benchmarking and standardization. • Energy Analysis: Densification of solids, efficiency improvement of power plant and energy production from waste plastics.	**4**	**4**	
5	**Energy Policies** • The energy policies and other policies supporting energy production form waste. The available schemes for the Waste to Energy in India. • Role of the Government in promoting 'Waste to Energy' Sectoral Policies, Programmes, tariff & subsidy schemes.	4		
6	**Case Studies – Success/failures of waste to energy** • Global Best Practices in Waste to energy production distribution and use. • Indian Scenario on Waste to Energy production distribution and use in India. Success and failures of Indian Waste to Energy plants.	4		
7	**Centralized and Decentralized Waste to Energy Plants** • Waste activities – collection, segregation, transportation and storage requirements. Location and Siting of 'Waste to Energy' plants. • Industry Specific Applications – In-house use – sugar, distillery, pharmaceuticals, Pulp and paper, refinery and petrochemical industry and any other industry. • Centralized and Decentralized Energy production, distribution and use. • Comparison of Centralized and decentralized systems and its operations.	6		
8	**Waste To Energy & Environmental Implications** • Environmental standards for Waste to Energy Plant operations and gas clean-up-zero- emissions. • Savings on non-renewable fuel resources. • Carbon Credits: Carbon foot calculations and carbon credits transfer mechanisms.	4	4	
	Total	30	15	

Evaluation criteria:

Test 1: Assignment (after completion of modules 1, 2 and 3) - 20%Test 2: Case Studies (after completion of module 5) - 20%
Test 3: Written test (after completion of module 4) - 20%
Test 4: Written test (after completion of modules 6 and 7) - 40%

Learning outcomes:
On successful completion of this course the students will be able to:

- Apply the knowledge about the operations of Waste to Energy Plants. (Test 1 and 3)
- Analyse the various aspects of Waste to Energy Management Systems. (Test 3)
- Carry out Techno-economic feasibility for Waste to Energy Plants. (Test 2)
- Apply the knowledge in planning and operations of Waste to Energy plants. (Test 3 and 4)

Pedagogical approach:
A combination of class-room interactions, group discussion and presentations, tutorials and assignments

Materials:

Recommended readings

- Industrial and Urban Waste Management in India, TERI Press.
- Wealth from Waste: Trends and Technologies by Banwari Lal and Patwardhan, TERI Press. Fundamentals of waste and Environmental Engineering, S.N Mukhopadhyay, TERI Press. Gazette Notification on Waste Management Rules 2016.
- CPCB Guidelines for Co-processing in Cement/Power/Steel Industry
- Waste-to-Energy in Austria – White Book – Figures, Data Facts, 2nd edition, May 2010
- Report of the task Force on Waste to Energy, Niti Ayog (Formerly Planning Commission) 2014.Municipal Solid Waste Management Manual, CPHEEO, 2016

Reference Books/Journals:

Environmental and Resource Economics Environmental Monitoring and Assessment
Journal of Environmental Assessment Policy and Management
Reference papers and journals will also be given in class.

Enclosure 5

Approval for starting the one-year PG Diploma in Renewable Energy Management (PGDREM) in online mode.

1 Context:

The Department of Sustainable Engineering has started offering one-year PG Diploma in Renewable Energy Management (PGDREM) in regular/offline mode with approval from the BoS meeting held on 5th April 2023 and subsequently after approval by Academic Council in its 55th meeting. This has been deliberated in the above meetings of BoS and Academic Council that The PG diploma programme can be offered in online mode once the first batch (in regular mode) is passed out as per UGC regulations for offering online programmes. The Department, therefore, is seeking formal approval from the BoS to start offering the one-year PG Diploma in Renewable Energy Management (PGDREM) in online mode. Further, to update that the process of submitting application on DEB portal for the same has been initiated. The approved eligibility criteria and programme structure are presented again for reference.

2 Eligibility Criteria:

Bachelor's degree in Science/ Technology/ Engineering/ Management or equivalent or B.Voc in similar streams. Admission will be based on the aggregate marks obtained in the qualifying degree.

3 Programme Structure:

Semester 1			
Course No.	**Course Title**	**Type**	**Credits**
NRE 106	Communication skills andtechnical writing	Core	2
ENR 148	Energy and environmentalimplications	Core	2
ENR 185	Introduction to management techniques - I	Core	1
ENR 154	Renewable energy policiesand regulations	Core	3
ENR 146	Renewable energy resourcecharacteristics	Core	3
ENR 105	Independent study	Core	4
NRE 165	Introduction to SustainableDevelopment		1
Semester 2			
Course No.	**Course Title**	**Type**	**Credits**
ENR 166	Electric vehicle, energy storage system and Hydrotechnologies	Core	3
ENR 167	Energy and CarbonMarkets	Core	1
ENR 111	Energy conservation andmanagement	Core	2
ENR 156	Renewable energy projectmanagement	Core	3
ENR 151	Solar technologies	Core	4
ENR 164	Wind, biomass and otherrenewable technologies	Core	3
ENR 108	Summer internship	Core	8

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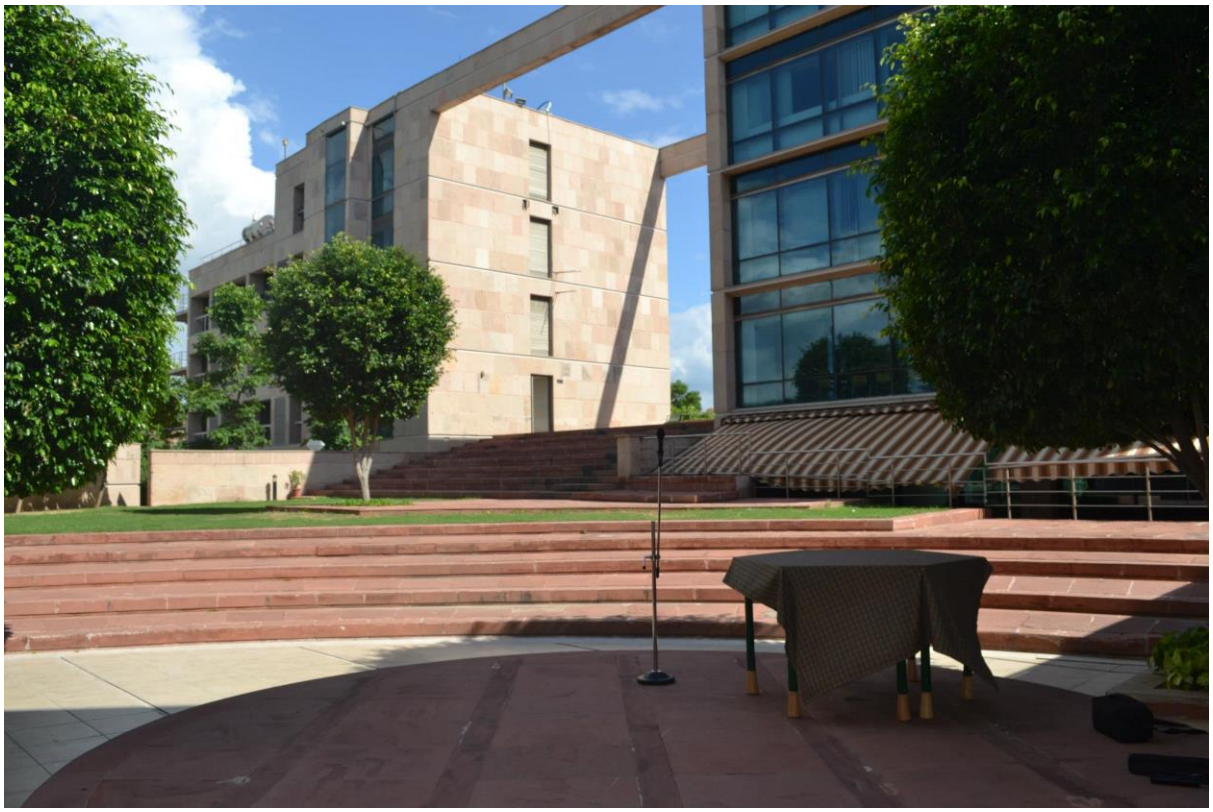
Knowledge for Sustainable Development
— Deemed-to-be University —



Programme Project Report

One-year online PG Diploma
in
Renewable Energy Management (PGDREM)

1. Programmes Mission & Objectives:

The Indian power sector is growing very fast to achieve the new targets of 450 GW of installed capacity through renewable energy sources by the year 2030 . In the year 2015, India targeted for 175 GW of installed capacity through renewable energy sources by the year 2022 . To achieve these targets India is continuously working towards policy reforms, on field deployment strategies and facilitating market practices to achieve the targets. India's target to achieve net zero by 2070 also have a target to meet 50% of its energy demand using renewable energy sources. This requires trained manpower with knowledge of renewable energy policies, technologies, and its management. The programme PG Diploma in Renewable Energy Management provides a structured and comprehensive knowledge about resources, technologies and management of Renewable Energy and allied fields. The program is designed to incorporate features which facilitates equal opportunity of capacity building for working professionals as well as fresh graduates

2. Mission, Goals and Programme Outcomes

2.1 HEI's Vision

To accelerate the transition towards a more sustainable world through the creation of knowledge and human capacity. To be a globally recognized deemed University in the sphere of sustainability studies.

2.2 HEI's Mission

To create new knowledge through research and contribute to the discourse on sustainability issues at national and global levels.

To design and deliver academic programmes, training and research on sustainability issues relevant to all streams of life and across age groups, assimilating the latest science and evidence.

2.3 HEI's Core Values

TERI School of Advanced Studies, in the design of its teaching-learning environment, adheres to the following values:

- To instil the knowledge of, and desire for, systemic approaches to problem solving.
- To empower the commitment to environmental protection and social justice.
- To constructively engage in deliberative processes.
- To promote critical, and solutions-oriented, thinking.

2.4 Programme Specific Outcome

- The programme provides a comprehensive knowledge about resource characteristics of renewable sources, renewable energy technologies, renewable energy policy and regulations
- The programme also provides in depth knowledge off renewable energy project management, energy conservation and carbon markets

- The programme has inbuilt component of providing knowledge about contemporary topics like electric vehicles, energy storage systems and hydrogen technologies

3. Nature of Prospective Target Group of Learners

3.1.**Students**:

- College or university students seeking additional skills or knowledge to complement their degree programs.

3.2.**Working Professionals**:

- Individuals looking to upskill or reskill to stay competitive in their current job or industry.
- Professionals aiming for career advancement or transition into a new field.

3.3.**Lifelong Learners**:

- Adults who have a passion for learning and want to gain knowledge in new areas for personal enrichment.
- Retirees looking to explore new interests and keep their minds active.

3.4.**Job Seekers**:

- Individuals looking to improve their employability by gaining new skills or certifications.
- People who are unemployed or underemployed and want to enhance their qualifications.

3.5.**Entrepreneurs and Business Owners**:

- Aspiring entrepreneurs seeking knowledge and skills to start their own businesses.
- Small business owners looking to expand their business acumen and improve operations.

3.6.**Specific Industries or Roles**:

- Professionals in specific industries, such as new green energy technologies, green financing, energy transition, green hydrogen, electric vehicle, etc., looking for specialized training.
- Individuals in specific roles, such as managers, developers, marketers, etc., seeking role-specific skills.

4. Eligibility Criteria

A Bachelor's degree in Science/ Engineering/ Energy/ Economics/ Mathematics/ Statistics/ Geology/ Geography/ Commerce/ Management/ Computer or B.Voc in relevant stream with a minimum cumulative grade point average of 6.2 on a 10 point scale or equivalent or 55% marks in aggregate.

5. Instructional Design: Curriculum Design, Credit Structure

The Course & Curriculum Design, and Credit Structure with Credit Hours is as below:

Programme Structure:

Semester 1			
Course No.	**Course Title**	**Type**	**Credits**
NRE 106	Communication skills and technical writing	Core	2
ENR 148	Energy and environmental implications	Core	2
ENR 185	Introduction to management techniques - I	Core	1
ENR 154	Renewable energy policies and regulations	Core	3
ENR 146	Renewable energy resource characteristics	Core	3
ENR 105	Independent study	Core	4
NRE 165	Introduction to Sustainable Development		1
Semester 2			
Course No.	**Course Title**	**Type**	**Credits**
ENR 166	Electric vehicle, energy storage system and Hydro technologies	Core	3
ENR 167	Energy and Carbon Markets	Core	1
ENR 111	Energy conservation and management	Core	2
ENR 156	Renewable energy project management	Core	3
ENR 151	Solar technologies	Core	4
ENR 164	Wind, biomass and other renewable technologies	Core	3
ENR 108	Summer internship	Core	8

6. Detailed Syllabi

Detailed Syllabus for the Programme / Courses is attached in Annexure .

7. Duration of the Program

The Programme can be completed in a minimum of 1 years, and a maximum of ‘n+2’ years, as per UGC Regulations.

8. Instruction Delivery Mechanisms

Courses shall be delivered in supervised self-learning mode leading to guided ‘self-study’ with Self Learning Material (SLM) in the form of print form / eBook Form and Self Assessments being available to the students. Additionally, Personal Contact Programs (PCP’s) in classroom lecture mode at campus and online via recorded lecture / virtual classroom sessions to be provided as per a fixed schedule towards the end of each term.

9. Instruction Media

Program Instruction shall be delivered using Print SLM, eBook/eSLM, as well as a Personal Contact Program that shall be conducted in classroom mode, as well as broadcast using the internet using virtual classroom platform for students unable to attend physically.

10. Student Support Service

Systems Learner Support Service via Web, Chat, Call Support. Access to counsellors at Department.

11. Access to Library resources at the University / Department

All the enrolled students shall have full access to library resources at the University / Department. The students can get the books/journals/magazines and other reading materials issued as per university rules. The remote access of library services shall also be provided through OPAC.

12. Pedagogical Tools

13. Quality Assurance Mechanism and Expected Program Outcomes

The quality of the programme shall be ensured by the following strategies at regular intervals.

I. Review Mechanism for Programme
II. Course Benchmarking
III. Mechanism for Monitoring Effectiveness.

Institutional IQAC shall also bring systematic procedures to provide necessary check to maintain the quality of the programme. The IQAC is striving to bring newer initiatives pertaining to research, campus development, ICT adoption in teaching, providing better focus for the research scholars through workshops, coordinating Academic and Administrative Audit of the University, etc. At the end of every academic year, the University conducts assessment of the curriculum/ course/ academic programme by students. The assessment focuses on broad areas like

1) reasons for selecting courses,
2) facilities available in the Departments,
3) quality of the syllabus,
4) internal assessment evaluation,
5) quality of the teacher in terms of regularity to classes, command over language, encouragement of students in the classes, completion of syllabus, and
6) rating of the programme and the Department. This feedback contributes to the academic radar prepared by the IQAC.

Towards the Quality Assurance Mechanism for ODL Programs, the University shall strengthen the Centre for Internal Quality Assurance (CIQA) exclusively for programmes in the Open and Distance Learning mode established at the beginning of Academic Year 2018-19, and follow the Quality Assurance Guidelines on learning materials in multiple media, human resources, curriculum and pedagogy, as specified in the UGC ODL Regulations. Since the CIQA is having limited functionality as of now due to suspension of distance learning programme, the CIQA will

be required to Conduct training and capacity building of teaching and administrative staff and counsellors at regular intervals.

The University IQAC's cell shall work closely with the CIQA to develop Feedback mechanisms, to allow for Program and Process Review on a regular basis. 360 Degree feedback, from Students, Faculty, Counsellors and Admin Staff shall be processed, and suggestions and improvements incorporated accordingly. The Courses shall be benchmarked with the Courses conducted in campus, for full time students, in order to ascertain the quality. Students Learning outcomes as measured through the exams and tests shall be compared on a regular basis. Post completion of a Degree Program, Students will be regularly polled / interviewed using email feedback surveys, to measure impact of the program on their professional and academic lives. These indicators shall be used to constantly improve upon the programs and make them at par industry standards and expectations.

Enclosure 6

MSc ESRM Programme Outline

Semester	Courses	Credits	Duration
First Year			
1st Semester	Seven core courses of 20 credits, one compulsory audit course	20	15 weeks
2nd Semester	Two core courses of 6 credits and five elective courses of minimum 15 credits	21	15 weeks
Second Year			
3rd Semester	One core course of 4 credits and three elective courses of minimum 9 credits	13	15 weeks
	Minor Project	8	8 weeks
4th Semester	Major project	20	
Semester 1			
Course Code	**Course Title**	**Type**	**Credits**
NRE 106	Communication skills and technical writing	Core	2
NRE 113	Applied mathematics	Core	0
NRE 121	Ecology	Core	3
NRE 131	Environmental chemistry and microbiology	Core	3
NRE 138	Environmental monitoring laboratory	Core	3
NRE 139	Environmental geosciences	Core	3
NRE 155	Environmental law and policy	Core	3
NRE 189	Solid and hazardous waste management	Core	3
Semester 2			
Course Code	**Course Title**	**Type**	**Credits**
NRE 114	Advanced analytical techniques for environmental application	Elective	3
NRE 115	Environmental statistics	Core	4
NRE 123	Biodiversity assessment and conservation	Elective	3
NRE 130	Soil science	Elective	3
NRE 133	Environmental management system	Elective	4
NRE 134	Air quality management	Elective	3
NRE 141	Basic course in environmental and resource economics	Elective	3
NRE 142	Water quality management	Elective	3
NRE 162	Hydrology	Elective	3
NRE 170	Advanced geosciences	Elective	3
NRE 172	Principles of geoinformatics	Elective	3
NRE 173	Research methodology and thesis writing	Core	2
Semester 3			
Course Code	**Course Title**	**Type**	**Credits**
NRE 103	Minor project	Core	8
NRC 162	Climate change and disaster risk reduction	Elective	3
NRE 112	Multivariate data analysis	Elective	3
NRE 136	Glacier hydrology	Elective	3
NRE 144	Environment health and risk assessment	Elective	3
NRE 145	Integrated impact assessment	Core	4
NRE 147	Environmental economics	Elective	3

NRE 149	Governance and management of natural resources	Elective	3
NRE 151	Wildlife conservation and management	Elective	3
NRE 163	Groundwater hydrology and management	Elective	3
NRE 167	Integrated watershed management	Elective	3
NRE 168	Food security and agriculture	Elective	3
NRE 171	Environmental modelling	Elective	4
NRE 174	Water and wastewater treatment processes and design	Elective	4
NRE 175	Geoinformatics for resource management	Elective	4
NRE 178	Satellite meteorology	Elective	3
Semester 4			
Course Code	**Course Title**	**Type**	**Credits**
NRE 104	Major project	Core	20

Enclosure 7

BSc in Environmental Studies (Hons./Hons. with Research)

Semester 1		**Total credits = 20**	
Code	**Course Title**	**Type**	**Credits**
UES 102	Introduction to Environmental Physics	Major	3
UES 104	Introduction to Environmental Biology	Major	3
UES 106	Introduction to Environmental Chemistry	Major	3
AEC 101	Communication Skills and Technical Writing	AEC	2
MDC 103	Data Science Fundamentals	MDC	2
SEC 101	Fundamentals of Computers and Programming	SEC	2
VAC 101	Basic Concepts of Sustainable Development	VAC	2
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	3
Semester 2		**Total credits = 26**	
MDC 101	Environment and Society	Major	2
UES 101	Ecology and Ecosystems	Major	4
UES 103	Earth and Earth Surface Processes	Major	4
UDS 102	Problem-Solving and Python Programming	MDC	3
SEC 102	Introduction to Remote Sensing	SEC	3
AEC 102	Modern Indian Language 1	AEC	3
VAC 102	Ancient Indian Sustainable Practices	VAC	2
VAC 104	Personality Development for Success	VAC	2
UES XXX	Sustainability Communication	Minor	3
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	3
	Vocational course/ Summer internship (8-weeks) to Exit with UG-Certificate	Vocational/ Internship	4
Semester 3		**Total credits = 22**	
UES 201	Sustainable Built Environment	Major	3
UES 203	Biodiversity Conservation	Major	3
UES 205	Soil Conservation and Management	Major	3
UES 207	Conventional and Renewable Energy Resources	Minor	3
MDC 201	Environmental Statistics	MDC	4
AEC 201	Modern Indian Language 2	AEC	3
SEC 201	Introduction to Geographic Information System	SEC	3
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	3
Semester 4		**Total credits = 20**	
	Sustainable Natural Resource Management	Major	4
	Environmental Policy, Law and Governance	Major	4
	Water and Soil Pollution	Major	4
	Environmental Laboratory-I	Major	3
	Spatial Data Modelling and Analysis	Minor	3
	Global Climate Change	Minor	2
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	4
	Vocational course/ Summer internship project (8-weeks) to Exit with UG-Diploma	Vocational/ Internship	4

Semester 5		**Total credits = 20**	
	Solid and Hazardous Waste Management	Major	4
	Contemporary Environmental Issues	Major	4
	Environmental Economics	Major	4
	Environmental Justice and Ethics	Minor	4
	Global Positioning and Navigation Systems	Minor	4
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	4
Semester 6		**Total credits = 21**	
	Research Methodology	Major	2
	Natural Hazards and Disaster Risk Reduction	Major	4
	Environmental Convention and Treaties	Major	3
	Air and Noise Pollution	Major	4
	Environmental Laboratory-II	Major	2
	Development and Resource Economics	Minor	3
	Digital Image Processing	Minor	3
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	4
	Vocational course/ Summer internship project (8-weeks) to Exit 3-Years BSc Degree	Vocational/ Internship	4
Semester 7		**Total credits = 20**	
	Climate Science and Policy	Major	4
	Integrated Watershed Management	Major	4
	Environmental Health and Risk Assessment	Major	4
	Geocomputation	Minor	4
	Agriculture and Forest Management	Minor	4
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	4
Semester 8		**Total credits = 24**	
	Geo-environment	Major	4
	Environmental Management	Major	4
	Climate Change Impacts, Adaptation and Mitigation	Major	4
	Environmental modelling	Major	4
	Geospatial applications for Resource Management	Minor	4
	Geopolitcs of Energy and Environment	Minor	4
	Research Project/Dissertation	Major	12
	Any Major Course from Economics/ Management/Data Science can also be taken as Minor	Minor	4
	Vocational course/ Summer internship project (8-weeks) to Exit 4-Years B.Sc. (Hons./Hons. with Research) in Environmental Studies	Vocational/ Internship	4*

BSc in Data Science (Hons./Hons. with Research)

Semester 1		**Total credits = 23**	
Code	**Course Title**	**Type**	**Credits**
MDC 103	Data Science Fundamentals	Major	2
UDS 101	Statistics for Data Science	Major	4
UDS 103	Mathematics for Data Science	Major	4
UES 102	Introduction to Environmental Physics	MDC	3
AEC 101	Communication Skills and Technical Writing	AEC	2
SEC 101	Fundamentals of Computers and Programming	SEC	2
VAC 101	Basic Concepts of Sustainable Development	VAC	2
NDSXXX	Any Major Course from Economics/ Management/Environmental Studies can also be taken as Minor	Minor	4
Semester 2		**Total credits = 25**	
UDS 102	Problem-Solving and Python Programming	Major	3
UDS 104	Fundamentals of Information Technology	Major	3
UDS 106	Database Management System	Major	3
MDC 101	Environment and Society	MDC	2
SEC 102	Introduction to Remote Sensing	SEC	3
AEC 102	Modern Indian Language 1	AEC	3
VAC 102	Ancient Indian Sustainable Practices	VAC	2
VAC 104	Personality Development for Success	VAC	2
	Any Major Course from Economics/Management/ Environmental Studies can also be taken as Minor	Minor	3
	Vocational course/ Summer internship (8-weeks) to Exit with UG-Certificate	Vocational/ Internship	4
Semester 3		**Total credits = 22**	
UDS 201	Data wrangling and Visualization	Major	3
UDS 203	Cybersecurity for Data Science	Major	3
UDS 205	Data Mining and Analysis	Major	3
MDC 201	Environmental Statistics	MDC	4
AEC 201	Modern Indian Language 2	AEC	3
SEC 201	Introduction to Geographic Information System	SEC	3
	Any Major Course from Economics/ Management/Environmental Studies can also be taken as Minor	Minor	3
Semester 4		**Total credits = 20**	
	Time series analysis in Data Science	Major	4
	Open source programming	Major	4
	Network science	Major	4
	Management Information System	Major	4
	Spatial Data Modelling and Analysis	Minor	3
	Global Climate Change	Minor	2
	Any Major Course from Economics/ Management/Environmental Studies can also be taken as Minor	Minor	4
	Vocational course/ Summer internship project (8-weeks) to Exit with UG-Diploma	Vocational/ Internship	4
Semester 5		**Total credits = 20**	

	Predictive Modelling and Analytics	Major	4
	Cloud Computing and Big Data	Major	4
	Blockchain security	Major	4
	Global Positioning and Navigation Systems	Minor	4
	Any Major Course from Economics/ Management/Environmental Studies can also be taken as Minor	Minor	4
Semester 6		**Total credits = 22**	
	Machine Learning & NLP	Major	4
	Performance Evaluation of Computing Systems	Major	4
	Digital Marketing Analytics	Major	4
	Research Methodology	Major	2
	Digital Image Processing	Minor	3
	Any Major Course from Economics/ Management/Environmental Studies can also be taken as Minor	Minor	4
	Vocational course/ Summer internship project (8-weeks) to Exit 3-Years BSc Degree	Vocational/ Internship	4
Semester 7		**Total credits = 20**	
	Soft - Computing	Major	4
	Software Engineering and Project Management	Major	4
	Information Retrieval & Semantic Web	Major	4
	Strategic management	Minor	4
	Geocomputation	Minor	4
	Any Major Course from Economics/ Management/Environmental Studies can also be taken as Minor	Minor	4
Semester 8		**Total credits = 24**	
	Deep Learning	Major	4
	Intellectual Property rights	Major	4
	Generative AI	Major	4
	Computer Vision	Major	4
	Geospatial applications for Resource Management	Minor	4
	Research Project/Dissertation	Major	12
	Any Major Course from Economics/ Management/Environmental Studies can also be taken as Minor	Minor	4
	Vocational course/ Summer internship project (8-weeks) to Exit 4-Years B.Sc. (Hons./Hons. with Research) in Environmental Studies	Vocational/ Internship	4*

* In case student not credited 4-credit summer internship during 1st / 2nd year / 3rd year has to earn 4-credit summer internship in 8th semester.
BSc (Hons with Research): 12 credits Research Project/Dissertation, 4 credits Major course, 4 credits Minor course, 4 credits vocational course
BSc (Hons.): 16 credits Major course, 4 credits Minor course, 4 credits vocational course

AEC-Ability Enhancement Course, SEC-Skill Enhancement Course, VAC-Value Added Course, MDC-Multidisciplinary

Enclosure 8

Course Title: Environmental Policy, Law and Governance			
Course code:	**No. of credits: 4**	**L-T-P: 52-8-0**	**Learning hours: 60**
Pre-requisite course code and title (if any):			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Major		**Course offered in:** Semester 4	

Course Description

The course 'Environmental Policy, Law and Governance' is designed to provide students with a comprehensive understanding of the legal frameworks, policies, and governance mechanisms that guide environmental protection and sustainable management of resources. It covers the evolution of environmental laws, policy instruments, institutional frameworks, and international environmental agreements, with a specific focus on India. Students will explore various aspects of environmental governance, including pollution control, biodiversity and forest conservation, climate change mitigation, and the role of judiciary in environmental jurisprudence.

Course objectives

The course aims to build the following basic understanding among students:

- To provide an understanding of the role of environmental policy and law in natural resource management and pollution control.
- To analyze the legal and institutional frameworks for environmental governance in India and at the global level.
- To equip students with knowledge of key environmental policies, regulations, and judicial decisions influencing environmental protection.
- To develop skills in interpreting and applying environmental laws and policies to real-world issues.

Course content

Module	Topic	L	T	P
1	**Introduction to Environmental Policy and Law**			
	This module explores the evolution of environmental law in India, focusing on its constitutional foundations and principles. It also highlights the judiciary's role in shaping environmental policies. Historical Development of Environmental Law: International and Indian; Constitutional Provisions on Environmental Protection; Role of Judiciary in Environmental Protection; Principles of Environmental Law: Sustainable Development, Precautionary Principle, Polluter Pays Principle, Public Trust Doctrine and Absolute Liability	12		
2	**Pollution Control and Waste Management: Laws, Policies and Institutional Framework**			
	This module focuses on India's key pollution control laws. It examines the institutional roles of Pollution Control Boards and the National Green Tribunal. Environmental Protection Legislations: Air (Prevention and Control of Pollution) Act, 1981, Water Act, 1974, Environment Protection Act (EPA), 1986, Rules under EPA, 1986; Role of Central and State Pollution Control Boards, National Green Tribunal; Environmental Impact Assessment (EIA): Concepts, Processes, and EIA Notification 2006; Case Studies of Ministry of Environment Programmes: National Water Policy, Green India Mission, National River Conservation Programme, National Afforestation Programme.	15	5	
3	**Forest and Biodiversity Conservation**			
	This module examines the legal frameworks for forest and biodiversity protection in India. It also explores community-based conservation efforts and national programs.	12	3	

	National Forest Policy; Legal Framework for Forest: Indian Forest Act, 1927, Forest Conservation Act, 1980; Rights of Forest Dwellers; Wildlife Protection Act, 1972, Biological Diversity Act, 2002; Community-based Conservation Initiatives and Rights; Case Studies of Conservation Programs: Project Tiger and Elephant Division, 2023, Joint Forest Management; Issues and Challenges in Forest Governance			
4	**International Environmental Agreements and Contemporary Issues**			
	This module delves basic principles of international environmental law. It explores global treaties and key international environmental agreements. Definition of International Law; Sources of International Law; UNFCCC, Convention on Biodiversity, CITES Contemporary Issues: Space Law and Environmental Concerns; Marine Genetic Resources and Governance under International Law	13		
	Total	52	8	

Evaluation criteria

- Minor Test 1: Written test [at the end of teaching of modules 1] -- 15%
- Minor Test 2: Written test [at the end of teaching of modules 2] -- 20%
- Major Test: Written test [at the end of the semester, full syllabus] -- 40%
- Term Paper/Project: 25%

Learning outcomes

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

- understand the legal and policy frameworks guiding environmental governance in India and globally. [minor 1, minor 2 and major test]
- analyze the role of judiciary and public policies in environmental protection. [term paper]
- apply principles of environmental law to practical case studies and real-world scenarios. [term paper]
- develop critical thinking skills to assess environmental laws, policies, and governance mechanisms. [minor 1, minor 2 and major test]

Pedagogical approach

The course will be delivered through a combination of lectures, case study discussions, policy analysis, and project work. Students are expected to actively participate in classroom discussions and engage with reading materials prior to each session.

Reading materials

- Divan, S. & Rosencranz, A. (2005). *Environmental Law and Policy in India*, 2nd ed., Oxford University Press, New Delhi.
- Leelakrishnan, P. (2008). *Environmental Law in India*, 3rd ed., Lexis Nexis, India.
- Birnie, P., Boyle, A., & Redgwell, C. (2009). *International Law and the Environment*, 3rd ed., Oxford University Press, Oxford.
- Sands, P. (2002). *Principles of International Environmental Law*, 2nd ed., Cambridge University Press, Cambridge.
- Shyam Divan (2016). *Environmental Law and Policy in India: Cases, Materials and Statutes*, 3rd ed., Lexis Nexis.
- Gadgil, M. & Guha, R. (1995). *Ecology and Equity: The Use and Abuse of Nature in Contemporary India*, Oxford University Press, New Delhi.
- Jadhav, N. (2002). *Biodiversity Law: A Casebook*, 2nd ed., Eastern Book Company, Lucknow.
- Singh, Chhatrapati (2000). *Water Law in India: Cases and Materials*, 2nd ed., Oxford University Press, New Delhi.
- Guha, R. (2000). *Environmentalism: A Global History*, Oxford University Press, New Delhi.
- Upadhyay, S. & Upadhyay, V. (2002). *Handbook on Environmental Law: Forest Laws, Wildlife Laws, and the Environment*, Vols. I-III, Lexis Nexis-Butterworths, New Delhi.

Journals

- *Economic and Political Weekly*
- *Journal of Environmental Law*
- *Indian Journal of Environmental Protection*
- *Journal of Indian Law Institute*

Reports

- World Bank (2020). *India: Strengthening Environmental Regulations*, World Bank Publications.
- Ministry of Environment, Forest and Climate Change (MoEFCC), India. (2018). *State of Environment Report*.
- UNEP (2019). *Global Environment Outlook (GEO-6): Healthy Planet, Healthy People*, United Nations Environment Programme.
- IPCC (2021). *Sixth Assessment Report on Climate Change*, Intergovernmental Panel on Climate Change.

List of Cases:

- Rural Litigation and Entitlement Kendra vs. State of Uttar Pradesh (1985) (Module 1)
- M.C. Mehta vs. Union of India (Ganga Pollution Case, 1985) (Module 1 and 2)
- M.C. Mehta vs. Union of India (Oleum Gas Leak Case, 1986) (Module 1 and 2)
- Sachidanand Pandey vs. State of West Bengal (1987) (Module 1)
- M.C. Mehta vs. Union of India (Taj Trapezium Case, 1996) (Module 1 and 2)
- Indian Council for Enviro-Legal Action vs. Union of India (1996) (Module 1)
- Vellore Citizens Welfare Forum vs. Union of India (1996) (Module 1)
- T.N. Godavarman Thirumalpad vs. Union of India (Forest Conservation Case, 1996) (Module 3)
- Samatha v. State of Andhra Pradesh (1997) (Module 3)
- Narmada Bachao Andolan vs. Union of India (2000) (Module 1)
- M.C. Mehta vs. Kamal Nath (2000) (Module 1)
- Karnataka Industrial Areas Development Board vs. C. Kenchappa (2006) (Module 2)
- M.C. Mehta vs. Union of India (Delhi Air Pollution Case, 1998-ongoing) (Module 1 and 2)
- Wildlife First v. Ministry of Forest and Environment (2008) (Module 3)
- Almitra H. Patel vs. Union of India (Solid Waste Management Case, 2010) (Module 2)
- Niyamgiri Hills Case (2013) (Module 3)
- Centre for Environmental Law (WWF) v. Union of India & Others (2013) (Module 3)
- Arjun Gopal vs. Union of India (Firecracker Ban Case, 2017) (Module 1)
- T.N. Godavarman Thirumalpad vs. Union of India (Elephant Corridor Case, 2018) (Module 3)
- MK Ranjitsinh et al. v. Union of India et al. (2024) (Module 3)

Student Responsibilities

The students must attend the classes regularly and ensure timely submissions of tutorials and assignments. Their other responsibilities include feedback and discipline in the class.

Course Designed by:

- Dr. Manini Syali, Assistant Professor, Department of Policy and Management Studies, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by the following reviewers:

- Dr. M. Sakthivel, Professor, Tamil Nadu National Law University
- Dr. Aditi Singh, Associate Professor, Woxsen University, Hyderabad

Course Title: Global Climate Change			
Course Code:	**No. of Credits: 2**	**L-T-P: 20-10-0**	**Learning Hours: 30**
Pre-requisite Course Code and Title (if any): None			
Department: Natural and Applied Sciences			
Course Coordinator:		**Course Instructor:**	
Contact Details:			
Course Type: Minor		**Course Offered In:** Semester 4	

Course Description

The course has been designed to introduce the basics of global climate change to the students. It provides a fundamental understanding of the science and the impacts of climate change. The course enables learners to identify different indicators of climate change. It further introduces strategies to address climate change, adaptation, mitigation, and policy responses at the global and national levels.

Course Objectives

- To examine the evidence, science, and causes of climate change.
- To explore the impacts of climate change on different systems and sectors.
- To understand the various strategies to address climate change, including adaptation, mitigation, and policy responses.

Course Content

Module	Topic	L	T	P
1	**Introduction to Climate Change**			
	This module focuses on introductory knowledge about global climate change and its various evidence. It also sets the context for the subsequent modules. Introduction to Climate Change: Climate vs weather, elements of climate, climate change indicators: global temperature trends, changes in precipitation regimes, melting of ice caps and glaciers, sea-level rise, CO_2 concentrations in the atmosphere, ocean acidification, extreme climate events.	4	2	
2	**Science of Climate Change**			
	This module explains the natural forcings and anthropogenic drivers causing climate change. Students will explore the science of climate change, including the greenhouse effect, aerosol, and carbon cycle. The module will also cover the difference between the current phase of global climate change and historical climate change. Science of climate change, natural drivers of climate change, solar radiations, greenhouse effect, greenhouse gases (GHGs), anthropogenic forcings and human impact on global climate, global warming potential, aerosols, carbon cycle, and palaeoclimate.	6	2	
3	**Impacts of Climate Change**			
	This module focuses on the impacts of climate change on systems, sectors, and regions. Impacts of climate change: impacts on natural and managed systems, observed and projected impacts, impacts across sectors and regions.	4	2	
4	**Dealing with Climate Change**			
	This module will help students identify the response measures to address the climate change crisis. It will also incorporate international and national efforts in this direction. Climate change adaptation and mitigation, policy responses, geopolitics of climate change, international initiatives to address climate change: UNFCCC and COPs,	6	4	

	IPCC, Kyoto Protocol, Paris Agreement, India's response and National Action Plan on Climate Change.			
	Total	20	10	

Evaluation Criteria

- Minor Test: 25% [at the end of teaching of modules 1 and 2]
- Major Test: 50% [at the end of the semester, full syllabus]
- Tutorials/assignment: 25%

Learning Outcomes

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

- develop a fundamental understanding of evidence, science, and causes of climate change. [Module 1 and 2, Tutorials, Minor Test, Major Test]
- gain knowledge on how the current phase of global climate change is different from paleoclimatic changes. [Module 2, Tutorials, Minor Test, Major Test]
- develop a basic understanding of the impacts of climate change on different systems and sectors. [Module 3, Tutorials, Major Test]
- understand the crucial adaptation, mitigation, and policy instruments to address climate change. [Module 4, Tutorials, Major Test]

Pedagogical Approach

- The course will be delivered through classroom lectures, class exercises, and tutorials. It will be further connected with real-life examples and case studies.
- The course will focus on classroom discussions and assignments that will help to make this study more participatory, robust, and productive.

Reading Resources

- Maslin M (2021). *Climate Change: A Very Short Introduction*. Fourth Edition, Oxford University Press.
- Dessler AE (2015). *Introduction to Modern Climate Change*. Second Edition. Cambridge University Press.
- IPCC (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- IPCC (2021). *Summary for Policymakers*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Steffen W, Crutzen PJ, McNeill JR (2007). The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature. *AMBIO: A Journal of the Human Environment, 36(8),* 614-621
- Abbass K, Qasim MZ, Song H, et al (2022). A review of the global climate change impacts, adaptation, and sustainable mitigation measures. *Environmental Science and Pollution, 29,* 42539–42559

Student Responsibilities

The students must come prepared with readings suggested during the classes and ensure timely submissions of tutorials and assignments. They are also expected to attend classes regularly, participate, and contribute to classroom discussions to strengthen their understanding further. Their other responsibilities include feedback and discipline.

Course Designed by:

- Dr. Anand Madhukar, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies

Course Reviewers:

The course is reviewed by following reviewers:

- Dr. Richa Kothari, Professor, Department of Environmental Sciences, School of Life Sciences, Central University of Jammu
- Dr. Rajeev Pratap Singh, Associate Professor, Institute of Environment and Sustainable Development, Banaras Hindu University

Course Title: Network Science			
Course Code:	**No. of credits: 4**	**L-T-P:** 30-15-30	**Learning hours: 60**
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite (if any): Data Wrangling and Visualization (UDS 201)			
Department: Natural and Applied Sciences			
Course Coordinator:		**Course Instructor:**	
Contact Details:			
Course Type: Major		**Course Offered in:** Semester 4	

Course Description

This course on network science delves into the core principles and applications of analysing large-scale graphs within complex systems. Students will explore the significance of network structures, learning how to extract meaningful insights from vast datasets. The curriculum covers random network theory and its application to large graphs, emphasizing the role of heterogeneity within hyper-graphs and multi-graphs. Learners will also investigate diverse methods for handling and processing data, examining frameworks suited for interconnected structures. By the end, students will have designed and evaluated algorithmic solutions tailored to the dynamic, large-scale networks prevalent in modern data science applications.

Course Objectives

- Understand the structural properties and significance of graphs in real-world networks.
- Apply network science and analytical techniques to extract insights from complex data sources.
- Design solutions to model and analyze behaviour of networked entities in different types of interconnected structures.

Course Content

Module	Topic	L	T	P
1	**Introduction to Graphs and Networks**			
	The focus of this module is on the basic introduction of graphs. This module will help the students to understand significance of graph characteristics for real-world networks. Following topics will be covered in this context: Basics of graph theory, applications of graphs and networks, characteristics, challenges, types of graphs - simple, weighted, directed, signed, multi-graphs, hypergraphs; graph data sources, categories - endorsement graphs, location graphs, social networks, topological properties of networks - degree distribution, clustering coefficient, neighbourhood connectivity, centrality metrics. Hands-on using python programming for creating nodes, edges, different types of graphs, accessing nodes and neighbours.	6	2	5
2	**Network Analysis of Graph-based Structures**			
	This module highlights significance of graph-based structures and properties for performing network analysis. Following topics will be addressed in this module: Graph properties, strong ties, weak ties, power law, six degrees of separation, growing networks, homophily, network analysis techniques - graph traversal and search algorithms, list ranking, graph partitioning, connected component algorithms, graph-cut method, practice with NetworkX and NetCenLib with Python programming	8	3	5

3	**Implementation & Analysis of Networked Structures**			
	The purpose of this module is to introduce the implementation and analytical techniques with case studies. The major topics to be covered in module include: Adjacency matrix representation, adjacency list representation, multi-graph & hypergraph representation, modules/communities of networks, community finding methods: Girvan-Newman method, link prediction measures, link analysis, web crawling, social web, page ranking algorithms, personalized page rank, page rank axioms, hits, spectral clustering, modularity-based clustering, signed networks, social balancing, practical with network-based case studies	8	5	10
4	**Information Spread Analysis in Networks**			
	This module encompasses through different network-based content diffusion and dynamics. This module will also provide insights to content virality and explore tools to assess the spread of information across networks. This will include the following contents: Diffusion in Networks, Epidemic Models, SI, SIS, Profile Threshold Models, Independent Cascades, Information Spread Analysis, Influence Maximization, Opinion Dynamics Models, Voter, Q-Voter. Hands-on with large-scale network analysis using tools and libraries, including - NdLib, iGraph, SNAP, NetworKit, and case studies with online social networks.	8	5	10
	Total	**30**	**15**	**30**
Practical Sessions	Explore creation of random graphs and perform processing tasks using Python	-	-	5
	Hands-on sessions for network analysis of graph-based interconnected structures using NetworkX and NetCenLib programming			5
	Practicals on network science and graph algorithms with real-world case studies	-	-	10
	Hands-on for diffusion and network analysis using NdLib, iGraph, SNAP, NetworKit for large-scale network analysis	-	-	10
	Total Practical Sessions	**-**	**-**	**30**

Evaluation Criteria

- Minor Test: Written test [at the end of teaching of modules 1 and 2] -- 20%
- Major Test: Written test [at the end of the semester, full syllabus] -- 40%
- Practical Test: Practical test [including modules 1, 2 and 3] -- 20%
- Project-based learning: Project presentation [at end of teaching of module 4] -- 20%

Learning Outcomes

By the end of the course, students will:

- understand real-world significance of networks and graph-based modeling
  [Module 1 and 2; Minor Test]
- develop in-depth knowledge of networked structures and analysis techniques
  [Module 2 and 3; Practical Test]
- gain insights on clustering, diffusion, and prediction methods
  [Module 1, 2, 3, and 4; Project-based learning and Major Test]

Pedagogical Approach

- The course will provide knowledge and awareness on concepts of network science through classroom discussions, lectures, tutorials, and assessments.

- The course will enable students to explore different techniques of network analysis.

Reading Resources Recommended (* = suggested readings)

- * Menczer, F., Fortunato, S., & Davis, C. A. (2020). *A first course in network science*. Cambridge University Press.
- * Hexmoor, H. (2014). *Computational network science: an algorithmic approach*. Morgan Kaufmann.
- * Deo, N. (2016). *Graph theory with applications to engineering and computer science*. Courier Dover Publications.
- * Lewis, T. G. (2011). *Network science: Theory and applications*. John Wiley & Sons.
- West, D. B. (2001). *Introduction to graph theory* (Vol. 2). Upper Saddle River: Prentice hall.
- Hamilton, W. L. (2020). *Graph representation learning*. Morgan & Claypool Publishers.
- Jackson, M. O. *Social and Economic Networks*. Princeton University Press.
- Gross, J. L., Y., J (2013). *Handbook of Graph Theory*. CRC press.
- Bollobás, Béla. *Modern Graph Theory* (2013). Springer Science & Business Media.

Student Responsibilities

The students are required:

- To be regular and attentive in theory classes and lab sessions
- To come prepared with readings that would be given in the theory class
- To come prepared in lab with readings from respective theory concepts taught in the class
- To participate in the day-to-day lab activities
- To incorporate real-word datasets as case-studies in project-based learning

Course Designed by:

- Dr Adwitiya Sinha, Associate Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by following reviewers:

- Dr R.K. Brojen Singh, Professor, School of Computational and Integrative Sciences, Jawaharlal Nehru University, New Delhi
- Dr Nanhay Singh, Professor, Department of Computer Science and Engineering, Netaji Subhas University of Technology, New Delhi

Course Title: Open Source Programming			
Course Code:	**No. of credits: 4**	**L-T-P:** 30-15-30	**Learning hours: 60**
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite (if any): Problem-Solving and Python Programming (UDS 102) and Fundamentals of Information Technology (UDS 104)			
Department: Natural and Applied Sciences			
Course Coordinator:		**Course Instructor:**	
Contact Details:			
Course Type: Major		**Course Offered in:** Semester 4	

Course Description

This course provides a comprehensive understanding of the methods, challenges, and tools used in open-source software development. The students will explore the significance of open-source contributions, and the collaborative dynamics to drive innovation. The course covers object-oriented programming techniques and API-based integration using open-source language, like Python, Linux, Gawk, etc. The learners will understand the significance of version control systems, like Git, to facilitate collaborative development and continuous deployment. By the end of the course, students will be equipped with the skills needed to contribute to open-source projects.

Course Objectives

- Understand the need for open-source development, and its associated challenges.
- Perform object-oriented and API-based programming with open-source language.
- Develop version control system using Git for collaborative and continuous deployments

Course Content

Module	Topic	L	T	P
1	**Introduction to Open Source Development**			
	This module highlights the significance and challenges associated with open source programming. The following topics will be addressed in this module: Introduction to open source and proprietary software, open source programming, advantages and drawbacks, evolution of Free & Open Source Software (FOSS), technical aspects of FOSS licencing and policies, threats and vulnerabilities in open source languages, evolution of open source development (GNU, Linux, Apache, etc.), vulnerabilities in open source languages, contribution guidelines to open source, managing conflicts and collaboration in open source projects. Hands-on with open-source operating system, shell programming, Regex, Regex^{+}, AWK, GAWK programming	6	3	6
2	**Object Oriented Programming using Python**			
	The focus of this module is on Python as the open-source language. This module will help the students to apply object-oriented concepts to real-world problems using Python. Following topics will be covered in this context: Basics of object-oriented programming, procedural and functional programming, unified modeling language (UML), structural UML diagrams: class, component, and deployment diagrams; behavioural UML diagrams: state, use case, sequence, and activity diagrams. Functions in Python, basic syntax of class, accessing class with objects, constructor method, class	10	4	8

	methods, static methods, encapsulation, inheritance, polymorphism. Hands-on with object-oriented Python programs and practice with UML diagrams.			
3	**Open Source APIs using Python Programming**			
	The purpose of this module is to introduce the usage of open-source APIs using advanced Python programming. The topics to be covered in this module include: Automation in Python, email automation, Google search automation, API programming, Practice with public open-source APIs, like - Scopus, OpenAI, Twitter/X, NASA, OpenWeatherMap, DataGovIndia, NewsAPI, GitHub, and Spotify API. Building dashboards, static and dynamic dashboards, interactive dashboards, integrating dashboards with APIs, case study with large-language models and generative AI, like ChatGPT and Llama.	6	4	8
4	**Version Control using Git Programming**			
	This module encompasses through the importance of versioning in open-source programming using Git. This module will include the following contents: Version control overview, types of version control systems, centralized and distributed, introduction to git, features, git commands, tracking changes, branching, visualizing Git process using GitFlow, commit graphs, resolving conflicts, forking, cloning, Git push and pull requests, working with GitHub and GitLab, continuous integration and continuous deployment (CI/CD) pipelines. Practical with Git programming, creating GitHub profile, building capstone projects, and uploading on GitHub.	8	4	8
	Total	**30**	**15**	**30**
Practical Sessions	Hands-on with shell programming, Regex, Regex+, AWK, GAWK	-	-	6
	Practice UML diagrams and programming with Python classes, objects, constructors, encapsulation and data hiding, inheritance, polymorphism			8
	Practical session with open-source APIs in Python, building dashboard, LLMs	-	-	8
	Hands-on session with Git version control, Git commands, and GitHub	-	-	8
	Total Practical Sessions	**-**	**-**	**30**

Evaluation Criteria

- Minor Test: Written test [at the end of teaching of modules 1 and 2] -- 20%
- Major Test: Written test [at the end of the semester, full syllabus] -- 40%
- Practical Test: Practical test [including modules 1, 2 and 3] -- 20%
- Project-based learning: Project presentation [at end of teaching of module 4] -- 20%

Learning Outcomes

By the end of the course, students will:

- develop understanding of the need for open-source software development [Module 1 and 2; Minor Test]
- perform object-oriented programming using Python as open-source language [Module 2 and 3; Practical Test]
- explore open-source API-based programming and version-control using Git [Module 1, 2, 3, and 4; Project-based learning and Major Test]

Pedagogical Approach

- The course will provide knowledge and awareness on concepts of open-source and Git programming through classroom discussions, lectures, tutorials, and assessments.
- The course will enable students to explore different techniques of object-oriented programming

aspects, using Python open-source language.

Reading Resources Recommended (* = suggested readings)

- * Aho, A. V., Kernighan, B. W., and Weinberger, P. J. (2023). *The AWK programming language*. Addison-Wesley Professional.
- * Lott, S. F., and Phillips, D. (2021). *Python Object-Oriented Programming*: Build robust and maintainable object-oriented Python applications and libraries. Packt Publishing Ltd.
- * Dawson, C., and Straub, B. (2016). Building tools with GitHub: Customize your workflow. O'Reilly Media, Inc.
- * Liberty, J., and Galloway, J. (2021). *Git for Programmers*: Master Git for effective implementation of version control for your programming projects. Packt Publishing Ltd.
- Robbins, A. (2001). *Effective Awk Programming*: Text Processing and Pattern Matching. O'Reilly Media Publication.
- Ebrahim, M., and Mallett, A. (2018) *Mastering Linux Shell Scripting*. Packt Publishing.
- Goldwasser, M. H., and Letscher, D. (2008) *Object-oriented programming in Python*. Pearson Prentice Hall
- Buelta, J. (2020) *Python Automation Cookbook*. Packt Publishing.
- Chacon, S., and Straub, B. (2014) *Pro Git*. Apress.

Student Responsibilities

The students are required:

- To be regular and attentive in theory classes and lab sessions
- To come prepared with readings that would be given in the theory class
- To come prepared in lab with readings from respective theory concepts taught in the class
- To participate in the day-to-day lab activities
- To incorporate real-word datasets as case-studies in project-based learning

Course Designed by:

- Dr Adwitiya Sinha, Associate Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by following reviewers:

- Dr D. K. Lobiyal, Professor, School of Computer and Systems Sciences, Jawaharlal Nehru University, New Delhi
- Dr. Ela Kumar, Professor, Department of Computer Science and Engineering, Indira Gandhi Delhi Technical University for Women, New Delhi

Course Title: Time Series Analysis in Data Science			
Course code:	**No. of credits: 4**	**L-T-P: 34-10-32**	**Learning hours: 60**
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Major		**Course offered in:** Semester 4	

Course Description: The course provides an in-depth understanding of time series analysis, equipping students with skills in stationarity, noise, trend analysis and advanced forecasting techniques, supported by real-world case studies. The students will also learn to apply linear stochastic models, enhancing their quantitative skills and data-driven decision-making.

Course objectives

The course aims to provide a foundational understanding of:

- Fundamentals of time series analysis, including concepts of outlier, noise, stationarity, trend and the application of linear stochastic models.
- Various linear stochastic models and forecasting techniques, using real-world case studies to develop practical skills in making accurate time series prediction.

Course content

Module	Topic	L	T	P
1	**Fundamentals of time series data**			
	This module covers time series principles, focusing on trend, seasonality, and irregular variations, along with decomposition techniques, trend estimation, and fitting models like exponential and logistic curves. Introduction to time series data, Time series components, Univariate, Multivariate and cross-sectional time series, Data collection and sampling in time series.	4	2	2
2	**Introduction to time series data and pre-processing**			
	This module covers time series analysis concepts, Data interpretation: Descriptive statistics; Box – Plot; Interquartile range (IQR); outlier analysis single tails and double tails. Missing values and Noise removal analysis: Linear interpolation; Spline interpolation; Kalman smoothing; Last Observation Carried Forward (LOCF); Median filter. Time series analysis: Concept of Trend, Seasonality, Cycle and Residual; Methods for trend estimation; Method of semi averages; Seasonality measurement; Time series decomposition Trend analysis - Mann-Kendall test for monotonic trend and Innovative trend analysis (ITA) detects non-monotonic trends.	14	2	12
3	**Time series test and models**			
	This module introduces time series analysis, covering linear stochastic models and forecasting. Concept of stationarity and non-stationarity series; types of stationarity; Testing Methods, Invertibility, Moving Average (MA), Auto-regression (AR), and Auto regressive moving average (ARMA) models, Autoregressive Integrated Moving Average (ARIMA) Models correlograms, Autocorrelation function (ACF) for diagnostics; White noise, Independent and Identically Distributed (IID) noise in series.	10	4	10
4	**Forecasting techniques and case studies**			
	This module explores forecasting techniques and real-world case studies	6	2	8

	Holt winters method, Box-Jenkins model, Model performance and validation, Error Metrics for Forecast Evaluation (R^2, RMSE, MAPE and IA) Forecasting case studies based on real world applications.			
	Total	34	10	32

Evaluation criteria

- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 20%
- Minor Test 2: Written test [at the end of teaching of modules 3 and 4] -- 20%
- Major Test: Written test [at the end of the semester, full syllabus] -- 40%
- Practical exam: 20%

Learning outcomes

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

- Students will gain a comprehensive understanding of time series analysis, enabling them to identify key insights and patterns in datasets. [Test1, Test2, Practicals, Major Test]
- Students will learn to develop, implement, and evaluate linear stochastic time series models, including Holt-Winters and Box-Jenkins methods, and effectively apply these techniques to solve real-world problems. [Practicals, Major Test]

Pedagogical approach

- The course will be delivered through class lectures, practicals and tutorials.

Reading resources

- Montgomery, D. C., Jennings, C. L., Kulahci, M. (2011). *Introduction to Time Series Analysis and Forecasting*. Germany: Wiley.
- Brockwell, P. J., & Davis, R. A. (Eds.). (2002). *Introduction to time series and forecasting*. New York, NY: Springer New York.
- Peixeiro, M. (2022). *Time Series Forecasting in Python*. United States: Manning.
- Huang, C., Petukhina, A. (2022). *Applied Time Series Analysis and Forecasting with Python*. Switzerland: Springer International Publishing.

Journals

- Journal of time series analysis, Wiley
- International Journal of Forecasting, Elsevier
- Computational Statistics & Data Analysis, Elsevier

Student Responsibilities

The students are required to come prepared with readings that are suggested during the class and ensure timely submission of assignments. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions.

Course Designed by:

- Dr Adil Masood, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies

Course Reviewed by:

The course is reviewed by following reviewers:

- Dr Azhar Husain, Professor, Department of Civil Engineering, Jamia Millia Islamia
- Dr Vinay SP Sinha, Professor, Centre for Study and Regional development, Jawaharlal Nehru University

Course Title: Environmental Laboratory-I			
Course code:	**No. of credits: 3**	**L-T-P: 4-14-54**	**Learning hours: 72**
Pre-requisite course code and title (if any):			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Major		**Course offered in:** Semester 4	

Course Description

This course aims to provide the preliminary understanding of laboratory methods for analyzing water and soil samples. The course equips students with the skills to perform quantitative analyses of various physical, chemical, and biological parameters in water, soil, and microbiology research. Students will learn standard protocols used in environmental monitoring. Acting as a foundational course for advanced courses in subsequent semesters, it also offers students the chance to learn theoretical concepts and develop practical skills using contemporary tools and techniques necessary for environmental impact assessment.

Course objectives

The course aims to build the following basic understanding among students:

- The course is designed to develop sampling and analytical skills of the students which are required in environmental monitoring
- The students will be exposed to various standard protocols used in environmental monitoring

Course content

Module	Topic	L	T	P
1	**Introduction to Water Quality Analysis**			
	Introduction of environmental monitoring, pre-processing, collection, preservation and precaution during sampling, basic concept of quantitative techniques; Quality Assurance /Quality Control (QA/QC): precision, accuracy, Replicate Analyses, Split samples, Reference Samples, Standard samples, Spiked samples	4		
2	**Physical Water Quality parameters**			
	General understanding of alternation in the water quality through various physical water quality parameters, its causes and impact on environment and human health. Colorimetry: Importance of colour for aquatic, home and industrial uses; pH determination: Litmus paper test and Benchtop method, environmental significance of pH in water sample; solids: total, dissolved and suspended solids, settleable solids; Turbidimetry: importance and uses; turbidity measurement and its environmental significance; electrical conductivity		3	9
3	**General Water Quality parameters**			
	Study of sources and nature, environmental significance, methods of measurement of general water quality parameters. Acidity and Alkalinity: Titrimetric method for the determination of the carbonate, bicarbonate and hydroxide alkalinity; Determination of type and extent of acidity; Hardness: EDTA method for estimation of total hardness; Chlorides: Argentometric method		4	15
4	**Wastewater Quality Analysis**			
	Environmental significance of dissolved oxygen, collection of samples for determination of dissolved oxygen, methods of determination. Dissolved oxygen (DO): Winkler Procedure for dissolved oxygen (Azide Modification) and Membrane Electrode Method for Dissolved Oxygen (DO Meter); Biochemical Oxygen Demand (BOD): estimation of BOD_3/BOD_5; Chemical oxygen Demand (COD): Open reflux method		3	16

5	**Biological Water Quality parameters**			
	Understanding of indicators of fecal contamination and the concept of indicator organisms; coliform bacteria count and its sampling: Membrane Filter Method, Multiple Tube Fermentation Method or Most Probable Number (MPN) method and its environmental relevance Bacterial and microscopical characteristics, common indicator bacteria; determination of total coliform and fecal coliform for drinking and wastewater samples		1	4
6	**Soil Analysis**			
	Understanding of soil characteristics by physio-chemical parameters and its importance for agricultural productivity Soil moisture & soil pH determination; Soil organic content determination (Walkley-Black method); N, P, K estimation; Electrical conductivity for the determination of dissolved salts in the soil		3	10
	Total	4	14	54

Evaluation criteria

- Test 1: Practical exam and records [at the end of the semester, full syllabus] -- 40%
- Test 2: Spotting and Assignment [at the end of the semester, full syllabus] -- 30%
- Test 3: Viva [at the end of the semester, full syllabus] -- 30%

Learning outcomes

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

- trained in analytical and conceptual skills required for environmental research (water and soil). [Test 1]
- correlate environmental impacts and field processes. [Test 2]
- gain the conceptual clarity, theoretical concept and practical session. [Test 3]

Pedagogical approach

- The course will be delivered through class lectures and real time data.
- The course includes majorly the practical analysis in the laboratory.
- The course will also include the guided project work and its presentation.

Reading materials

Required text

- APHA (1980) Standard Methods for the Examination of Water and Wastewater Published by American Public Health Association, 15th ed.

Suggested readings

- Radojevic, M., Bashkin, V. N. (2006). *Practical Environmental Analysis*. United Kingdom: Royal Society of Chemistry.
- Hounslow, A. (2018). *Water quality data: analysis and interpretation*. CRC press.
- *Laboratory Analytical Techniques Series (LATS)*, published by CPCB.
- Wagner, T. P., & Sanford, R. M. (2018). *Environmental science: Active learning laboratories and applied problem sets*. John Wiley & Sons.
  Wells, E., Brooks/Cole. (2009). *Lab Manual for Environmental Science*. United States: Brooks/Cole.

Websites

- Central Pollution Control Board (CPCB) website for real time data collection (https://cpcb.nic.in/index.php)
- India Water Resources Information System website for surface and subsurface water information (https://indiawris.gov.in/wris/#/home)

Journals

- Environmental Science and Pollution Research
- Environmental Management

- Environmental Pollution
- Environmental Science and Technology

Student Responsibilities

The students must be present in the practical class before starting of the practicals. The attendance during the practical analysis in laboratory is compulsory to learn the handling of glassware, chemicals, instruments etc.

Course Designed by:

- Dr. Chandrashekhar Azad Vishwakarma, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies

Course Reviewers:

The course is reviewed by following reviewers:

- Dr. Prasant Singh, Professor, Department of Chemistry, D.A.V. (P.G) College, Dehradun, Uttarakhand
- Dr. Dinesh Mohan, Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi

Course Title: Sustainable Natural Resource Management			
Course code:	**No. of credits: 4**	**L-T-P: 38-22-0**	**Learning hours: 60**
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Major		**Course offered in:** Semester 4	

Course Description

This undergraduate course on Sustainable Natural Resource Management (NRM) focuses on the principles and practices of managing natural resources sustainably. The course will emphasize the integration of ecological, economic, and social factors in resource management, moving beyond mere conservation to encompass broader NRM principles. It aims to equip students from diverse academic backgrounds with the necessary skills and knowledge to effectively manage natural resources while considering ecological integrity, economic viability, and social equity.

Course objectives

The course aims to build the following basic understanding among students:

- Understand the fundamental principles of sustainable natural resource management.
- Analyze the interactions between human activities and natural resources.
- Develop strategies for effective and sustainable management of various natural resources.
- Evaluate the socio-economic implications of natural resource management decisions.

Course content

Module	Topic	L	T	P
1	**Introduction to Natural Resource Management**			
	Being an introductory module, this builds a general foundation by highlighting the following basic concepts relevant to NRM: Brief introduction to natural resources and associated issues – renewable and non-renewable resources (forest resources, water resources, mineral resources, food resources, energy resources, land resources), overview of NRM concepts, Tragedy of the Commons, Ostrom's eight principles for sustainable governance of Common-Pool Resources, importance of sustainability in resource management and roles of an individual, Human Development Index	6	0	0
2	**Key Principles of Sustainable NRM**			
	This module introduces the key principles of sustainable NRM, focusing on creating a balance between all dimensions. The contents of this module are as follows: Key principles of sustainable NRM: sustainability, equity, participation, adaptive management, precautionary principle, trusteeship of natural resources, collaboration and engagement, evidence-based decision making, long-term perspective, building resilience; Ecological principles: ecosystem functions and services; Biodiversity and its role in sustainability; 12 Principles of ecosystems approach to integrated management of resources highlighted by the Convention on Biological Diversity (CBD)	8	0	0
3	**Economic Aspects and Social Dimensions of Sustainable NRM**			
	This module introduces students to the economic aspects and social dimensions of NRM. The contents of this module are as follows: Resource economics fundamentals, renewable resources – optimal harvest, non-renewable resources – optimal depletion; Allocation of natural resources; Valuation of ecosystem services; Natural resource funds; Community involvement and stakeholder engagement; Social equity in resource distribution; Human rights and company-community agreements; Traditional Ecological Knowledge – global and Indian perspectives; Community resource management practices; Conflict resolution in NRM: addressing conflicts over resource use	8	4	0

4	**Governance and Policy Frameworks for Sustainable NRM**			
	This module introduces basic idea of governance models, strategies and policy frameworks for managing natural resources as covered under the following topics: Regulatory frameworks for NRM; Allocation of rights; Natural resources and the broader governance framework, international governance initiatives; Role of institutions in sustainable NRM; Transparency and accountability; Evidence-driven policy reforms; Resource Governance Index; Revenue sharing and decentralization; Legal and regulatory frameworks for extractive industries; State-owned enterprises: role and governance	8	2	0
5	**Planning and Best Practices for Sustainable NRM**			
	This module exposes students to the various planning aspects and some of the best practices for sustainable management of natural resources. The contents of this module are as follows: Integrated land use planning: strategies for land use optimization, balancing development and conservation needs; Water resource management: principles of sustainable water management, water scarcity and management strategies; Forest management practices: Sustainable forestry techniques, community-based forest management models; Sustainable management of bioresources; Soil conservation: importance of soil health in NRM, best practices for soil preservation and quality enhancement	8	6	0
6	**Case Studies in Sustainable NRM**			
	This module introduces global best practices and current efforts in bringing innovative practical applications of sustainable NRM principles in various environmental settings and scenarios. It also enables them to develop an understanding of the problems currently being faced during their implementation. Analysis of successful NRM initiatives globally, including Indian context and learnings; Case studies on global best practices for sustainably managing each resource type; Lessons learned from failures in resource management; Adaptation strategies for NRM under changing climatic regimes; Technological innovations, use of geospatial technologies for resource assessments; Data driven policy and decision support systems	0	10	0
	Total	38	22	0

Evaluation criteria

- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 15%
- Minor Test 2: Written test [at the end of teaching of modules 3 and 4] -- 15%
- Major Test: Written test [at the end of the semester, full syllabus] -- 40%
- Assignment and Presentation -- 30%

Learning outcomes

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

- understand the basics of sustainable natural resource management and synthesize learnings from all the modules. [Minor Tests, Major Test]
- think and develop holistic strategies for better management of natural resources [Tests, Assignment and Presentation]
- developed skills to summarize and articulate the learnings from case studies. [Assignment and Presentation]

Pedagogical approach

- The course will be delivered through lectures, tutorials and discussion of case studies.
- The course will also include guided assignments and associated student presentations.

Reading resources

- Anderson, D.A. (2024). *Environmental economics and natural resource management*. Routledge.
- Conroy, M. J., & Peterson, J. T. (2013). *Decision making in natural resource management: A structured, adaptive approach.* Wiley-Blackwell.
- Dasgupta P. (2001) *Human well-being and the environment*. Oxford University Press.

- Jana, B.K., & Majumder, M. (Eds.). (2010). *Impact of climate change on natural resource management*. Springer.
- Kerr J.M., Marothia D.K., Singh K., Ramasamy C., Bentley W.M. (1997) *Natural resource economics: theory and applications in India.* Oxford and IBH Company Private Limited.
- Kumar, P., Singh, R. K., Kumar, M., Rani, M., & Sharma, P. (Eds.). (2022). *Climate Impacts on Sustainable Natural Resource Management*. John Wiley & Sons, Inc.
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). *The limits to growth: A report for the club of Rome's project on the predicament of mankind*. Universe Books.
- Menon, A., Singh, P., Shah, E., Lele, S., Paranjape, S., & Joy, K. (2007). *Community-based natural resource management: Issues and cases in south Asia*. SAGE Publications.
- United Nations Conference on Trade and Development. (2020). *Natural resource management in the context of climate change*. UN. ISBN: 9789210047630

Student Responsibilities

The students are required to come prepared with readings that are suggested during the class and ensure timely submission of assignments. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions and case studies.

Course Designed By:

- Dr Amit Singh, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers

The course is reviewed by following reviewers:

- Dr Satyanarayan Shashtri, Associate Professor, School of Ecology and Environment Studies, Nalanda University, Rajgir, Nalanda, Bihar
- Dr Madhav Govind, Professor, Centre for Studies in Science Policy, School of Social Sciences, Jawaharlal Nehru University, New Delhi

Course Title: Water and Soil Pollution			
Course code:	**No. of credits:** 4	**L-T-P:** 40-20-0	**Learning hours:** 60
Pre-requisite course code and title (if any): No			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Major		**Course offered in:** Semester 4	

Course Description

This course covers the fundamental principles of water and soil pollution, focusing on the sources, types, and impacts of various pollutants. Students will explore the mechanisms of pollution transport and fate within the environment, the effects of pollution on ecosystems, pollution monitoring and assessment. The course also addresses pollution prevention, control, and remediation strategies, providing a comprehensive understanding of how to manage and mitigate the impacts of pollution on water and soil resources.

Course objectives

The course aims to build the following basic understanding among students:

- various sources of water and soil pollution and classification of pollutants
- interpretation of pollutant movement through water and soil environments
- knowledge of sampling methods, bioindicators, analytical techniques for detecting and quantifying contaminants in water and soil
- familiarity with the strategies for mitigating pollution, including water treatment technologies, soil remediation methods and best management practices

Course content

Module	Topic	L	T	P
1	**Introduction to water and soil pollution**			
	This module introduces key concepts of pollution in water and soil, including definitions, types, sources, and the environmental impacts of pollutants. Global water distribution; sources of water and soil pollution; historical context and major soil and water pollution events. Types of soil pollutants: physical, chemical, and biological; mining related soil pollution: mine overburden, mine tailing acidity. Types/class of water; water quality parameters; sewage pollution; industrial pollution; thermal pollution; marine pollution; agricultural pollution; urban runoff and storm water pollution leading to eutrophication process.	12	2	
2	**Transport, fate, monitoring, and assessment of water pollution**			
	This module covers the movement and degradation of water pollutants in subsurface flow and groundwater introducing models like Darcy's Law, and techniques for analysing pollutants. Darcy's Law; processes governing pollutant transport; factors influencing pollutant behaviour; residence time; biological and temperature stratification; lake turn over; N/P cycles; fate of pollutants in water bodies; POPs and PBTs; monitoring techniques for analysing pollutants.	8	2	
3	**Transport, distribution, and deposition of soil pollutants**			
	Students learn about the mechanisms of pollutant transport in soil and the retention of pollutants in different soil types, emphasizing how different factors influence pollutant behaviour and environmental risk. Pollutant transport in soil; retention of pollutants in different soil types; mobility, bioavailability, and toxicity of different soil contaminants; metal cycles (Hg/As/Cr); degradation of organic pollutants such as pesticides and POPs.	8	2	

4	**Pollution prevention, control, and remediation strategies**			
	This module covers strategies for pollution prevention and remediation of water and soil, and relevant laws and policies. Water and soil quality standards and guidelines; role of laws, policies, and international treaties in pollution control and prevention; best management practices in agriculture, industry, and urban planning; water treatment technologies; soil remediation methods including physical chemical and biological methods; role of remote sensing techniques and sensors in tracking the pollutant distribution and exploring remediation techniques for water and soil pollution.	12	2	
5	**Case studies of water and soil pollution**			
	Students will explore different case studies focussing on interconnected challenges of water and soil pollution, emerging contaminants, health impacts, and sustainable solutions. Case studies and visit to nearby polluted sites and urban soil pollution hot spots for understanding interlinkages of water and soil pollution, impact of renewable energy on water and soil conservation, wastewater and fecal sludge pollution and health impacts, emerging contaminants like microplastics and pharmaceuticals.		12	
	Total	40	20	

Evaluation criteria

- Minor Test I: Written test [at the end of teaching of modules 1, 2] -- 20%
- Minor Test II: Written test [at the end of teaching of modules 3, 4] -- 20%
- Major Test: Written test [at the end of the semester, full syllabus] -- 40%
- Assignments/Presentations on case studies: 20%

Learning outcomes

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

- understand the key concepts: learn the key concepts, definitions, and terminology related to water and soil pollution and identify various sources and types of water and soil pollutants [Minor Test I and Major Test].
- gain analysis and investigation skills: learn analytical methods for assessing the quality of water and soil, determine the transport and fate of pollutants in water and soil environments [Minor Test I, Minor Test II and Major Test].
- evaluate and assess: critically assess the effectiveness of various pollution monitoring and assessment techniques, evaluate existing pollution prevention and remediation strategies, considering their environmental sustainability and effectiveness [Minor Test II and Major Test].
- develop critical thinking and problem-solving skills: propose innovative solutions for mitigating water and soil pollution, integrating knowledge from various disciplines and design comprehensive management plans that address pollution sources, impacts, and prevention measures [Assignments/Presentations].

Pedagogical approach

- The course will be delivered through lectures, tutorials, and discussion of case studies.

Reading materials

- Pani, B. (2018). *Textbook of Environmental Chemistry*. (2nd ed.). I.K. International Publishing House Pvt. Ltd.
- Manahan, S.E. (2010). *Fundamentals of Environmental Chemistry*. (9th ed.). Taylor & Francis.
- Mirsal, I.A. (2008). *Soil pollution. Origin, Monitoring and Remediation*. (2nd ed.). Springer.
- Brady, N.C. & Weil, R.R. (2002). *The Nature and Properties of Soils*. (13th ed.). Prentice Hall.

Journals

- Chemosphere
- Journal of Environmental Management
- Water Research
- Science of The Total Environment

Student Responsibilities

The students must attend the classes regularly and ensure timely submissions of tutorials and assignments. Their other responsibilities include feedback and discipline in the class.

Course Designed by:

- Dr. Saumya Arya, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies
- Dr. Ranjana Ray Chaudhuri, Associate Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies

Course Reviewers:

The course is reviewed by following reviewers:

- Dr. Sudesh Yadav, Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi
- Dr. Chirashree Ghosh, Professor, Department of Environmental Studies, University of Delhi, Delhi

Course Title: Spatial Data Modelling and Analysis			
Course code:	**No. of credits:** 3	**L-T-P: 34-0-22**	**Learning hours: 45**
			L: Lecture**; T:** Tutorial**; P:** Practical
Pre-requisite course code and title (if any):			
Department: Department of Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Minor		**Course offered in:** Semester 4	

Course Description

This course is designed to equip students with the theoretical knowledge and practical skills needed to effectively manage, analyze, and visualize spatial data in various contexts. This course delves into the principles and methodologies of spatial data analysis, emphasizing the importance of geographic information systems (GIS), remote sensing, and statistical techniques in understanding spatial phenomena. Upon successful completion of the course, the students will be able to apply a range of statistical and geospatial analysis methods, such as spatial autocorrelation, interpolation, and surface analysis, to uncover patterns and relationships within spatial datasets.

Course objectives

- Develop an understanding of fundamental spatial concepts, terminology, and theories that underpin spatial data modeling and analysis.
- Develop skills in applying spatial analysis methods such as interpolation, and spatial statistics to identify patterns and relationships within spatial datasets.
- Develop proficiency in visualizing spatial data using maps and graphs, emphasizing the importance of effective communication of spatial information to diverse audiences.

Course content

Module	Topic	L	T	P
1	**Basics of Geospatial Data Modelling**			
	This module will provide an in-depth knowledge of geospatial modeling techniques. In addition, students will explore normalization methods and levels of measurement critical in geospatial analysis. Geospatial models: types and modelling: descriptive, prescriptive, and predictive	4		
2	**Concepts of Spatial Analysis**			
	The module will help students to explore how spatial relationships influence various phenomena and how these concepts can be applied in diverse fields such as geography, urban planning, environmental science, and social sciences. Introduction to algorithms and flowcharts; map algebra: operators and functions: mathematical, logical comparison and boolean; operations and functions: local, focal, zonal, and global; spatial interaction models; Key concepts of Spatial analysis: distance, adjacency, interaction, and neighbourhood	6		
3	**Point Pattern Analysis**			
	The module covers the advanced techniques for analyzing spatial distributions of points. Students will learn to identify patterns and assess spatial relationships, enabling them to draw meaningful conclusions from spatial data. Centrography; Distance based analysis: Nearest Neighbour Distance, K and L functions; Density based analysis: Quadrant, local, global and kernel, Cluster analysis: K-means Clustering, Hotspot analysis; Thiessen polygons; Spatial Autocorrelation - Moran's I	4		2
4	**Terrain Analysis**			
	The module covers the concepts of terrain analysis, their importance, and how they are applied in natural resource management. Local neighbourhood operation–slope, aspect, curvature, viewshed	2		2
5	**Network Analysis and Dynamic Segmentation**			

	The module equips students with the fundamental concepts of network analysis and dynamic segmentation, which are crucial for understanding and interpreting complex data flows within a network. Network Analysis**:** Geocoding, optimum routing, closest facilities, resource allocation; Watershed analysis: flow direction, flow accumulation, Stream Network Link; Dynamic Segmentation: route, section, events, and its application	6		10
6	**Spatial Interpolation**			
	The module delves into the theoretical foundations, methodologies, and practical applications of spatial interpolation, equipping students with the skills to analyze spatial data and make informed predictions. Regression model, Trend surface Analysis, Interpolation techniques: Local and global methods; Inverse Distance Weighting (IDW), Natural Neighbor Inverse Distance Weighted (NNIDW); Triangulated Irregular Network (TIN), Lattice Model	6		4
7	**Multi-Criteria Decision Support System**			
	The module provides insights into the methodologies and tools designed to aid decision-making in complex scenarios involving multiple conflicting criteria. Introduction to decision support systems, problem structuring and criteria definition, pairwise comparison, consistency, and sensitivity analysis; application of Multi-Criteria Decision Analysis (MCDM) - Analytical Hierarchy Process (AHP); Weighted Sum Method, Technique for Order Preference by Similarity to Ideal Solution (TOPSIS)	6		4
	Total	34	0	22
	Practical Modules			
1.	Point Pattern analysis			2
2.	Terrain analysis			2
3.	Watershed analysis			2
4.	Network analysis			4
5.	Dynamic segmentation			4
6.	Geostatistical analysis			4
7.	Multi-criteria decision analysis			4
	Total	34	0	22

Evaluation criteria

- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 20%
- Minor Test 2: Written test [at the end of teaching of module 3 and 4] -- 20%
- Major Test: Written test [at the end of the semester, full syllabus] -- 40%
- Practical Test: [at the end of the semester, full syllabus] -- 20%

Learning outcomes

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

- differentiate between different geospatial models and apply mathematical, logical, and Boolean operators to analyze spatial data. [Module 1 and 2; Minor Test 1]
- demonstrate a comprehensive understanding of the theoretical concepts underlying point pattern analysis and terrain analysis. [Module 3 and 4, Minor Test 2]
- apply optimal routing algorithms to determine the most efficient paths based on distance, time, and traffic conditions. [Module 5]
- demonstrate a comprehensive understanding of both local and global interpolation methods and their applications in spatial analysis. [Module 6]
- apply Multi-Criteria Decision Making (MCDM) techniques to real-world problems, demonstrating competence in decision-making frameworks. [Module 1-7; Major Test]

Pedagogical approach

- The course incorporates spatial data modeling and analysis while promoting student discussions through lectures and practicals.
- Students will have the opportunity to actively interact with spatial statistics tools and techniques through practical exercises and real-world applications.

Reading Resources (* = compulsory readings)

- O'Sullivan, D., & Unwin, D. J. (2010)*. *Geographic Information Analysis*. John Wiley & Sons.
- Verbyla, D. L. (2002)*. *Practical GIS analysis*. CRC press.
- Chang, K. T. (2019). *Introduction to geographic information systems, 9th Edition*. Mc Graw Hill Higher Education.
- Maguire, D. J., Batty, M., & Goodchild, M. F. (2005). *GIS, spatial analysis, and modeling*. ESRI Press ISBN 1589481305, 9781589481305
- Longley, P. (2005). *Geographic information systems and science*. John Wiley & Sons.

Suggested Readings

- Longley, Paul A., Michael F. Goodchild, David J. Maguire, and David W. Rhind. (2015). *Geographic Information Systems and Science, 4th ed.,* John Wiley and Sons, Toronto.
- Bhatta, B. (2008). *Remote sensing and GIS (Vol. 2)*. New Delhi: Oxford University Press.
- Lo, C.P., and Albert K.W. Yeung, (2007). *Concepts and Techniques of Geographic Information Systems, 2nd ed*., Pearson Education Canada, Inc., Toronto.
- Burrough, P. A., McDonnell, R. A., & Lloyd, C. D. (2015). *Principles of geographical information systems*. Oxford University Press, USA.
- DeMers, Michael N. (2008). *Fundamentals of Geographic Information Systems, 4th. ed*., John Wiley and Sons, Toronto.

Journals:

- Advances in Water Resources
- Agricultural and Forest Meteorology
- Asian Journal of Geoinformatics
- Ecological Modelling
- International Journal of Geoinformatics
- International Journal of Remote Sensing

Student Responsibilities

The students must come prepared with the readings given in the class. The students are required to participate in the discussion.

Course Designed by:

- Dr Ayushi Vijhani, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by following reviewers:

- Dr. P. K. Joshi, Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi
- Dr. Vinay SP Sinha, Professor, Centre of the Study Regional Development, School of Social Sciences, Jawaharlal Nehru University, New Delhi
- Dr. Sameer Saran, Dy General Manager (DGM) & Scientist/Engineer 'SG", Regional Remote Sensing Centre - North, NRSC/ISRO

Enclosure 9

Dear Dr. Sarangi,

I would support your decision regarding the application for extension of Mr. Tushar Saxena.

I have also been told by the Water & Energy International Journal that his paper has been accepted. I am presuming that he will get the letter from them soon.

Best Wishes
Ajay Mathur

Dear Dr. Gopal,

I am not sure if granting an extension is a wise idea. These conference presentations and certificates were anyways there. I do not have any idea about the progress of the concerned student. If this becomes a precedent this may simply continue. There is absolutely no guarantee about it. I am simply fed up with this.

Regards,
Shantanu

From: Manish Kumar Shrivastava <manish.shrivastava@teri.res.in>
Sent: Friday, December 13, 2024 12:57 PM
To: Gopal K Sarangi <gopal.sarangi@terisas.ac.in>; Shantanu De Roy <shantanu.roy@terisas.ac.in>; DG ISA <amathur@isolaralliance.org>; DoPMS <DoPMS@terisas.ac.in>
Cc: Dean Academic <dean.academic@terisas.ac.in>
Subject: Re: Request for extension for PhD thesis submission

Dear Gopal
I concur with your observation regarding forwarding the request for an extension.

Regards
Manish

Enclosure 10

<table>
<tr><td colspan="5">Course title: Intermediate Macroeconomics-II</td></tr>
<tr><td>Course code: BPE XXX</td><td>No. of credits: 4</td><td>L-T-P: 56-4-0</td><td colspan="2">Learning hours: 60</td></tr>
<tr><td colspan="5">Pre-requisite course code and title (if any): Intermediate Macroeconomics-I</td></tr>
<tr><td colspan="5">Department: Policy and Management Studies</td></tr>
<tr><td colspan="2">Course coordinator: XXX</td><td colspan="3">Course instructor: XXX</td></tr>
<tr><td colspan="5">Contact details: XXX</td></tr>
<tr><td colspan="2">Course type: Major</td><td colspan="3">Course offered in: Semester 4</td></tr>
<tr><td colspan="5">Course description:

This is a follow-up course of Intermediate Macroeconomics-I that is offered in Semester 3 of the Four-Year Undergraduate Programme. It starts with a revision of the Simple Keynesian and the IS-LM Models that are introduced to the students in Intermediate Macroeconomics-I. This is followed by discussions on the theories of expectations formations and market outcomes. These discussions will focus on the monetary and real explanations of the business cycle.
Subsequent discussions centre on the various theoretical formulations of the Phillips curve, with expectations. In these discussions, prices and wages are flexible and competition is the dominant feature in the market.
The focus of discussions shifts to the analysis of the labour and commodity markets with the relaxation of the assumptions of wage and price flexibilities, and competition in the market. The relevance of policy interventions in a rigid price (and wage) regime is an important conclusion of these discussions. This contrasts with the flexible price (and wage) regime where policies are irrelevant.
Within the ambit of policy interventions, there is a dominance of monetary policy in the New Keynesian macroeconomic thought. In this paradigm, interest rate is the monetary policy instrument rather than an exogenously given money supply, for the central bank. This is the main theme of discussion in Module 6.
In Module 7, the discussion focusses on the behaviour of the households in terms of making choices between consumption and savings and work-effort and leisure. For instance, a rise in the rate of interest motivates households to save more and consume more in the future.</td></tr>
<tr><td colspan="5">Course objectives:

• To acquaint the students with diverse macroeconomic thoughts that vary in terms of formation of expectations, nature of the market, operations of the market forces like price and wage and relevance (or irrelevance) of policies.
• To understand the impacts of inflation in the economy and society.
• To understand, theoretically, the nature and scope of policy interventions by the central bank in the modern capitalist economies, including in India.
• To understand the intertemporal consumption choices of the households.</td></tr>
<tr><td colspan="5">Course contents</td></tr>
<tr><td>Module</td><td>Topic</td><td>L</td><td>T</td><td>P</td></tr>
</table>

1.	Simple Keynesian Model and the IS-LM Model in a closed economy • Determination of output and employment • Effectiveness of fiscal and monetary policy	4	1	
2.	Theories of Expectation Formation and the Market Outcomes • Static Expectations, Adaptive Expectations and Rational Expectations • Aggregate [surprise] supply function of Robert Lucas • Technology shocks, and market outcomes • Determination of equilibrium in the market	10	2	
3.	Theories of Inflation and Analysis of the Phillips Curve • The trade-off between inflation and unemployment under static expectations • Money illusion and expectation augmented Phillips curve • Policy irrelevance under Rational Expectations	11		
4.	Output, Unemployment and Inflation • Okun's law • Effects of the growth of money supply on output, unemployment and inflation	6		
5.	The Macroeconomics of Price and Wage Rigidity • Imperfect competition and price rigidity • Labour market under wage rigidity: policy relevance under rational expectation	8		
6.	Monetary Policy in New Keynesian Paradigm • The IS-MP-IA model • Controlling of inflation: The Monetary Policy Committee and inflation targets • A theoretical critique of the monetary policy	10		
7	Intertemporal Consumption-Savings Choice • Budget constraints for two periods • Choosing consumption over two periods—interest rate and intertemporal substitution	8		
	Total (in hours)	**57**	**3**	

Evaluation criteria

1. Minor 1: Written test [after the completion of Modules 1, 2 and 3] – 30% [learning outcome 1]
2. Minor 2: Written exam [after the completion of Module 4] – 30% [learning outcome 1]
3. Major exam: Written test [after the completion of the course; based on Modules 5, 6 and 7] – 40 % [learning outcomes 1, 2 and 3]

Learning outcomes

After the completion of the course, students will develop:

1. A comprehensive understanding of diverse macroeconomic thoughts in terms of its core features, labour and commodity market outcomes, application of expectations formation and policy interventions.
2. An understanding of the role of the central bank in macroeconomic stabilization.
3. Understanding the behaviour of households with respect to consumption (and savings) and work effort across periods.

References

Textbooks

Barro, R. (1997). *Macroeconomics (5th edition)*, MIT Press.
Begg, D., Vernasca, G., Fischer, S., and Dornbusch, R. (2014). *Economics (11th edition)*, McGraw Hill Education.
Andrew, A. B., Bernanke, B.S., and Croushore, D. (2011). *Macroeconomics (7th edition)*, Pearson.
Mankiw, N. G. (2015). *Macroeconomics (9th edition)*, Worth Publishers.

CORE reading materials (module-wise):

Module 1: Simple Keynesian Model and the IS-LM Model in a closed economy
Dornbusch, R. and Fischer, S. (2010). *Macroeconomics (6th edition)*. McGraw Hill India.

Module 2: Theories of Expectation Formation and the Labour Market Outcomes
Snowdon, B., and Vane, H.R. (2006). Chapter 5 in *Modern Macroeconomics: Its Origins, Development and Current State*, Edward Elgar Publishing Limited.

Module 3: Theories of Inflation and Analysis of the Phillips Curve
Blanchard, O., and Johnson, D. R. (2013). Chapter 8 in *Macroeconomics (6th edition)*, Pearson.
Andrew, A. B., Bernanke, B.S., and Croushore, D. (2011). Chapter 12 in *Macroeconomics (7th edition)*, Pearson.
Snowdon, B., and Vane, H.R. (2006). Chapters 4 and 5 in *Modern Macroeconomics: Its Origins, Development and Current State*, Edward Elgar Publishing Limited.

Module 4: Output, Unemployment, and Inflation
Blanchard, O. (2007). Chapter 9 in *Macroeconomics (4th edition)*, Pearson.

Module 5: The Macroeconomics of Price and Wage Rigidity
Andrew, A. B., Bernanke, B.S., and Croushore, D. (2011). Chapter 12 in *Macroeconomics (7th*

edition), Pearson.

Module 6: Monetary Policy in New Keynesian Macroeconomics

Romer, D. (2000). Keynesian macroeconomics without the LM curve. *Journal of economic perspectives*, *14*(2), 149-170.

Begg, D., Vernasca, G., Fischer, S., and Dornbusch, R. (2014). Chapter 22 in *Economics (11th edition)*, McGraw Hill Education.

Azad, R. (2016). The New Keynesian Paradigm of Monetary Policy: A Theoretical Critique. *Economic and Political Weekly*, 79-85.

Reserve Bank of India (various years). *Monetary Policy Reports*, available at https://www.rbi.org.in/scripts/Annualpolicy.aspx

Module 7: Intertemporal Consumption-Savings Choice

Barro, R. (1997). Chapter 3 in *Macroeconomics (5th edition)*, MIT Press.

Branson, W. H. (2011). Chapter 12 in *Macroeconomic Theory and Policy (3rd edition)*, East-west press.

Additional reading materials:

Mankiw, N. G. (2003). *Principles of Macroeconomics*. South-Western College Publishing House.

Stiglitz, J. E. and Walsh, C. E. (2005). *Economics (4th edition)*, W. W. Norton and Company.

Carlin, W. and Soskice, D. (2015). *Macroeconomics: Institutions, Instability and the Financial System*. Oxford University Press.

Pedagogical Approach:

- Classroom lectures

Additional information (if any):

Course prepared by: Dr. Shantanu De Roy

Student responsibilities: Attendance, feedback, discipline: as per university rules.

Course reviewers:

Dr. Jyotirmoy Bhattacharya, Associate Professor, School of Liberal Studies, Dr. B. R. Ambedkar University Delhi.

Dr. Naveen Joseph Thomas, Associate Professor, Jindal School of Government and Public Policy, O. P. Jindal Global University

Course title: Intermediate Statistical methods for economics			
Course Code: TBD	**No of credits**: 4	**L-T-P:** 44-16-0	**Learning Hours**: 60
Pre-requisite course code and Title: Introductory Statistical Methods (UEO 104); Statistics for Data Science (UDS 101); Mathematics for Data Science (UDS 103); Problem Solving and Python Programming (UDS 102); Environmental Statistics (MDC 201)			
Department: Department of Policy and Management Studies			
Course coordinator:		**Course Instructor:**	
Contact Details:			
Course Type: Core		**Course offered in:** Semester 4	
Course Description: This course is a follow-up course on the introductory course on statistical methods. The course covers different types of probability distributions, introduce students to different types of samples, and to various hypothesis testing procedures. The course also provides a basic understanding of simple linear regression model.			
Course Objective: 1. Building on the foundations of previous course on statistics, the intent of this one is to familiarise students with different type so discrete and continuous probability distributions. 2. To familiarize them with joint probability distributions 3. To introduce them to the distinction between population and samples and consequently discuss the notion of hypothesis testing in case of large samples and small samples.			
Course contents:			

S.N.	Topics	L	T	P
1	Population, Samples and Processes • Sample spaces and events • Conditional probability • Independence	4	1	
2	Discrete random variables • Probability distributions of discreet random variables • Expected values • Binomial, hypergeometric and negative binomial, Poisson	8	2	
3	Continuous random variables • Probability density functions • Cumulative distribution functions • Expected values • Normal distribution • Exponential and gamma distribution	8	2	
4	Joint probability distributions • Jointly distributed random variable • Expected values, covariance and correlation	6	2	
5	Sampling • Meaning, objective and methods • Central Limit theorem	2	1	
6	Point estimation and interval estimation • type 1 errors ,type 2 errors and p-values • with sessions on R	4	2	
7	Hypothesis testing Large sample tests	6	3	

	• For specific means and proportion • For equality of means and proportions • with sessions on R			
8	Hypothesis testing small sample tests (when population standard deviation is known and when it is unknown) • For specific means and proportion • For equality of means and proportions • with sessions on R	6	3	
Total		**44**	**16**	
Pedagogical Approach: Classroom teaching and problem solving sessions				
Evaluation Criteria: Minor 1: Written examination (Module 1, 2 , and 3) – 30% Minor 2: Written examination (Module 4, 5 , and 6) – 30% Major : Written examination (Module 1 to 8) – 40%				
Learning Outcomes: At the end of the course the student must be able to: • Understand differences in various probability distributions – discrete, continuous as well as joint. (Based on Minor 1 and Minor 2) • Should be able to formulate hypothesis and be able to employ adequate testing methods. (Based on Major)				
Core Readings: Devore, Jay L. *Probability and Statistics for Engineering and the Sciences, Brooks /Cole (2009)* Freund, John E., and Benjamin M. Perles. *Modern Elementary Statistics: Pearson New International Edition*. Pearson Higher Ed, 2013.				
Module wise chapters from the core readings Module 1: Devore, Chapter 1 Module 2: Devore, Chapter 2 and 3 Module 3: Devore, Chapter 4 Module 4: Devore, Chapter 5 Module 5: Freund and Perles, Chapter 10 Module 6: Devore, Chapter 6 Module 7: Devore, Chapter 8 and 9 Module 8: Devore, Chapter 9				
Additional information : Course prepared by Dr. Aditi Singhal				
Student responsibilities: Attendance, feedback, discipline: as per university rules				

Course reviewers:

Dr. Divya Gupta, Assistant Professor, O.P. Jindal Global University
Dr. Apoorva Gupta, Assistant Professor, Hansraj College, University of Delhi

Course title: Economic History of India			
Course code: BPE XXX	**No. of credits**: 4	**L-T-P**: 60-0-0	**Learning hours:** 60
Pre-requisite course code and title (if any): None			
Department: Policy and Management Studies			
Course coordinator: XXX		**Course instructor:** XXX	
Contact details: XXX			
Course type: Major		**Course offered in:** Semester 4	

Course description:

This course brings into focus certain key aspects of the Indian economy during the colonial period. It starts with a discussion of the trends of the fundamental macroeconomic features of the Indian economy during this period. Discussions in the course then centers on the core sectors of the Indian economy. The key issues in Indian agriculture, Indian industry and foreign trade are the focus of these discussions. However, these issues and the performances of each of the core sectors cannot be isolated from the policies that were being pursued by the colonial government in India that were primarily meant to cater to the interests of the economy of colonial Britain. Critical analysis of the economic policies—fiscal, monetary, and industrial—that were pursued by the colonial administration in India with the related consequences on the levels of living of a huge mass of the population, is the focus of discussions in Module 5.

The transition of India from a colonised nation to a post-colonial state is inextricably related to the policies that were pursued by the government of the independent nation. Discussions in the last module (Module 6) revolve around the debates, prior to and at the time of independence, on the possible development trajectories of the newly independent nation. The government position on the subsequent implementation of Five-Year Plans that shaped the development trajectory was an outcome of these debates.

Course objectives:

- To understand the structure and overall performance of the Indian economy and its core sectors between 1857 and 1947.
- To acquaint the students with the macroeconomic policies that were pursued by the colonial administration and enable them to critically examine those through the impacts these policies had on the population.
- To understand the transition of a colonised nation in terms of pursuing an autonomous development trajectory after independence.

Course contents

Module	**Topic**	**L**	**T**	**P**

1.	Macroeconomic Trends in the Indian Economy • Growth rate of national income and shares of sectors in the national income • Structure of national income and workforce • Trends in real wages and the levels of living	10		
2.	Issues in Indian Agriculture • Trends in production and yield • Commercialization of agriculture • Agrarian relations in the countryside • Movements of agricultural prices	10		
3.	Issues in Indian Industry • The development of railways • De-industrialization debate • Labour relations	10		
4.	Colonial India in the World Economy • Levels and patterns of international trade • Economic relationship between colonial India and Britain	12		
5.	Economic Policy of the Colonial Government and its Consequences • Fiscal policy • Industrial policy • Monetary policy • Critical evaluation of policy interventions during famines	12		
6.	Indian Economy in Transition: From the Colonial to the Post-Colonial • Debates on the nature of Indian planning after Independence • The consensus on state-led capitalist development	6		
	Total (in hours)	**60**		

Evaluation criteria

- Minor 1: Written test [after the completion of Module 1] — 25% [learning outcome 1].
- Minor 2: Presentation [after the completion of Modules 2, 3 and 4] — 35% [learning outcome 2].
- Major exam: Written test: [after the completion of the course; based on Modules 2, 3, 4, 5 and 6] — 40% [learning outcomes 2, 3 and 4].

Learning outcomes

After the completion of the course, students will develop:

- Understanding of the performance of the Indian economy during the colonial period.
- Comprehensive understanding of the issues related to the core sectors of the economy that has repercussions in the contemporary period.
- Detailed understanding of the policies of the colonial administration and the impacts of these policies on the economy.
- Understanding of the changes in the development trajectory of the Indian economy during transition.

References

Textbooks

- Bagchi, A. K. (2008). *Private Investment in India: 1900-1939*. Cambridge University Press.
- Balakrishnan, P. (2010). *Economic Growth in India: History and Prospect*, Oxford University Press.
- Kumar, D. And Desai, M. (2008). *The Cambridge Economic History of India: Volume 2*, Cambridge University Press.
- Roy, T. (2011). *The Economic History of India: 1857-1947 (3rd edition)*, Oxford University Press.

CORE reading materials (module-wise):

- Module 1: Macroeconomic Trends in the Indian Economy
- Roy, T. (2011). Chapter 3 in *The Economic History of India: 1857-1947 (3rd edition)*, Oxford University Press.
- Krishnamurty, J. (2008). The occupational structure in D. Kumar and M. Desai (eds.), *The Cambridge Economic History of India: Volume 2*, Cambridge University Press.

Module 2: Issues in Indian Agriculture

- McAlpin, M. (2008). Price movements and fluctuations in economic activity (186-1947) in D. Kumar and M. Desai (eds.), *The Cambridge Economic History of India: Volume 2*, Cambridge University Press.
- Habib, I. (2006). Chapter 3 in *Indian Economy: 1858-1914*, Tulika Books.
- Roy, T. (2011). Chapter 3 in *The Economic History of India: 1857-1947 (3rd edition)*, Oxford University Press.
- Guha, S. (1992). Introduction to *Growth, Stagnation or Decline? Agricultural Productivity in British India*, Oxford University Press.

Module 3: Issues in Indian Industry

- Roy, T. (2011). Chapter 6 in *The Economic History of India: 1857-1947 (3rd edition)*, Oxford University Press.
- Bagchi, A. K. (2008). Chapter 14 in *Private Investment in India: 1900-1939*. Cambridge University Press.
- Habib, I. (2006). Chapter 2 in *Indian Economy: 1858-1914*, Tulika Books.

- Morris, D. Morris. (1965). Chapter 11 (Summary and Conclusions) in *The Emergence of an Industrial Labour Force in India: A Study of the Bombay Cotton Mills, 1854-1947*, Oxford University Press, University of California Press.
- Hurd, J. H. (1983). Chapter 8 in in D. Kumar and M. Desai (eds.), *The Cambridge Economic History of India: Volume 2*, Cambridge University Press.

Module 4: Foreign Trade and the Balance of Payments

- Mukherjee, A. (2010). How colonial India made modern Britain. *Economic and Political Weekly*, 45(50), 73-82.
- Roy, T. (2011). Chapter 3 in *The Economic History of India: 1857-1947 (3rd edition)*, Oxford University Press.
- Habib, I. (2006). Chapter 4 in *Indian Economy: 1858-1914*, Tulika Books.
- Chaudhuri, K.N. (1983). Foreign trade and balance of payments (1757-1947) in D. Kumar and M. Desai (eds.), *The Cambridge Economic History of India: Volume 2*, Cambridge University Press.
- Patnaik, U. (2017). Revisiting the 'drain', or transfer from India to Britain in the context of global diffusion of capitalism. *Agrarian and Other Histories: Essays for Binay Bhushan Chaudhuri, New Delhi:* Tulika Books, 277-317.
- Balachandran, G. (2016). Colonial India and the world economy, C. 1850-1940., in Chaudhury, L. et al (eds.), *A New Economic History of Colonial India*. Routledge, London and New York.

Module 5: Economic Policy of the Colonial Government and its impacts

- Bagchi, A. K. (2008). Chapter 2 in *Private Investment in India: 1900-1939*. Cambridge University Press.
- Patnaik, U., (2018). Profit inflation, Keynes and the holocaust in Bengal, 1943–44. *Economic and Political Weekly*, *53*(42), 33-43.
- Dreze, J. (1991). Chapter 1 in *The Political Economy of Hunger. Volume 2: Famine Prevention*, Clarendon Press.

Module 6: Indian Economy in Transition: From the Colonial to the Post- Colonial

- Balakrishnan, P. (2010). Chapter 2 in *Economic Growth in India: History and Prospect*, Oxford University Press.
- Patnaik, P. (1998). Some Indian debates in planning in T. J. Byres (ed.), *The Indian Economy: Major Debates Since Independence*, Oxford University Press.
- Dasgupta, C. (2016). Chapters 4 and 5 in *State and Capital in Independent India: Institutions and Accumulation*, Cambridge University Press.

Additional reading materials:

- Guha, S. (1992). *Growth, Stagnation or Decline? Agricultural Productivity in British India*, Oxford University Press.
- Chattopadhyay, R. (1987). An early British government initiative in the genesis of Indian planning, *Economic and Political Weekly*, 22(5), 19-29.
- Parthasarathi, P. (2011). *Why Europe grew rich and Asia did not: Global economic divergence, 1600–1850*. Cambridge University Press.
- Ray, R. K. (1992). *Entrepreneurship and industry in India, 1800-1947*. Oxford University

Press.
- Patnaik, U. and Patnaik, P. (2021). *Capital and imperialism: theory, history, and the present*. Monthly Review Press.
- Parthasarathi, P (2009), "Historical Issues of Deindustrialisation in Nineteenth Century South India" in T. Roy and G Riello (eds) *How India Clothed the World: The World of South Asian Textiles I500-1850*, Brill, Leiden, pp. 415-435.

Pedagogical Approach:

- Classroom lectures

Additional information (if any): None

Course prepared by: Dr. Shantanu De Roy

Student responsibilities: Attendance, feedback, discipline: as per university rules.

Course reviewers:

Prof. C. Saratchand, Department of Economics, University of Delhi.
Mr. Saumyajit Bhattacharya, Associate Professor, Department of Economics,
Kirori Mal College, University of Delhi.

Enclosure 11

Course title: Business Communication-II			
Course code:	**No. of credits:** 2	**L-T-P:** 16-14-0	**Learning hours:** 30
Pre-requisite course code and title (if any): Communication Skills and Technical Writing			
Department: Policy and Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course description

Students in the technology professions are proficient in their particular disciplines, but often unable to articulate their views strongly and scientifically. They face challenges in writing effective reports and scientific publications (research papers).

This course continues from business communication 1 but with an emphasis on understanding and practicing the communication skills in holistic manner viz. verbal, non-verbal, written visual and listening). In all forms of communication, the process begins with the understanding the audience which forms the basis of the start of the process itself. The course is designed to be taught in work shop mode ensuring the practice of learned skills either individual or group work. By ensuring that the students have several opportunities to speak in the class and are exposed to the requirements of adjusting communication in different settings and audience across occasions and cultures.

Course objectives

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

Understand the importance of various forms of communication (verbal, non-verbal, written, visual and listening)

Know the initiation of the communication begin with the "understanding the audience"

Be more confident in speaking in front of an audience

Principles of Negotiation and Persuasion Techniques

Understand how cultural difference impact communication? and still be able to communicate effectively

Course content

Module	Topic	L	T	P
1.	A**. Deciding Communication Methods and Channels–**Understanding Audience **B. Revisiting Kinds of Communication Skills** **Verbal-** Act of speaking (offline and online modes), choice of words and arranging **them eff**	6	4	

	Non-Verbal- Body Language, Facial expressions Eye Contact, etc **Written** -Effective use of written words to convey the message-emails, memos, reports, social media posts etc. **Visual-**effective use of presentations, paintings, drawings, etc Listening			
2.	**Understanding and Practicing Persuasion Skills** a) Communication b) Emotional Intelligence c) Active Listening d) Logic and Reasoning e) Interpersonal skills f) Negotiation **(Role Plays)**	4	4	
3.	**Negotiation - A Communication focus** 1. Negotiation Fundamentals 2. Negotiation Preparation 3. Value creation and value claiming 4. Peer assessment 5. Negotiation Process **(Role Plays)**	4	4	
4.	**Managing cross cultural communications** **(a)** Language, value systems, perceptions, philosophies (b) Time and space (c) Fate and personal responsibility Case study	2	2	
	Total	**16**	**14**	**0**

Evaluation criteria

- Detailed Group Presentations: 20%
- Group Assignments including Role Plays: 30%
- End Term: 50%

Learning outcomes

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

- Be more confident in speaking in front of an audience
- Understand how cultural difference impact communication and be able to bridge the gap
- Understand the power of persuasion and storytelling in business setting and learn how to use it
- Have an understanding of negotiations.

Pedagogical approach

- Lectures
- Role Plays (Module 2 & 3)
- Case Studies (Module 4)

- Student Presentations for module 1

Materials

Required text

- Beer D. (1991) *Writing and Speaking in the Technology Professions: A Practical Guide***,** Wiley-IEEE Press.
- Markel M. (2009) *Technical Communications*, 9th Edition, Bedford/St Martin's.
- Daly, John, and Isa Engleberg. "Coping with Stage fright." *Harvard Management Communication Letter* 2, No. 6, (June 1999), 1-4.
- Getting to Yes: Negotiating Agreement without Giving in. Roger Fisher, William L. Ury and Bruce Patton. Penguin Books
- Mandal S.K. Effective Communication and Public Speaking. Jaico Publishing
- The Seven Myths of Win-Win Negotiations, Horacio Falcao
- Beebe, S.A & Beebe S.J (2012) Public Speaking: An Audience Centred Approach (8th Edition) Boston Pearson Publishers
- Jaffe,C.I (2013) Public Speaking : Concepts and Skills for a Diverse Society (7th Ed) Boston. Cengage Learning

Additional information (if any)

Course Prepared by: Prof. Neeraj Sharma

Course Reviewers:

1. Dr. Ramandeep Kaur, Associate Professor, School of Management, GD Goenka University, Gurgaon- 122103, Haryana
2. Dr. Nandita Sharma, Assistant Professor, University of the People

Course title: Business Economics (Part -I)			
Course code:	**No. of credits:** 3	**L-T-P**: 32-13-0	**Learning hours:** 45
Pre-requisite course code and title (if any): None			
Department: Policy & Management Studies			
Course coordinator(s): Dr. Parul Behl		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** Semester 2	

Course Description

The **Business Economics** course is designed to provide undergraduate students with a foundational understanding of both microeconomic principles and their practical application in the business world. The course focuses on how economic concepts such as demand and supply, elasticities of demand and supply affect the business decisions in both domestic and global markets.

Through this course, students will learn to analyze market dynamics, evaluate business strategies, and assess the economic environment's impact on business performance. By the end of the course, students will be equipped with the analytical tools necessary to make informed business decisions and respond to economic challenges.

Course objectives

This course is designed for the BBA students to build a strong foundation in Business Economics. The course provides a balanced blend of theoretical knowledge and practical application equipping students with the skills needed to navigate complex economic landscapes. This course typically revolves around understanding the economic principles and their application in business decision making. The common objectives are to:

Understand the basic economic concepts. This course aims to provide students with a solid foundation in fundamental economic theories such as demand and supply, theory of consumer and producer behaviour.

Apply the economic principles in business. This course will help in the application of business economics concept to solve real world business problems.

Enable students to analyze in detail the theories of consumer behaviour and producer behaviour to formulate effective business strategies.

The overall goal is to provide students with the tools to analyse individual and firm behaviour in markets and understand price mechanism.

Course content

Module	Topic	L	T	P
1	**Introduction to Business Economics** Meaning and relevance of economics in the business world. Philosophy of Business Economics. The economic problem – scarcity and choice; central problems of an economy; production possibility curve. Case-study.	4	2	0
2	**Demand Analysis** Meaning of Demand, law of demand, demand function, demand schedule and demand curve, Movement and shift of demand curve; Individual and market demand curve. Consumer Surplus.	6	2	0
3	**Elasticity of Demand and other applications** Meaning of Elasticity of Demand, Determinants of elasticity of Demand, Types of Elasticity of Demand, Price elasticity formula and its	6	2	0

	applications (elastic, inelastic, unitary elastic, perfectly elastic and perfectly inelastic demand); Income elasticity and its applications (normal goods, inferior goods and Giffen goods), cross- price elasticity (substitutes and complimentary goods). Elasticities in different industries with case studies.			
4	**Supply Analysis** Meaning of supply, law of supply, supply function, supply schedule and supply curve. Movement and shift of supply curve with diagram, producer surplus; determination of market equilibrium.	4	2	0
5	**Elasticity of Supply and its applications** Elasticity of supply; meaning, importance and formula; determinants of elasticity of supply. Applications in business with case- studies.	4	2	0
6	**Theory of Consumer Behaviour** Ordinal approach; Cardinal utility approach, law of diminishing marginal utility, Utility theory, indifference curve approach- indifference curve, properties of indifference curves, budget line and consumer's equilibrium	4	2	0
7	**Theory of Production** Theory of production- factors of production, basic concepts, production function, law of variable proportion , returns to scale, producer's equilibrium	4	1	0
	TOTAL	**32**	**13**	

Evaluation criteria:

The break-up of the evaluation procedure is as follows:

- Minor Test 1: Quizzes: 20%
- Minor Test 2: Test/ Assignment: 20%
- Projects: 20%
- Major Exam: Written Examination: 40%

Learning outcomes:

After successful completion of the course, students will be able to:

- **Understand** and explain core economic concepts, including market mechanisms, price determination, and macroeconomic indicators.
- **Apply** economic principles to analyze business problems, forecast trends, and assess market behaviour.
- **Evaluate** the impact of government policies, inflation, and unemployment on business environments.
- **Develop** strategies for business decisions based on economic trends and global market conditions.

Pedagogical approach

The course will be delivered through lectures and tutorials.

References:

- Mankiw, N. G. (2021). *Principles of economics*. Cengage Learning.
- Mohana, K. R., & Patro, C.S. (2023). Managerial Economics. IK International Pvt. Ltd.

Additional Readings

- Ahuja, H. L. (2017). *Advanced economic theory*. S. Chand Publishing
- Salvatore, D. (2019). *International economics*. John Wiley & Sons

Additional information (If any): None

Students Responsibilities: Class attendance, timely submission of assignments and other

projects.

Prepared by: Dr. Parul Behl

Course Reviewers:

1. Dr. Anish Gupta, Associate Professor, Delhi School of Economics, University of Delhi.
2. Dr. Ganita Bhupal, Associate Professor, Rajdhani College, University of Delhi.

Course title: Business Economics (Part-II)			
Course code:	**No. of credits:** 3	**L-T-P**: 32-13-0	**Learning hours:** 45
Pre-requisite course code and title (if any): None			
Department: Policy & Management Studies			
Course coordinator(s): Dr. Parul Behl		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** Semester 2	

Course Description

The **Business Economics** Part 2 is an extension to Business Economics Part- 1. This course is further designed to provide the undergraduate students with a foundational understanding of various cost concepts and market structures in economics. This course will further enlighten students regarding the basic understanding of cost estimation in various kinds of market structures and their relevance in the real- world.

Through this course, students will learn to analyze market dynamics, evaluate business strategies, and assess the economic environment's impact on business performance. By the end of the course, students will be equipped with the analytical tools necessary to make informed business decisions and respond to economic challenges.

Course objectives

This course is designed for the BBA students to build a strong foundation in business economics. The course provides a balanced blend of theoretical knowledge and practical application equipping students with the skills needed to navigate complex economic landscapes. This course typically revolves around understanding the economic costs and their application in business decision making. The common objectives are to:

Understand the basic economic costs. This course aims to provide students with a solid foundation in cost analysis in business and economics.

Apply the economic principles in business. This course will help in the application of the theory of costs to solve the real-world business problem such as price and output decisions in various kinds of market structures.

Enable students to analyze market conditions, competition, and consumer behaviour to formulate effective business strategies.

The overall goal is to provide students with the tools to analyse firm behaviour in different markets and understand price mechanism.

Course content

Module	Topic	L	T	P
1.	**Cost Concepts in Business Economics** Introduction to costs in business economics, importance of cost analysis in business and economics, explicit vs implicit costs; economic cost vs accounting costs with relevant examples.	6	2	0
2.	**Categories of Costs** Basic concepts, opportunity and sunk cost; cost-curves (fixed and variable) , shape and behaviour of cost curves , short-run average and marginal cost curves, short run vs long run cost curves, long run cost curve as envelope of short run cost curves, relationship between marginal cost and average cost	6	2	0
3.	**Analysis of markets** Basic concepts of revenue, revenue curves, relationship between average and marginal curves, concept of market and main forms of market	4	2	0
4.	**Cost in different market structure**	4	2	0

	Cost behaviour in perfect competition, monopoly, monopolistic competition and oligopoly, role of costs in pricing and output decision, application of cost analysis.			
5.	**Equilibrium price and output determination under perfect competition** Equilibrium of the firm, total revenue- total cost approach, marginal revenue- marginal cost approach, price and output determination under perfect competition. Short-run and long- run equilibrium.	4	2	0
6.	**Equilibrium price and output determination under imperfect competition** Price and output determination under monopoly, monopolistic competition, and oligopoly. Short-run and long- run equilibrium.	4	1	0
7.	**Case- studies of different kinds of market structures**	4	2	0
	TOTAL	**32**	**13**	**0**

Evaluation criteria:

The break-up of the evaluation procedure is as follows:

- Minor Test 1: Quizzes/short tests: 20%
- Minor Test 2: Presentations : 20%
- Assignments/Projects: 20%
- Major Exam: Written Examination:40%

Learning outcomes:

After successful completion of the course, students will be able to:

- **Understand** and explain core economic concepts, including market mechanisms, price determination, and macroeconomic indicators.
- **Apply** economic principles to analyze business problems, forecast trends, and assess market behaviour.
- **Evaluate** the impact of government policies, inflation, and unemployment on business environments.
- **Analyze** different market structures and identify optimal pricing and output strategies for firms.
- **Develop** strategies for business decisions based on economic trends and global market conditions.

Pedagogical approach

The course will be delivered through lectures and tutorials.

References:

- Mankiw, N. G. (2021). *Principles of economics*. Cengage Learning.
- Mohana, K. R. & Patro, C.S. (2023). Managerial Economics. IK International Pvt. Ltd.

Additional Readings

- Ahuja, H. L. (2017). *Advanced economic theory*. S. Chand Publishing
- Salvatore, D. (2019). *International economics*. John Wiley & Sons

Additional information (If any): None

Students Responsibilities: Class attendance, timely submission of assignments and other projects.

Prepared by: Dr. Parul Behl

Course Reviewers:

1. Dr. Anish Gupta (Associate Professor), Delhi School of Economics, University of Delhi.
2. Dr. Ganita Bhupal (Associate Professor), Rajdhani College, University of Delhi

Course title: Business Research Methodology			
Course code:	**No. of credits:** 4	**L-T-P**: 45-15-00	**Learning hours:** 60
Pre-requisite course code and title (if any): None			
Department: Policy & Management Studies			
Course coordinator(s): Dr. Moumita Acharya		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** Semester 4	

Course Description

This course provides BBA students with a comprehensive understanding of research methods essential for making informed business decisions. In a competitive and data-driven business environment, organizations must rely on systematic research rather than assumptions to solve problems and capitalize on opportunities.

The course covers key research concepts such as research design, data collection, sampling techniques, and both qualitative and quantitative analysis, all crucial for evaluating business scenarios like market trends, consumer behavior, and operational challenges. Students will also explore the application of research methodologies to real-world business situations.

Through practical exercises and case studies, students will learn how to formulate research questions, develop hypotheses, and apply statistical tools to interpret data. The course emphasizes logical reasoning, ethical considerations, and critical thinking, enabling students to produce actionable insights that support strategic decision-making and problem-solving in business contexts.

Course Objectives

The objective of this course is to provide BBA students with a thorough understanding of research methodologies and their application in business decision-making. By integrating research techniques with practical business challenges, students will learn to design, execute, and interpret research that informs strategic business decisions.

- Develop a foundation in research design, data collection methods, and analysis techniques.
- Enhance skills in both qualitative and quantitative research methodologies.
- Learn to apply research findings to solve business problems and support decision-making processes.
- Prepare students to conduct independent research and present actionable business insights.

Course content

Module	Topic	L	T	P
1	**Introduction to Business Research** Overview of business research, its significance in strategic decision-making, and the role of research in solving business problems. Introduction to various types of research (exploratory, descriptive, causal), and how they are applied in business contexts. Case study on Motorola.	5	2	0
2	**Research Design and Formulation of Research Questions** Understanding research problems, objectives, and how to formulate clear, testable hypotheses. Overview of different research designs (qualitative, quantitative, and mixed methods) and their applications. The importance of selecting an appropriate research design to achieve research goals.	5	2	0
3	**Literature Review and Theoretical Framework** Importance of literature review in research. How to search, evaluate, and synthesize relevant academic articles, reports, and other resources. Developing a theoretical framework and conceptual models from	4	1	0

	literature to support research objectives. Techniques for structuring an effective literature review.			
4	**Sampling Methods and Techniques** Comprehensive overview of sampling techniques including random sampling, stratified sampling, and cluster sampling. Comparison of probability vs. non-probability sampling, sampling errors, and methods to determine appropriate sample size. Challenges and limitations of sampling in business research.	4	1	0
5	**Data Collection Methods** Deep dive into primary and secondary data collection techniques, including surveys, questionnaires, interviews, observations, and focus groups. Best practices for designing data collection instruments and ensuring reliability and validity in collected data. How to manage data collection logistics in field and online settings.	4	1	0
6	**Measurement and Scaling Techniques** Introduction to measurement scales used in research such as nominal, ordinal, interval, and ratio scales. Detailed understanding of Likert scales, semantic differential scales, and their applications in business research. Methods for developing and validating research instruments.	4	1	0
7	**Qualitative Research Methods** Exploration of qualitative research methods including case studies, ethnography, grounded theory, and content analysis. Techniques for data collection, coding, and interpretation in qualitative research. Application of qualitative methods to understand complex business phenomena.	5	2	0
8	**Quantitative Data Analysis and Interpretation** Introduction to key data analysis techniques including descriptive statistics (mean, median, mode, variance) and inferential statistics (t-tests, ANOVA, regression analysis). How to use statistical software for data analysis. Techniques for interpreting and communicating research findings. Application of quantitative methods to understand complex business phenomena.	7	1	0
9	**Structured Research Writing** Step-by-step guide on structuring a research report, including abstract, introduction, methodology, results, and discussion sections. The importance of clarity, coherence, and proper use of citations in research writing. Techniques for presenting research findings using visual aids like graphs, charts, and tables.	4	2	0
10	**Ethics in Business Research** Examination of ethical issues in business research, including confidentiality, informed consent, data integrity, and the researcher's responsibility to participants. How to handle conflicts of interest and ethical dilemmas in business research. Best practices for ensuring ethical compliance in research design and execution. Plagiarism Issues and AI content issues in research.	3	2	0
	TOTAL	**45**	**15**	**00**

Evaluation criteria:

The break-up of the evaluation procedure is as follows:

- Minor Test 1 : Assignment/Written Examination (Module 1, 2 & 3) - 20%
- Minor Test 2 : Research Project Assignment 1 (Module 4,5 & 6) - 20%
- Minor Test 3 : Research Project Assignment 2 (Module 7, 8, 9 & 10) - 20%
- Major Exam : Written Examination (Module 1-10) - 40%

Learning outcomes:

After successful completion of the course, students will be able to:

- Analyze research problems to formulate relevant research questions and hypotheses that address specific business issues.
- Evaluate various research methodologies and data collection techniques to determine their appropriateness for different types of business research.
- Design a comprehensive research proposal that outlines objectives, methodology, sampling strategies, and data analysis plans.
- Interpret data analysis results to draw meaningful conclusions and make evidence-based recommendations for business strategies.
- Communicate research findings effectively through structured reports and presentations, utilizing appropriate visual aids to support conclusions.

Pedagogical approach

The course will be delivered through lectures and tutorials. Application of research tools in business & related problems would also be a part of the pedagogical approach for the course. Research project-based evaluation will be included for practical application of the learnings.

References:

Textbooks:

- Business Research Methods | by Donald R. Cooper and Pamela S. Schindler, McGraw-Hill Education.
- Business Research: A Practical Guide for Undergraduate and Postgraduate Students | by Neal J. Rozenberg, Bloomsbury Publishing.

Additional Readings:

1. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches | by Creswell, John W., Sage Publications.
2. Research Methods for Business Students | by Mark N.K. Saunders, Philip Lewis, and Adrian Thornhill, Pearson.
3. Research Methodology: A Step-by-Step Guide for Beginners | by Ranjit Kumar, Sage Publications.
4. Qualitative Research Methods for the Social Sciences | by Bruce L. Berg and Howard Lune, Pearson.
5. The Essentials of Business Research Methods | by Joseph F. Hair Jr., William C. Black, and Baba V. Darden, Cengage Learning.

Additional information (If any): None

Student responsibilities: Attendance, timeline adherence for assignments, come prepared according to the session plan and as when provided.

Prepared by: Dr. Anand Jaiswal

Course Reviewers:

1. Dr. Vinaytosh Mishra, Associate Professor and Director, Thumbay Institute of AI in Healthcare, Gulf Medical University, Ajman, UAE
2. Dr. Cherian Samuel, Associate Professor, Indian Institute of Technology (BHU), Varanasi, India

Course title: Emerging Technologies and Business Application			
Course code:	**No. of credits:** 2	**L-T-P**: 20-10-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Policy and Management Studies			
Course coordinator(s): Dr. Moumita Acharya		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** Semester 2	

Course Description

The Emerging Technology and Business Applications course offers BBA students an in-depth exploration of the evolution and impact of technology in the business world. Starting with the history of industrial revolutions, this course traces the journey from early mechanical innovations in Industry 1.0 to the advanced, interconnected systems of Industry 4.0. Students will examine foundational technologies like computer systems, networks, and databases that form the backbone of business operations, as well as cutting-edge technologies like Artificial Intelligence, IoT, Blockchain, and Cloud Computing that are reshaping today's business landscape.

Through each module, students will gain an understanding of how these technologies enhance operational efficiency, support decision-making, and enable competitive advantages in various industries. The course also emphasizes the adoption and implementation of technology in business settings, addressing the benefits and challenges that accompany digital transformation. The final module highlights the ethical, social, and security implications of emerging technologies, preparing students to navigate and manage these considerations responsibly.

By completing this course, students will be well-prepared to evaluate, integrate, and leverage both foundational and emerging technologies in modern business contexts, equipping them to become effective leaders in a rapidly advancing digital economy.

Course objectives

The objective of this course is to equip BBA students with a comprehensive understanding emerging technologies, enabling them to evaluate and apply these tools effectively within modern business environments. By examining the technological evolution from early industrial advances to the latest digital innovations, students will gain insights into how technology drives business transformation, efficiency, and competitive advantage.

- Understand the historical evolution of technology, from Industry 1.0 to Industry 4.0, and its impact on business applications.
- Develop foundational knowledge of essential business technologies, such as computer systems, databases, and networks, and their roles in supporting business operations.
- Explore emerging technologies, including Artificial Intelligence, IoT, Blockchain, and Cloud Computing, and their transformative potential across different business functions.
- Analyze how technology enhances business efficiency, operational effectiveness, and decision-making, using real-world case studies and examples.
- Assess the factors influencing technology adoption in business, including cost, scalability, and organizational readiness.
- Examine the ethical, social, and security implications of emerging technologies, addressing challenges related to data privacy, cybersecurity, and societal impact.

Course content

Module	Topic	L	T	P
1	**History and Evolution of Technology in Business** Overview of industrial revolutions from Industry 1.0 to Industry 4.0, key technological advancements in each phase, transition from manual to automated processes, introduction to digital transformation,	4	2	0

	the role of technology in enabling globalization and competitive advantage, understanding business applications of technology evolution.			
2	**Foundational Technologies and Business Applications** Computer systems and networks, database management basics, office productivity software, data storage and digital communication tools, evolution of foundational business applications (ERP, CRM), transition of foundational tech into new technologies, foundational tech in supporting data management, operational efficiency, and communication in businesses.	4	2	0
3	**Emerging Technologies and Their Business Applications** Introduction to Industry 4.0 technologies, Artificial Intelligence (AI), Internet of Things (IoT), Blockchain, Cloud Computing, Machine Learning, Robotics, use cases of emerging tech in finance, marketing, supply chain, retail, and customer service, how these technologies transform business models and decision-making processes, integration of these technologies in strategic planning.	4	2	0
4	**Enhancing Business Efficiency and Technology Adoption** Operational efficiency through automation, data-driven decision-making, customer engagement improvements with technology, key considerations for technology adoption (cost, scalability, ROI, alignment with business goals), real-world examples of successful technology adoption, case studies on barriers to adoption and overcoming challenges in implementation.	5	2	0
5	**Ethical, Social, and Security Implications** Data privacy and cybersecurity, ethical implications of AI and automation, social impacts, security considerations in digital transformation, regulatory and compliance requirements, and the responsibility of businesses in using technology ethically, sustainable technology practices.	3	2	0
	TOTAL	**20**	**10**	**00**

Evaluation criteria:

The break-up of the evaluation procedure is as follows:

- Minor Test 1: Assignment/Written Examination (Module 1,2 & 3): 30%
- Minor Test 2: Assignment/Written Examination (Module 4 & 5): 30%
- Major Exam : Written Examination (Module 1-9): 40%

Learning outcomes:

After successful completion of the course, students will be able to:

- Comprehend the historical progression of technology, from Industry 1.0 through Industry 4.0, and its influence on business applications and practices.
- Demonstrate foundational knowledge of essential business technologies in supporting day-to-day business operations.
- Examine emerging technologies and assess their potential to transform business models and strategies.
- Evaluate the benefits and challenges of technology adoption in various business scenarios.
- Discuss the ethical, social, and security implications of emerging technologies in business.

Pedagogical approach

The course will be delivered through lectures. Real world examples, case studies, flip classroom approach would also be a part of the pedagogical approach for the course.

References:

Textbooks:

- Emerging Technology | by Dr. Sanjay Sharma, Khanna Publishers

Additional Readings:

- Emerging Technologies: Theories, Futures, Provocations | by Steve Jones & Nicholas Bowman, Peter Lang Inc
- Emerging Technologies / Life at the Edge of the Future | by Sarah Pink, Routledge
- Emerging technologies unveiled | Dr. Soniya Gupta et al., Anvi books & publishers

Additional information (If any): None

Student responsibilities: Attendance, timeline adherence for assignments, come prepared according to the session plan and as when provided.

Prepared by: Dr. Anand Jaiswal

Course reviewers:

1. Dr. Vinaytosh Mishra, Associate Professor and Director, Thumbay Institute of AI in Healthcare, Gulf Medical University, Ajman, UAE
2. Dr. Cherian Samuel, Associate Professor, Indian Institute of Technology (BHU), Varanasi, UP

Course title: Entrepreneurship and Startup Ecosystem			
Course code:	**No. of credits**: 2	**L-T-P**: 20-10-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Policy and Management Studies			
Course coordinator(s): Dr. Moumita Acharya		**Course instructor(s):** Shruti Jolly	
Contact details:			
Course Type: Core		**Course offered in:** Semester 4	

Course Description

This course is designed for **BBA students** to understand the foundations of entrepreneurship and navigate the broader startup ecosystem. Students will explore the essential skills and mindset required to launch and grow a successful startup. The course provides a comprehensive understanding of the entrepreneurial process, from idea generation to scaling and exiting a business.

Through interactive discussions, case studies, and real-world applications, students will gain insights into the various components of the startup ecosystem, including incubators, accelerators, venture capital, and government support systems. They will learn how to identify business opportunities, develop a viable business model, secure funding, and create a sustainable growth strategy.

By the end of the course, students will be equipped with the knowledge and tools to confidently navigate the entrepreneurial landscape, whether by launching their own ventures or contributing to the startup ecosystem. The course culminates in a final project where students present a startup idea and demonstrate their understanding of ecosystem strategies to a panel of entrepreneurs and investors.
This course emphasizes practical learning, collaboration, and strategic thinking, making it ideal for aspiring entrepreneurs or those seeking to understand the dynamics of startups and innovation.

Course objectives

The objective of this course is to equip BBA students with a comprehensive understanding of entrepreneurship and the startup ecosystem. It emphasizes both theoretical knowledge and practical skills necessary for identifying business opportunities, launching a venture, and navigating the challenges of early-stage startups. By exploring the entrepreneurial process, students will develop critical thinking and problem-solving abilities, as well as learn to leverage the resources and support available within the startup ecosystem. The course aims to build a solid foundation for aspiring entrepreneurs or individuals seeking to thrive in dynamic business environments.
Understand the key elements of the entrepreneurship process.
Explore the components of the startup ecosystem.
Gain insight into the stages of launching a startup.
Learn how to navigate the support systems available to entrepreneurs.
Analyze real-world case studies of successful startups.

Course content

Module	**Topic**	**L**	**T**	**P**

1.	**Introduction to Entrepreneurship and the Startup Ecosystem** Definition and importance of entrepreneurship. Entrepreneurial mindset and traits of successful entrepreneurs. Types of entrepreneurs (social, lifestyle, scalable startups). Challenges faced by Entrepreneurs Students will also examine the key players within entrepreneurial ecosystems, including entrepreneurs, incubators, and venture capitalists, and their contributions to innovation.	2	2	0
2.	**Startup Life Cycle and Business Models** Phases of a startup's life: Idea, validation, launch, growth, maturity Understanding different business models: Lean startup, subscription, freemium, etc. Business model canvas and value proposition design	6	2	0
3.	**Opportunity Recognition and Idea Generation** Identifying business opportunities in the marketplace, Techniques for idea generation. Assessing feasibility: Market need, customer pain points, and trends.	2	2	0
4.	**Funding Your Startup** Bootstrapping: Self-funding your startup Angel investors, venture capital, crowdfunding, and other sources Understanding equity, shares, and valuation	2	1	0
5.	**Risk Management and Failure in Entrepreneurship** Identifying potential risks: Financial, operational, and market risks. Risk mitigation strategies. Pivoting vs persevering in entrepreneurship Learning from failure: Case studies of failed startups and lessons learned. Analysing why Startups Fail	2	1	
6.	**Growth Hacking and Scaling Your Startup** What is growth hacking? Strategies to grow with limited resources Marketing and scaling strategies: Digital marketing, customer acquisition, partnerships, Measuring growth: Key metrics and performance indicators (KPIs)	3	1	0
7.	**Creating a Business Plan** Components of a business plan. Financial projections: Basic accounting, cash flow, and profit/loss. Writing a business plan: Best practices	3	1	0
	Total	**20**	**10**	**0**

Evaluation criteria:
The break-up of the evaluation procedure is as follows:

Class Participation and Quizzes :	20%
Case Study Analysis (Written Examination):	20%
Presentation on a Startup/ Entrepreneur:	20%
Major Exam : Business Plan Presentation:	40%

Learning outcomes:
After successful completion of the course, students will be able to:

Understand and apply key entrepreneurial concepts, including innovation and startup methodologies.

Identify and evaluate viable business opportunities and develop a startup from concept to execution.

Navigate support systems such as incubators, accelerators, and funding networks to aid in startup growth.

Critically analyze real-world startup case studies to extract valuable lessons and strategies for success.

Present a comprehensive startup idea, incorporating business models, market strategies, and ecosystem engagement.

Pedagogical approach
The course employs an interactive, experiential pedagogical approach, combining lectures, case studies, and hands-on projects to foster practical learning

References:
Recommended Books:

- “The Lean Startup" by Eric Ries
- "Zero to One: Notes on Startups, or How to Build the Future" by Peter Thiel
- "Business Model Generation" by Alexander Osterwalder & Yves Pigneur
- "The Startup Owner's Manual" by Steve Blank & Bob Dorf
- "Disciplined Entrepreneurship" by Bill Aulet
- "The Innovator's Dilemma" by Clayton M. Christensen.
- "Lean Analytics" by Alistair Croll & Benjamin Yoskovitz

Additional Resources:

- Startup Databases: Crunchbase, AngelList, PitchBook.
- Business Journals and Magazines: Harvard Business Review, Forbes, Inc., Entrepreneur.
- Y Combinator Website and Videos

Additional information (If any): None

Prepared by: Shruti Jolly

Course Reviewers:

1. Aditi Balbir- CEO and Founder at EcoRatings , Serial Entrepreneur
2. Sukhmani Bedi - Partner at Orios Venture

Course Title: Organizational Behavior			
Course code: BPB104	**No. of credits:** 4	**L-T-P:** 45-15-00	**Learning hours:** 60
Pre-requisite course code and title (if any):			
Department: Policy and Management Studies			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course description:

Human behaviour in the organizational and work context is a complex phenomenon. Individual behaviour at work is a result of interaction between various individual, group and organizational level factors. Understanding how individuals and groups behave at work place will not only help improve their effectiveness but also nurture the quality of work life of the individuals. This course will help students to be cognizant of these work place dynamics so that they make conscious decisions in their future work life as well as long term career.

Course objectives:

1. To understand the conceptual framework and fundamentals of Organizational Behaviour to enable and sustain high performance and effectiveness.
2. To attain and improve the ability and skills to analyse and apply critical thinking and learning skills to "real life" problems and situations concerning human behaviour.
3. To understand and identify the behavioural skills that improve individual and group performance for business effectiveness and apply them in organizational work.
4. To achieve overall development to become effective leaders & managers.

Course Content

Module	Topic	L	T	P
	Individual Dynamics (Module 1-7)			
1.	**Organizational Behavior: Foundation and Overview** Why study of Organizational Behavior is important Evolution of the field of Organizational Behavior Spectrum of Individual behaviors in organizations. Organizational behavior trends – impacting economies Contemporary challenges for organizations vis a vis OB	5	2	0
2.	**Personality** Definition and concept of personality Role of Personality determinants: Heredity and environment Personality Frame works – Big Five Determinants, traits & major personality attributes influencing Personality and Situation	5	2	0
3.	**Perception** Definition, Factors influencing perception Complete process of perception Perceptual bias and errors Rectifying perceptual errors Attribution theory Specific Applications in organizations	5	2	0
4.	**Attitude, Values and Belief** Concept and components of attitudes Types of attitudes in the workplace Importance and organization of values, Cultural values.	4	1	0
5.	**Motivation**	4	2	0

	Defining Motivation Theories of motivation (Content theory and Process theory) Motivation: From Concepts to Applications Case study discussion.			
6.	**Emotional intelligence and Stress management** Emotions, feelings and moods Workplace and emotions Emotional intelligence **Stress management:** Work stress, coping strategies and management and employee wellbeing	4	1	0
	Group Dynamics (Module 8-10)			
7.	**Team Processes** Groups and Teams Concept, nature and importance of teams Types of teams Team Building processes Team Roles Creating effective and winning teams	4	1	0
8.	**Power, Politics and Conflict** Power and politics Conflict management Organization change and negotiation skills	4	1	0
9.	**Leadership:** Introduction, Trait, Behavioural and Contingency Approaches to leadership, Transactional and Transformational leadership.	4	1	0
	Organization Dynamics (Module 11-12)			
10.	**Foundations of Organization structure and Organization culture** What is organization structure, common organizational design and employee behavior. **Organization culture** Elements of culture Types of Culture Organization culture and Ethics Cultural mindset and embracing diversity	4	1	0
11.	**Responsibility of organization towards sustainability issues** Role of organizations towards various environmental problems such as air quality, water quality, land quality. Various sustainability interventions taken by organizations	2	1	0
	Total	**45**	**15**	**0**

Evaluation criteria:
Minor Test 1: 30% (at the end of teaching of module 4)
Structure: The students will be quizzed from the first four modules of the course.
Minor Test 2: Case Analysis/ Assignment/ Presentation: 30% (at the end of teaching of module 7)
Structure: Students in groups will be assigned role plays/case study assignments.
Major Test 3: 40% (at the end of teaching of all modules)
This will be an exam based on all the modules covered in the class.

Learning Outcomes:
By the end of the course, the students should be able to:

- **LO1:** Understand the broader perspectives and importance of interpersonal dynamics and organizational behavior at the workplace.
- **LO2:** Strengthening the foundations of individual behavior with an understanding of

human personality, perception, attitude and emotions

- **LO3:** Develop an understanding of teams and groups in organizations and the process of leadership.
- **LO4:** Identify the various organization structures and their usefulness and learn to sustain an organization's culture.

Pedagogical approach: Case study, In-class discussions, Role play, Debate

Materials:

Reference books

Core text

- Organizational Behavior: Stephen R.Robbins /Tomothy A. Judge Neharika (2019)18th edition , Pearson Publisher

Additional books

- Organizational Behaviour - Fred Luthans, McGraw Hill International Edition (FL)
- Organizational Behaviour- Mirza S Saiyadain, Tata McGraw Hill, (MSS)

Additional information (if any):

Student responsibilities:

Attendance, Participation in the class exercises and case discussions, to read relevant student material before attending the class.

Prepared by:

Course reviewer(s):

1. Dr. Nidhi Mathur, Associate Professor, IMT Ghaziabad (CoDL)
2. Dr. Archana Poonia, Associate Professor, O.P. Jindal University

Course title: Human Resource Management			
Course code:	**No. of credits:** 4	**L-T-P:** 45-15-00	**Learning hours:** 40
Pre-requisite course code and title (if any):			
Department: Policy and Management studies			
Program coordinator (s): Dr. Moumita Acharyya		**Course instructor (s):** Dr. Moumita Acharyya	
Contact details: moumita.acharyya@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 4	

Course description: Human Resource Management (HRM) is a comprehensive course designed to introduce students to the strategic and operational aspects of managing human capital within organizations. This course provides a detailed understanding of key HR functions, including recruitment, selection, training and development, performance management, compensation, employee relations, and legal considerations in HR. Throughout the course, students will explore both the theoretical frameworks and practical applications of HRM in modern workplaces. They will gain insights into the role of HR in fostering organizational success through talent management, employee engagement, and creating a positive organizational culture.

Course objectives:

- Understand the fundamental principles and functions of human resource management.
- Develop strategies for effective talent acquisition, retention, and development.
- Analyze the legal and ethical considerations affecting HR practices.
- Explore the role of HR in promoting a positive organizational culture and employee well-being.

Course content

Module	Topic	L	T	P
1.	Introduction to Human Resource Management: Introduction to employee life cycle, explain human resource management; Define the functions of HRM; challenges of HRM; Explain personnel management; Relate strategic management and HRM.	4	2	0
2.	Human Resource Planning and Job analysis: Importance of workforce planning, techniques of forecasting (qualitative and quantitative), SWOT analysis. Explain the concept of job analysis, Hackman & Oldham model of job analysis, Define job description • Describe job specification • Explain the concept of job design • Identify different approaches to job design Hands-on exercise in conducting job analysis and designing job descriptions Core dimensions of job design: Job rotation, job simplification, job enrichment.	4	2	0
3.	Recruitment and Selection: Recruitment Strategies Internal vs. external recruitment Effective recruitment practices Selection Process and Techniques: Interviews, assessments, and psychometric testing, Selection decision-making. Effective talent management.	4	2	0
4.	Induction & Orientation: Purpose, Types and process of orientation; Challenges of online onboarding. Types of onboarding.	4	1	0
5.	Competency Mapping & Assessment Centers, importance of competency	4	2	0

	models, measurement tools used in assessment centers.			
6.	Employee Training and Development: Learning and Development in Organizations, Importance of employee training, Assessing training needs. Designing and Evaluating Training Programs: Training methods (on-the-job, off-the-job), Measuring training effectiveness.	4	1	0
7.	Human resource development: functions of HRD, Stages in the HRD process, types of HRD systems, effectiveness of HRD. Case study: TCS HRD System	4	1	0
8.	Career Planning and Succession Planning: Define the term career, Explain various career stages, various career anchors, concept of career planning, concept of succession planning	4	1	0
9.	Performance Management: Concept and process of PMS. Fours aspects of PMS. Performance Appraisal Systems Objectives and types of performance appraisal 360-degree feedback, Behaviourally anchored rating scale (BARS), Management by objective (MBO). Implementing Effective Performance Management Linking performance to compensation and development Addressing performance issues	6	1	0
10.	Compensation and Benefits: Compensation Strategies, Components of compensation (salary, benefits, incentives), Job evaluation and pay structures. Employee Benefits and Incentive Plans Designing effective benefit packages Linking rewards to performance Basic factors in determining pay; Benchmarking.	5	1	0
11.	HR Audit and HR Accounting Technology in HR	2	1	0
	Total	**45**	**15**	**0**

Evaluation criteria

- Minor-1: Assignment: 30%
- Minor-2: Presentation: 30%
- Major exam 3: End-Term Exam: 40%

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Minor-1 (at the end of module 4)

Structure: Students will be given a detailed case study based on an organization facing HR-related challenges (such as recruitment issues, performance management, or employee engagement). They will be required to:

Identify the key HR issues faced by the organization.

Analyse the root causes of these issues using HR concepts discussed in class.

Recommend actionable HR strategies or interventions that the organization can implement to resolve the challenges.

Evaluate the potential outcomes of their recommendations.

Minor 2 (at the end of module 8)

Structure: The students will create an **HR strategy** that aligns with the company's goals and addresses a specific HR function (e.g., recruitment, training & development, or compensation).

Groups will: Choose an HR function relevant to the organization's needs, conduct research on industry best practices, Develop a comprehensive HR strategy for the company.

Major exam 3 (End-Term Exam; at the end of all modules) This will be a closed book exam based on all the modules covered in the class.
Case Study discussion: A case may be studied keeping in mind the following:
a problem definition statement, which identifies the key issues facing management (not more than a few lines);
the objectives
alternative plan of action
an analysis section which synthesizes and integrates the answers to the key questions for the case, but does not repeat the facts themselves, and presents logical arguments in defense of both the problem definition and the recommended solution; a set of detailed recommendations and suggestions for their implementation, including how to overcome any potential issues of implementation identified by the analysis

Learning outcomes:
By the end of the course, the students should be able to:
- Understand Core HRM Functions
- Develop and Implement HR Strategies
- Enhance Employee Performance and Development
- Evaluate HR's Role in Organizational Change
- Integrate HRM with Organizational Strategy

Pedagogical approach
- Interactive Lectures
- Case discussions and presentations
- News crunching

Materials:
Textbook
- **"Human Resource Management"** by Gary Dessler
- **"Human Resource Management: Gaining a Competitive Advantage"** by Raymond A. Noe, John R. Hollenbeck, Barry Gerhart, and Patrick M. Wright
- **"Managing Human Resources"** by Scott Snell, Shad Morris, and George W. Bohlander
- **"Fundamentals of Human Resource Management"** by David A. DeCenzo, Stephen P. Robbins and Susan L. Verhulst

Additional information (if any): None

Student responsibilities: Attendance, timeline adherence for assignments, come prepared with readings / cases according to the session plan and as and when provided

Prepared by: Dr**.** Moumita Acharyya

Course Reviewers:

1. Dr. Sanyukta Jolly, Associate Professor, IILM
2. Dr. Sushma Muralie, Associate Professor, NDIM

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Course Title: Legal and Ethical Issues in Business			
Course code:	**No. of credits:** 4	**L-T-P:** 46-14-0	**Learning hours:** 60
Pre-requisite course code and title (if any):			
Department: Policy and Management Studies			
Course coordinator:		**Course instructor:**	
Contact details:		**Course offered in:** Semester 4	
Course type: Core			

Course description:

This course provides an introduction to the legal environment and ethical challenges that businesses face. It covers the fundamental legal principles, regulatory frameworks, and ethical issues that influence decision-making in business. Students will develop an understanding of how legal and ethical considerations impact businesses and the role of business professionals in fostering compliance and corporate responsibility.

Course objectives:

The objectives are:

Understand the basic principles of business law and their application to real-world scenarios.

Identify and analyze ethical issues in business contexts.

Explore the relationship between law, business, and ethics.

Develop problem-solving skills for handling legal and ethical dilemmas in business.

Appreciate the importance of corporate governance, CSR, and sustainability in modern business.

Course Content

Module	Topic	L	T	P
1.	**Introduction to Business Law** • Overview of the Legal Environment in Business • Sources of Law: Statutes, Common Law, Regulations • Court Systems and Procedures: Understanding Litigation and Arbitration • Role of Law in Shaping Business Strategies	6	2	0
2.	**Contract Law- General Principles of Law of Contract** • Essentials of a Valid Contract: Offer, Acceptance, Consideration • Types of Contracts: Express, Implied, Void, and Voidable Contracts • Breach of Contract and Remedies- Dispute Resolution: Overview about Arbitration, Conciliation and Mediation. • Case Studies on Business Contracts	6	2	0
3.	**Sale of Goods Act, 1930** Contract of sale, Meaning and difference between sale and agreement to sell Conditions and warranties Transfer of ownership in goods including sale by non-owners Performance of contract of sale Unpaid seller- meaning and Rights of an unpaid seller against the goods and the buyer	6	2	0
4.	**The Companies Act, 2013** Incorporation of a Company; Corporate Governance and Board of Directors; Meetings and Resolutions; Share Capital and Debentures; Financial Statements and Audit; Fraud Prevention and Whistleblower Protection; Mergers, Acquisitions, and Restructuring; Winding Up of Companies; Penalties and Legal Compliance	6	2	0

5.	**Industrial Relations and Labour Laws** • Industrial Relations Code, 2020: The Trade Unions Act, 1926; The Industrial Employment (Standing Orders) Act, 1946; and The Industrial Disputes Act, 1947 • Code on Wages, 2019: The Minimum Wages Act, 1948; The Payment of Wages Act, 1936; The Payment of Bonus Act, 1965; and The Equal Remuneration Act, 1976 • Social Security Code, 2020: The Employees' Provident Fund Act, 1952; The Employees' State Insurance Act, 1948; The Maternity Benefit Act, 1961; and The Payment of Gratuity Act, 1972	6	2	0
6.	**Consumer Protection Act, 2019** • Objectives of the Act; Key Definitions- Consumer; Goods; Service; Unfair Trade Practices; Deficiency in Service • Consumer Rights Under the Act; Consumer Disputes Redressal Forums • Central Consumer Protection Authority (CCPA) • E-Commerce and Online Shopping • Unfair Trade Practices and Penalties	8	2	0
7.	**Ethics in Business Decision-Making** • Ethical Theories and Approaches: Utilitarianism, Deontology, Virtue Ethics • Ethical Decision-Making Models • Balancing Profitability with Ethical Responsibility • Case Studies on Ethical Dilemmas in Business	8	2	0
	Total (in hours)	**46**	**14**	**0**

Evaluation criteria:

1. Minor 1 Exam - 30%
2. Minor 2 Exam Case Analysis/Assignment/Presentation - 30%
3. Major Exam - 40%

Test 1 (at the end of module 4)
Structure: The students will be quizzed from the first four modules of the course.
Test 2 (at the end of module 7)
Structure: The students will be required to submit a Case Analysis/Assignment and give one presentation for the same.
Test 3 (End-Term Exam; at the end of all modules)
This will be an exam based on all the modules covered in the class.

Learning outcomes:
By the end of the course, the students should be able to:
Understand concepts of fundamental business laws, including contracts, sale of goods, company law and consumer protection law and apply them in business settings.
Evaluate business decisions using ethical theories and develop problem-solving skills for handling legal and ethical dilemmas.
Understand corporate governance and the role of corporate social responsibility (CSR) in fostering ethical business practices.
Learn how businesses comply with national and international laws, focusing on global trade, labor, and environmental regulations.

Materials
Suggested Readings
Kuchhal, M.C. and Vivek Kuchhal (4th Ed. 2014) Business Law, Vikas Publishing House, New Delhi

Pathak A. (6th Ed. 2014), Legal Aspects of Business, Mc Graw Hill Education
Dr Maheshwari, S.K. and Dr Maheshwari S.N. (6th Ed. 2015), A Manual of Business Law, Himalayan Publishing House.
Singh, Avtar, Business Law, (1st Ed. 2015), Eastern Book Company, Lucknow.
N.D. Kapoor, (1st Ed. 2013), Business Law, Sultan Chand, New Delhi
Bulchandani K.R., Business Law for Management, (8th Ed. 2014), Himalayan Publishing House, New Delhi
Fernando, A.C. (2nd Ed. 2013), Business Ethics, Pearson Education.
Mandal S.K., (2nd Ed. 2012), Ethics in Business and Corporate Governance, McGraw Hill Education.
Rao, A.B. (1st Ed. 2012), Business Ethics and Professional Values, Excel Book.
Manuel G. Velasquez, (7th Ed. 2012), Business Ethics Concepts, Printice Hall of India.
Sison, Alejo G. Corporate Governance and Ethics, (1st Ed. 2010) Edward Elgar Publishing Ltd

Additional Readings:

Pedagogical Approach:

The course will be primarily taught though a combination of class lectures and interactive discussions, quizzes, and case analysis and assignment, and presentations. Guest Speakers from Legal and Business Professions will also be invited as Resource Persons

Additional information:

Student responsibilities:

Attendance; Participation in the class exercises and case discussions; and Reading of relevant student material before attending the class.

Course prepared by: Dr. Kavita

Course Reviewer(s):

1. Dr Ankur Agarwal, Associate Professor, SUSBS, Sharda University, Greater Noida.
2. Dr. Vidhi Madan Chaddha, Associate Professor, Faculty of Law, Delhi University

Course title: Management Accounting			
Course code:	**No. of credits:** 4	**L-T-P**: 45-15-00	**Learning hours:** 60
Pre-requisite course code and title (if any): None			
Department: Policy & Management Studies			
Course coordinator(s): Dr. Parul Behl		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** Semester 4	

Course Description

This course offers an in-depth exploration of management accounting principles and practices. It equips students with the knowledge and skills necessary to use accounting information for decision-making, planning, control, and performance evaluation. The course emphasizes budgeting, strategic financial analysis, and performance measurement in both traditional and modern business environments. Through case studies, students will apply management accounting tools to real-world scenarios, fostering a strategic understanding of how accounting data is used to drive business success. Moreover, the course would be helpful in the development of soft-skills such as decision- making, leadership and strategic thinking.

Course objectives

By the end of this course, students will:

Gain a thorough understanding of key management accounting concepts and practices.
Analyze cost behaviors and how they influence decision-making.
Learn to prepare and manage budgets and perform variance analysis.
Apply cost management techniques to improve business efficiency and profitability.
Evaluate performance using financial and non-financial indicators.
Utilize strategic management accounting tools such as activity-based costing and balanced scorecards.
Understand the role of management accounting in long-term business strategy.

Course content

Module	Topic	L	T	P
1.	**Introduction to Management Accounting** Definition, nature, and scope of management accounting The role of management accounting in business decision-making Differences between management accounting, financial accounting, and cost accounting	6	1	0
2.	**Cost Concepts, Behavior, and Classification** Types of costs (fixed, variable, semi-variable, and step costs) Direct and indirect costs Cost classification and its role in managerial decision-making Cost-volume-profit (CVP) analysis and break-even analysis Case- study	6	1	0
3.	**Costing Methods and Techniques** Job costing, process costing, and contract costing Marginal costing vs. absorption costing Activity-Based Costing (ABC) and Activity-Based Management (ABM) Cost control and cost reduction techniques	6	1	0
4.	**Budgeting and Budgetary Control** Types of budgets: fixed and flexible budgets Master budget and cash budget	6	1	0

	Budget preparation process Budgetary control and variance analysis Zero-based budgeting (ZBB) and incremental budgeting			
5.	**Standard Costing and Variance Analysis** Understanding standard costs Material, labor, and overhead variances Analyzing and interpreting variances The role of variance analysis in business decisions	4	1	0
6.	**Performance Measurement and Balanced Scorecard** • Financial and non-financial performance measures • Return on investment (ROI), residual income (RI), and economic value added (EVA) • Introduction to the balanced scorecard and its four perspectives (financial, customer, internal processes, learning & growth) • Key performance indicators (KPIs) • Case study	5	2	0
7.	**Decision-Making Techniques** • Relevant costing and decision-making • Make or buy decisions • Product pricing decisions • Capital investment decisions: net present value (NPV), internal rate of return (IRR), and payback period	5	2	0
8.	**Strategic Management Accounting** • Value chain analysis and its importance • Competitor analysis and benchmarking • Transfer pricing and global considerations	4	2	0
9.	**Contemporary Issues in Management Accounting** • Management accounting for lean production • Environmental and sustainability accounting • Corporate social responsibility (CSR) reporting • Technological advancements in management accounting	4	2	0
10.	**Relevant industry specific case-studies**	4	2	0
	TOTAL	**45**	**15**	**0**

Evaluation criteria:

The break-up of the evaluation procedure is as follows:

- Minor Test 1: Quiz : 30%
- Minor Test 2: Written Examination: 15%
- Project: Decision Making: 15%
- Major Exam: Written Examination: 40%

Learning outcomes:

Upon successful completion of this course, students will:

- Apply advanced management accounting techniques in real-life business situations.
- Analyze cost behaviors and use them to make informed business decisions.
- Design and implement effective budgeting systems for planning and control.
- Measure and evaluate organizational performance using financial and non-financial metrics.
- Utilize strategic management accounting tools for long-term business planning.
- Assess the impact of contemporary issues like sustainability and technology on management

accounting.
- Develop critical thinking and problem-solving skills through case studies and practical applications.

Pedagogical approach
The course will be delivered through lectures, presentations, and case studies.

References:

1. **Drury, C. (2018).** *Management and Cost Accounting* (10th ed.). Cengage Learning.
2. **Horngren, C.T., Datar, S.M., & Rajan, M.V. (2017).** *Cost Accounting: A Managerial Emphasis* (16th ed.). Pearson Education.

Additional Readings:

- **Kaplan, R.S., & Atkinson, A.A. (2015).** *Advanced Management Accounting* (3rd ed.). Pearson.
- **Langfield-Smith, K., Thorne, H., & Hilton, R. (2020).** *Management Accounting: Information for Creating and Managing Value* (8th ed.). McGraw-Hill.
- **Atrill, P., & McLaney, E. (2019).** *Accounting and Finance for Non-Specialists* (11th ed.). Pearson.
- **Anthony, R. N., Hawkins, D. F., & Merchant, K. A. (2018).** *Accounting: Text and Cases* (13th ed.). McGraw-Hill.

Additional information (If any): None

Students Responsibilities: Class attendance, timely submission of assignments and other projects

Prepared by: Dr. Parul Behl

Course Reviewers:

1. Dr. Navita Nathani, Professor, IQAC.
2. Dr. Pushpa Negi, Associate Professor, New Delhi Institute of Management.

Course title: Management Information System			
Course code:	**No. of credits:** 4	**L-T-P**: 46-14-00	**Learning hours:** 60
Pre-requisite course code and title (if any): None			
Department: Policy & Management Studies			
Course coordinator(s): Dr. Moumita Acharyya		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** Semester 4	

Course Description

This course introduces BBA students to the fundamental concepts and frameworks of Management Information Systems (MIS) critical for navigating today's business environment. As technology continues to evolve rapidly, businesses must harness information systems to enhance decision-making, streamline operations, and maintain competitive advantage.

The course covers essential topics such as the role of information systems in organizations, database management, enterprise systems, and e-commerce. Students will also explore how information technology (IT) can be leveraged to optimize business processes, manage data, and support decision-making.

Through practical applications and case studies, students will learn how MIS tools facilitate key business functions like supply chain management, customer relationship management (CRM), and business analytics. The course emphasizes the strategic use of information systems to improve efficiency, enhance communication, and foster innovation in a dynamic business landscape.

Course Objectives

The objective of this course is to equip BBA students with the knowledge and skills necessary to effectively utilize Management Information Systems in business operations and decision-making. By focusing on the integration of technology with business processes, students will be able to harness the power of information systems to support business objectives and drive competitive advantage.

- Develop a strong understanding of the role of MIS in organizations and its impact on business performance.
- Learn to analyze and manage data using MIS tools to improve decision-making and operational efficiency.
- Gain practical skills in database management, enterprise systems, and business analytics.
- Understand how information systems can support strategic initiatives like e-commerce, supply chain management, and customer relationship management (CRM).
- Prepare students to apply MIS solutions to real-world business challenges, fostering innovation and process improvement.

Course Content

Module	Topic	L	T	P
1	**Introduction to Management Information Systems** Overview of MIS, its role in modern organizations, importance of technology in business, types of information systems, and basic MIS concepts.	5	2	0
2	**Information Systems and Organizations** Understanding how businesses leverage information systems, interaction between technology and organizational structure, the impact of MIS on productivity and competitiveness.	5	2	0
3	**Database Management and Data Organization** Introduction to databases, data storage, and retrieval techniques,	5	2	0

	relational database concepts, basic SQL queries, and data management principles. Data Quality and Governance.			
4	**Enterprise Systems and Business Processes** Study of enterprise resource planning (ERP), supply chain management (SCM), and customer relationship management (CRM) systems; integration of business functions through information systems.	5	2	0
5	**E-commerce and Digital Business** Fundamentals of e-commerce, digital business models, the role of information systems in online business operations, payment systems, and security. Case study of Amazon.	5	2	0
6	**Business Analytics and Decision Support Systems** Introduction to business analytics, decision support systems (DSS), and how organizations use analytics to drive decisions; overview of business intelligence tools.	5	1	0
7	**Information Systems Security and Ethical Issues** Understanding the importance of cybersecurity, common security threats, and how businesses protect data; ethical considerations and legal issues related to information systems.	5	1	0
8	**Emerging Trends in MIS** Exploration of current trends like cloud computing, artificial intelligence (AI), and big data; how these technologies are reshaping the role of MIS in business.	5	1	0
9	**MIS and Strategic Business Initiatives** How MIS supports long-term strategic planning, competitive advantage, and innovation in business; case studies on successful use of MIS in various industries.	5	2	0
	TOTAL	**45**	**15**	**00**

Evaluation criteria:

The break-up of the evaluation procedure is as follows:

- Minor Test 1 : Assignment/Written Examination (Module 1, 2 & 3) - 20%
- Minor Test 2 : Assignment/Written Examination (Module 4,5 & 6) - 20%
- Minor Test 3 : Assignment/Written Examination (Module 7, 8 & 9) - 20%
- Major Exam : Written Examination (Module 1-9) - 40%

Learning Outcomes:

After successful completion of the course, students will be able to:

- Explain the role of Management Information Systems (MIS) in supporting business operations and decision-making.
- Identify how different types of information systems, such as ERP, CRM, and SCM, integrate business processes.
- Analyze business data using database management systems and decision support tools to improve operational efficiency.
- Evaluate the impact of emerging technologies like AI, cloud computing, and big data on organizational strategy and innovation.
- Assess the importance of cybersecurity and ethical issues in the management and use of information systems in a business context.

Pedagogical approach

The course will be delivered through lectures and tutorials. Application of Information Management tools in business & sustainability related problems would also be a part of the pedagogical approach for the course.

References:

Textbooks:

1. Management Information Systems: Managing the Digital Firm | 15th Edition, by Kenneth C. Laudon and Jane P. Laudon, Pearson.
2. Management Information Systems for the Information Age | 9th Edition, by Stephen Haag and Maeve Cummings, McGraw-Hill.

Additional Readings:

1. Introduction to Information Systems: Supporting and Transforming Business by R. Kelly Rainer, Brad Prince, and Casey G. Cegielski, Wiley.
2. Principles of Information Systems by Ralph Stair and George Reynolds, Cengage Learning.
3. Management Information Systems: A Managerial Perspective by D.P. Goyal, Vikas Publishing House

Additional information (If any): None

Student responsibilities: Attendance, timeline adherence for assignments, come prepared according to the session plan and as when provided.

Prepared by: Dr. Anand Jaiswal

Course Reviewers:

1. Dr. Vinaytosh Mishra, Associate Professor and Director, Thumbay Institute of AI in Healthcare, Gulf Medical University, Ajman, UAE
2. Dr. Cherian Samuel, Associate Professor, Indian Institute of Technology (BHU), Varanasi, India

Course title: Marketing Management			
Course code:	**No. of credits:** 4	**L-T-P distribution:** 45-15-0	**Learning hours:** 60
Pre-requisite course code and title (if any):			
Department: Policy and Management studies			
Course coordinator (s):		**Course instructor (s):**	
Contact details:			
Course type	Core	**Course offered in:** Semester 2	

Course description

This is a core course in Marketing meant to build a foundation for students in the BBA Program. Marketing is a critical function that determines the health of an organization. Marketing is the set of activities designed to scan and identify market opportunities and plan to design price, promotion and the distribution of products, services and ideas that satisfy the needs of chosen target market(s). The Marketing Manager uses his range of marketing tools to transform the identified opportunities in a manner that achieves the organizational objectives.

Course objectives

This course is a fundamental course on marketing and develops the basic analytical skills, conceptual abilities, and substantive knowledge in marketing concepts like the marketing mix in a variety of real-life marketing situations. The objectives are:

To provide an in-depth understanding of the marketing process
To give students an appreciation of the global and domestic marketing environment.
To develop conceptual understanding of the STP process in the Indian environment.
To learn about all the elements of the marketing-mix
To sensitize the students about new developments like Multichannel and Omni channel marketing
To develop the ability to formulate a marketing plan

Course content

Module	Topic	L	T	P
1.	Introduction: Marketing concepts and philosophies. Evolution of Marketing. Marketing Myopia. Marketing philosophies. Concept of Marketing Mix Marketing Plan The sixth P of Marketing Holistic Marketing concept	9	3	0
2.	Strategic Marketing; Porter's Generic Strategies Michael Porter's Big Ideas Application and Evaluation of Strategy BCG Matrix, GE 9 Cell model Understanding Customer – Customer Value What have you done for me lately? Customer loyalty and satisfaction Why satisfied customers defect.	9	3	0

3.	Marketing Information System (MIS) Market Research Market Intelligence Data Management, data mining. Creating Marketing Dashboard	9	3	0
4.	Segmenting the consumer markets Basis of segmentation Product diff and market segmentation strategies. Advertising strategies. Digital Marketing , SEO,SEM. Targeting and positioning Lessons from faded Levi Strauss We try harder Dealing with competition Marketing Gaining competitive advantage Kodak Vs. Fuji	9	3	0
5.	Pricing Strategies Distribution Strategies Retailing Promotion Strategies Integrated Marketing Communications IMC. New Age Marketing concepts. Message evolution by McDonald's in India Services Marketing	9	3	0
	Total	**45**	**15**	**0**

Evaluation criteria

Test 1: Class participation 10% (Based on attentiveness and active participation during the entire course)

Test 2: News presentations 10% (To pick and critically present latest news about marketing activities done by any company)

Test 3: 20% (Written exam after completion of 16 sessions –to test the understanding of concepts of marketing, strategic planning and consumer behavior)

Test 4: Group Project 20% (To develop the Marketing Plan for a product / service and apply all the knowledge of marketing gained throughout the course. Report to be submitted at the end of 28 sessions and presentation in the last 2 sessions)

Test 5: Written Test 40% (Written examination covering the entire course)

Group Project: Marketing News Presentation and Creating a Marketing Plan

Each group should be prepared to make a presentation of news related to marketing gathered over one week prior to its turn to present in the class.

Each group needs to select one product category from the suggested list. No overlap of product category within each section is permitted. Your group may take the perspective of an organization that is either a leader in the category or a follower or a new entrant.

Prepare a detailed report on the project. The report should be submitted in soft copy on my email.

Each group should be prepared to make a presentation project in the class. Time limit is 15 minutes per group.

Case Study discussion: A case may be studied keeping in mind the following:

a problem definition statement, which identifies the key issues facing management (not more than a few lines);
the objectives
alternative plan of action
an analysis section which synthesizes and integrates the answers to the key questions for the case, but does not repeat the facts themselves, and presents logical arguments in defense of both the problem definition and the recommended solution;
a set of detailed recommendations and suggestions for their implementation, including how to overcome any potential issues of implementation identified by the analysis.

Learning outcomes:

After attending this course, students will be able to:
Develop an understanding of the role of marketing in the success of an organization (News presentation, Mid Term exam)
Develop an ability to identify and assess strategic choices in marketing (Mid Term exam, End Term exam)
Be able to propose innovative solutions to customer needs and continuous improvement of offerings (News presentation, Group Project)
Be able to develop the Marketing Plan for any organization (Group Project, End Term exam).
Be able to understand marketing mix and STP. (Mid-term exam)

Pedagogical approach

Interactive Lectures, Case discussions and presentations, News crunching

Materials

Text Book:

- Marketing Management by Philip Kotler, Kevin Keller, Pearson, New Delhi, 15th edition 2016, ISBN:978-81-317-3101-7

Reference Book:

- Philip Kotler, Kevin Lane Keller, Abraham Koshy, Mithleshwar Jha, "Marketing Management, A South Asian Perspective", 14th Ed (2013) by Pearson Education, New Delhi

Additional information (if any)

Student responsibilities: Attendance, timeline adherence for assignments, come prepared with readings / cases according to the session plan and as and when provided

Prepared by: Dr. Shruti Sharma

Course Reviewers:

1. Dr. Ruchi Khandelwal, Professor, Amity University, Noida.
2. Dr.Shampy Kamboj, Associate Professor, NIT, Hamirpur.

Course Title: Media Literacy & Critical Thinking			
Course Code:	**No. of credits:**2	**L-T-P distribution**:20-10-0	**Learning Hours**:30
Pre Requisite:			
Department: Policy and Management Studies			
Course Coordinator:		**Course Instructor:** Prof. Pooja Priyamvada	
Contact Details: poojapriyamvada@outlook.com			
Course Type: Core		**Course Offered:** Semester 2	

Course Description:

The course aims at equipping students with the skills to analyse media critically and make informed decisions in a media-saturated world. It explores the intersection of media, communication, and societal impact, focusing on bias, misinformation, and ethical dilemmas. Students will learn to deconstruct messages across diverse platforms, understand media influence on public opinion, and develop logical reasoning and argumentation skills. The course emphasizes critical evaluation of sources, fact-checking, and fostering media literacy to become discerning consumers and creators of content. Interactive discussions, case studies and practical projects will enhance students' ability to navigate and respond to the evolving media landscape effectively.

Course Objectives:

1. Understand media literacy and its significance in business and society
2. Understand media influence
3. Understand basics of critical thinking & its importance in business administration
4. The art of persuasion, argument & critical media skills
5. Effective decision making & Media communication for businesses
6. Importance of research & fact checking

Module	Topics	L	T	P
1.	**<u>Media Literacy & its significance</u>** **I. Introduction to Media Literacy** ▪ Definition, scope, and importance of media literacy. ▪ Overview of media types: print, broadcast, digital, & social media. **II. Understanding Media Messages** ▪ How media messages are constructed: text, visuals, & narratives. ▪ Recognizing stereotypes, biases, and propaganda techniques **III. Media's Impact on Society** ▪ Influence of media on culture, politics, and business. ▪ Analyzing media's role in shaping public opinion & behavior. **IV. Media Literacy in the Digital Age** ▪ Challenges of misinformation, fake news, and deepfakes. ▪ Evaluating credibility and authenticity of online sources.	3	1	
2.	**<u>Basics of Critical Thinking & its significance</u>** **I. Introduction to Critical Thinking** ▪ Definition, principles, and importance of critical thinking. ▪ Role of critical thinking in personal & professional decision-making. **II. Components of Critical Thinking** ▪ Logical reasoning, analysis, and evaluation. ▪ Distinguishing facts, opinions, and assumptions. **III. Barriers to Critical Thinking** ▪ Cognitive biases and logical fallacies. ▪ Influence of emotions, peer pressure, and cultural factors.	4	2	

	IV. Applications of Critical Thinking in Business ▪ Problem-solving and decision-making in business contexts. ▪ Critical thinking in leadership and team management.			
3.	**<u>The Art of Persuasion, Argument & Critical Media Skills</u>** **I. The Art of Persuasion in Business** ▪ Principles of persuasive communication in business contexts. ▪ Understanding audience psychology and crafting compelling messages. ▪ Ethical considerations in persuasion and influence. **II. Constructing and Evaluating Arguments** ▪ Elements of a strong argument: claims, evidence, and reasoning. ▪ Identifying and avoiding logical fallacies in arguments. **III. Critical Thinking and Media Skills in Business** ▪ Analyzing business-related media messages and advertisements ▪ Leveraging media platforms for strategic communication and branding. ▪ Managing media crises and responding to public criticism effectively.	4	2	
4.	**<u>Effective Decision Making</u>** **I. Importance of effective decision-making** **II. Tools of decision making SWOT analysis, cost-benefit analysis, and decision matrices.**	2	1	
5.	**<u>Media Communication for Business, Research & Fact-Checking</u>** **I. Media Communication Strategies for Business** ▪ Crafting clear and impactful messages for various media platforms. ▪ Tailoring communication for internal and external stakeholders. ▪ Role of storytelling and visuals in effective business communication. **II. Research Skills for Media Communication** ▪ Identifying credible sources for business-related information. ▪ Conducting primary and secondary research for media campaigns. **III. Fact-Checking and Verifying Information** ▪ Importance of accuracy and credibility in business communication. ▪ Tools and techniques for fact-checking media content. ▪ Avoiding the spread of misinformation in professional and public platforms.	4	2	
6.	**I. Analysis of real life case studies about media influence & Critical Thinking in Business strategies and Plans**	3	2	
	Total	**20**	**10**	

Evaluation Criteria

- **Class Participation & Discussion**:30 % - Attendance as per UGC norms-10 marks, 2 Group discussions 10 marks, 1 Presentation 10 marks
- **Assignments & Quizzes**:30% - 2 Written assignments 10 marks & 2 quizzes 10 marks each
- **Case Study Analysis & Presentation**: 40%- Students shall be assigned a case study in groups & each group will present it before the class. Case Study report 20 marks Presentation marks

Learning Outcomes of the course for the students

1. **Develop Media Literacy**: Students will critically analyze media messages, identifying biases, stereotypes, and misinformation across various platforms.

2. **Enhance Critical Thinking**: Gain the ability to evaluate arguments, assess evidence, and apply logical reasoning in decision-making processes.
3. **Apply Ethical Judgment**: Demonstrate awareness of ethical considerations in media consumption, creation, and communication.
4. **Improve Communication Skills**: Craft clear, persuasive, and responsible media messages tailored for diverse business audiences.
5. **Master Fact-Checking**: Utilize tools and strategies to verify the credibility of information and combat misinformation effectively in professional contexts.

Pedagogical Tool

Lectures, Group Discussions **,** Presentations & Seminar**,** Case studies and Readings

Suggested Readings

- Carr, Nicholas. *The Shallows: What the Internet Is Doing to Our Brains.* W. W. Norton & Company, 2010.
- Pariser, Eli. *The Filter Bubble: What the Internet Is Hiding from You.* Penguin Press, 2012.
- Chomsky, Noam, and Edward S. Herman. *Manufacturing Consent: The Political Economy of the Mass Media.* Pantheon Books, 1988.
- *Routledge Research in Media Literacy and Education.* Routledge, 2015.
- Silverblatt, Art, Jane Ferry, and Barbara Finan. *Approaches to Media Literacy: A Handbook.* Routledge, 2015.
- Morris, Sarah E., editor. *The Critical Thinking About Sources Cookbook.* ACRL, 2020.
- Pandya, Jessica Zacher, et al., editors. *The Handbook of Critical Literacies.* Routledge, 2022.
- Kress, G. *Literacy in the New Media Age.* Routledge, 2015.
- Frechette, Julie, and Rob Williams. *Media Education for a Digital Generation.* Routledge, 2017.
- Hoechsmann, Michael, and Stuart R. Poyntz. *Media Literacies: A Critical Introduction.* Polity Press, 2012

Online Resources

- Association for Media Literacy
- Center for Media Literacy
- International Council for Media Literacy
- Media Literacy and Media Education Organizations

Prepared by:

Course Reviewer(s):

1. Dr Shikha Gupta, Former Faculty/Director, Sushma Swaraj Institute of Foreign Service, Ministry of External Affairs, Government of India

Enclosure 12

Course title: Legal Aspects of Bidding and PPP			
Course code: MPL 148	**No. of credits:** 3	**L-T-P:** 30-15-0	**Learning hours:** 45
Pre-requisite course code and title (if any):			
Department: Centre for Post Graduate Legal Studies			
Course coordinator (s):		**Course instructor (s):**	
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course Description:

The course is designed to introduce students to the basic legal concepts of competitive bidding and PPP projects. It will also identify the financial and other risks related to bidding and PPP projects as well as challenges in the execution of such contracts.

Course objectives:

- Apprise students about the basic principles of competitive bidding and PPP projects
- Discuss the risks and benefits associated with bidding / PPP projects
- Case law studies on important issues related to bidding / PPP projects
- Discuss the role of governments & regulators

Course Contents:

Module	Topic	L	T	P
1.	**Introduction to Competitive Bidding** Understanding the concept of bidding, basic rules applicable to bidding, its merits and demerits, Bidding vs Bilateral Contracts Legal Foundations for Bidding: Principles of contract law; legal standards in procurement; Transparency and fairness in bidding and Overview of e-procurement laws Historical and Policy Background of PPP Case discussion	8	4	
2.	**Risks associated with bidding and execution of contracts** Introduction to assessment of risks for purposes of bidding, risks related to execution of contracts, challenges in long term contracts – how to address changes and alterations in circumstances; change in law and force majeure clauses, termination and step in rights; dispute resolution Dispute Resolution Mechanisms in PPPs; Legal provisions for arbitration, mediation and conciliation; Judicial review of PPP projects; Case law analysis: PPP disputes in India and abroad; Modern BITs and the 2015 Indian Model BIT; Investor-state dispute settlement (ISDS) Mechanisms	8	4	

	International Arbitration in PPP Projects: Key arbitration institutions and their rules; Enforcement of arbitral awards under international conventions; Cross-border disputes and jurisdictional issues; Role of Permanent Court of Arbitration; ICSID Convention Case study: Review of bid documents for different projects			
3	**Introduction to PPP projects** Understanding the concept of PPP projects, its merits and demerits, Role and duty of PPP developers, applicability of RTI Act, Financing models for PPP projects PPP Models: Legal Framework in India; The PPP guidelines and relevant national laws PPP in various infrastructure sectors in India e.g. Healthcare, Ports, Electricity, Railways etc. International Legal Frameworks on PPPs: United Nations Commission on International Trade Law (UNCITRAL) Model Legislative Provisions; World Bank and other international institutions' guidelines on PPP Case discussion	8	4	
4	**Role of government and regulators**			
	Role of governments, courts and regulatory bodies in relation to PPP projects – risk of governmental and judicial interventions Understanding the Regulatory sphere in India- Role of Competition Commission of India Impact of environmental laws and regulations on PPP projects Reforms required in PPP Models in India Financing and Financial Law in PPP Projects; Legal structures for PPP project financing; Key financial institutions and their roles; Legal issues related to foreign investments in PPPs Case discussion	6	3	
Total		**30**	**15**	**0**

Evaluation procedure:

	Weightage (%)
• Class participation	10
• Term Paper	25 (Modules 1-4)
• Presentation	25 (Modules 1-4)
• Final examination	40 (Module 2 &4)

Learning outcomes :

1. Able to understand legal issues related to competitive bidding & PPP projects (Modules 1, 2&3)
2. Appreciate business and regulatory risks related to PPP and infrastructure projects (Module 4)

Pedagogical approach :

The course will be taught through interactive sessions with reference to case laws and materials for understanding the legal issues related to infrastructure and PPP projects.

Suggested Readings :

- **1. Banerjee, A.** (2016). *Judicial Review of PPP Projects in India: Case Law and Analysis.* Indian Journal of Legal Studies.
- 2. Bhat Sairam, Public Private Partnership in India – A Sector Analysis, available at https://ceerapub.nls.ac.in/wp-content/uploads/2019/05/NLSIU-Book-Series-5-Public-Private-Partnership-in-India.pdf
- 3. Brower, C. N., & Schill, S. W. (2008). Regime change in international investment law: From bilateralism to multilateralism. In A. Reinisch (Ed.), Standards of investment protection (pp. 63–90). Oxford: Oxford University Press.
- **4. Desai, M.** (2012). *Dispute Resolution in Indian Public-Private Partnerships: The Legal Framework.* Journal of Indian Business Law.
- 5. Dolzer, R., & Schreuer, C. (2012). Principles of international investment law (2nd ed.). Oxford: Oxford University Press.
- 6. Gandhi, J. C. (2001). Law Relating to Public-Private Partnerships in India. Universal Law Publishing.
- 7. Gómez, K. F. (2018). Rethinking the role of ISDS in PPP projects. Journal of International Arbitration, 35(4), 421–446.
- 8. Gopalakrishnan, R. (2015). E-Procurement in India: Legal and Regulatory Framework
- ICSID Review – Foreign Investment Law Journal. (n.d.). Oxford University Press. Retrieved from https://academic.oup.com/icsidreview
- Investment Treaty News (ITN). (n.d.). Retrieved from https://www.iisd.org/itn/
- Journal of World Investment & Trade. (n.d.). Brill. Retrieved from https://brill.com/view/journals/jwit/jwit-overview.xml
- Kumar, A. (2017). Infrastructure Development through PPP in India: A Legal Perspective.
- Mathur, N. D. (2012). Public-Private Partnerships in Infrastructure: Indian Legal and Policy Framework. Indian Journal of Law and Public Policy.
- Newcombe, A., & Paradell, L. (2009). Law and practice of investment treaties: Standards of treatment. Alphen aan den Rijn: Kluwer Law International.
- NITI Aayog, 'Rebooting Public Private Partnership in India' (22 November 2017),

available at https://www.pppinindia.gov.in/report/Report%20of%20the%20Committee%20on%20Revisiting%20&%20Revitalizing%20the%20Public%20Privsaate%20Partnership%20Model%20of%20Infrastructure%20(Kelkar%20Committee%20Report).pdf_1685171086.pdf

- Overview of PPP experience – PPIAF's Toolkit for Public Private Partnership in Roads & Highways [https://www.ppiaf.org/sites/ppiaf.org/files/documents/toolkits/highwaystoolkit/6/pdf-version/1-21.pdf)
- Parthasarathy, S. (2010). Legal Issues in Public Procurement in India: Recent Developments. Journal of Indian Law Institute.
- Poulsen, L. N. S. (2015). Bounded rationality and economic diplomacy: The politics of investment treaties in developing countries. International Relations Journal, 29(1), 120–142.
- Public Private Partnership Projects in India: Compendium of Case Studies, June 2015
- Public Private Partnerships (PPP) in Infrastructure Projects - Public Auditing Guidelines, Comptroller & Auditor General of India, 2009
- Public-Private Partnership Legal Resource Center (PPP LRC). (n.d.). Retrieved from https://ppp.worldbank.org/
- Raghavan, S. (2013). Regulatory Mechanisms for PPP Projects in India.
- Rao, P. S. N. (2018). Public-Private Partnerships in Infrastructure: An Indian Perspective.
- Report of the Committee on Revisiting & Revitalizing the Public Private Partnership Model of Infrastructure (Kelkar Committee Report), November 2015
- Saxena, R. S. (2016). Compliance Challenges in Public Procurement and PPP Models in India. Journal of Regulatory Affairs.
- Schill, S. W. (2009). Fair and equitable treatment under investment treaties as an embodiment of the rule of law. International Law and Politics, 13(1), 1–33.
- Singh, B. (2015). Risk Allocation and Legal Challenges in PPP Contracts in India. Indian Law Review.
- Singh, K. P. (2014). Public Procurement and Competition Law in India.
- Sornarajah, M. (2021). The international law on foreign investment (5th ed.). Cambridge: Cambridge University Press.
- Thakur, R. (2011). Public-Private Partnerships in India: A Legal Guide. Eastern Book Company.
- Transnational Dispute Management (TDM). (n.d.). Retrieved from https://www.transnational-dispute-management.com/
- Van Harten, G. (2007). The public-private distinction in the international arbitration of individual claims against the state. International and Comparative Law Quarterly, 56(2), 371–393.
- Vijay Vir Singh and Siddharth Mitra, 'Regulatory Management and Reform in India', Background Paper for the OECD, available at www.oecd.org/gov/regulatory-policy/44925979.pdf
- Wälde, T. W. (2005). The "umbrella clause" in investment arbitration. The Journal of World Investment & Trade, 6(2), 183–236.
- Yannaca-Small, K. (Ed.). (2010). Arbitration under international investment agreements: A guide to the key issues. Oxford: Oxford University Press.

Additional information (if any):

Student responsibilities:
Attendance: At-least 75% attendance will be necessary to be able to appear for the final exam.

Course Revised By- Dr Kavita, Assistant Professor (Law), CPGLS, Department of Policy and Management Studies

Course Reviewers:

1. Mr Swapnil Verma, Chief Manager (Law) & Legal Head at Central Transmission Utility of India Ltd./POWERGRID, swapnilverma.adv@gmail.com.

2. Mr Akash Jandial, Advocate, Delhi High Court and Supreme Court, India.

Course title: Mining and Mineral Laws			
Course code MPL 154	**No. of credits:** 3	**L-T-P**: 30-15-0	**Learning hours:** 45
Pre-requisite course code and title (if any): None			
Department: Centre for Postgraduate Legal Studies			
Course coordinator (s)		**Course instructor (s)**	
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course Description

Minerals play a significant role in the economic development of a state. Therefore, the state has a larger role in regulating the extraction of minerals, which is particularly important for developing countries. Broadly there are three phases in the nature of policies and regulation of the mining sector in developing countries. First, the colonial polices on mining, which favored private companies from the colonial state. Second, post-World War II policies, which were adopted by most states of the Asia and Africa after their independence in a trend of nationalization and the involvement of State-owned Enterprises. Third, post globalization neoliberal policies, which aimed at attracting foreign direct investment in the sector.

Presently, India, a state rich in minerals, has a federal set-up for regulation of mining and minerals. Its regulatory structure and trajectory closely resemble to that of other developing countries. This course examines the laws and policies relating to the mining sector in India. Since mining is an activity that has externalities, mining law does not stand in neglect of issues relating to environment and tribal rights, setting an epistemological connection between mining law and law relating to environment and tribal rights. Hence the course has a substantial scope for critically understanding such issues.

Course objectives

The course aims to:

- provide an overview of the legal and policy framework on the mining sector in India
- understand the causal forces which have been transforming the laws and policies on the sector
- survey and appraise the major reformative efforts in the sector
- analyze the impact of mining on the environment and tribal rights and the possibilities of legislation/regulation/policy on mining and minerals in mitigating the externalities caused to environment.
- provide the participants an inside-out view by familiarizing them with decision-making, enforcement, and dispute settlement/avoidance.

Course content	**L**	**T**	**P**
Module 1: Introduction and Legal Framework	8	4	
An introduction to the mining sector in India Allocation of jurisdiction over minerals and mines under the Constitution Minor minerals and other minerals An overview of Policies: National Mineral Policy, 1993; National Mineral			

Policy, 2008; National Mineral and Exploration Policy, 2016, National Mineral Policy, 2019			

Overview of laws: Indian Mines Act, 1952; Mines and Minerals (Development and Regulation) Act, 1957; Atomic Energy Act, 1962; Oilfields (Regulation and Development) Act, 1948 Proprietary rights over minerals: Articles 294 and 297 Coal Nationalization laws Commercial Coal Mining (2020 Reforms): Opening up coal mining to private players and allowing 100% FDI; and Shift from captive mining to commercial production. Coal Mines (Special Provisions) Act, 2015: Amendments and their implications for India's energy security. Intersection of Mining with EIA Rules Economic Policy Reforms in Mining Sector			
Module 2: Laws relating to Prospecting and Mining	8	4	
Key Provisions related to Prospecting and Mining under Mines and Minerals (Development and Regulation) Act, 1957; Mineral Concession Rules, 1960; Mineral Conservation and Development Rules (MCDR) 1988 Powers of Central and State Governments; Reconnaissance permit, Prospecting and Mining licenses/lease, Composite License: Duration, termination etc. Method of grant of license: Auctions Amendments to the MMDR Act Captive mines Royalty: Different types: Unit based, ad valorem, share of profit Character and legal nature: Whether tax or not. 2015 Amendments: District Mineral Foundation, National Mineral Exploration Trust 2021 Amendments to the MMDR Act: Shift to auction-based allocation of mineral blocks; Removal of end-use restrictions; and Provisions for the transfer of mining leases. Streamlining of Statutory Clearances Role of Indian Bureau of Mines, State Departments of Mines and Geology			
Module 3: Mining and Environmental Issues	6	4	

Environmental laws and their applicability to the mining sector, Water and Air Pollution, EIA, Forest and Wildlife Clearance Illegal Mines: Justice Shah Commission Report on Illegal Mining in the State of Goa Role of NGT Sustainable Development Framework, Sustainable mining Initiative Discussion about Critical Minerals and Social License to Operate Coal-Phase Out Case Studies (Vedanta's Niyamgiri mining project & coal mining in the Hasdeo Arand forests of Chhattisgarh)			
Module 4: Mining and Laws relating to Scheduled Areas and Tribal Rights	4	2	
Article 244, Schedule V and VI Areas, Restriction on Transfer of Land Panchayats (Extension to Scheduled Areas) Act, 1996 Forest Rights Act, 2006 (FRA) Impact of 2015 Amendments Case Study- BALCO (1997); POSCO project in Odisha			
Module 5: Conflicts and local communities	4	1	
Causes, Role of governments, civil society organizations, courts Case studies- Sterlite Industries Case (Tamil Nadu); Vedanta and Niyamgiri Case; and Coal Mining in Hasdeo Arand (Chhattisgarh)			
Total	**30**	**15**	

Evaluation criteria

- Class participation 10%
- Case Analysis 25% (Module 3)
- Assignment & Presentations 25% (Modules 4 & 5)
- Major Test 40% (Module 1&2)

Learning outcomes

The course will provide the students:

- familiarity with the normative legal framework on mining in India (Modules 1 & 2)
- the ability to appreciate policy-shifts and policy-decisions on mining in India (Module 3)
- knowledge on dispute settlement in the mining sector and ability to imagine dispute avoidance in the sector (Module 3,4 &5)
- ability to understand externalities cost and propose solutions, particularly in the context externalities of mining like environmental damage and threat to the life and

livelihood of tribal population (Module 4)

Pedagogical approach

Lectures and discussions will be the prominent mode of teaching. The topics under each module will be introduced through an introductory lecture, followed by discussions by students. Students are expected to come prepared and initiate discussions on topics that have

been assigned beforehand.

Materials/

Suggested readings

Cases:

- *Common Cause v. Union of India (2017) (Odisha Mining Scam Case)*
- *Goa Foundation* v. *Union of India* (2014)
- *In re: Natural Resources Allocation* (2012)
- *India Cement Ltd.* v. *State of Tamil Nadu* (1990)
- *Lafarge Umiam Mining Pvt. Ltd. v. Union of India (2011)*
- M.*C. Mehta v. Union of India (2004) (Aravalli Hills Mining Ban)*
- *Manohar Lal Sharma* v. *Principal Secretary* (2014)
- *Mineral Area Development Authority* v. *Steel Authority of India* (2011).
- *Samatha* v. *State of Andhra Pradesh* (1997)
- *State of West Bengal* v. *Kesoram Ltd.* (2004)
- *Sterlite Industries (India) Ltd. v. Union of India (2013) (Sterlite Copper Plant Case)*
- *T.N. Godavarman Thirumulpad v. Union of India (1996) (Forest Conservation Case)*
- *Thresiamma Jacob* v. *Geologist, Department of Mines and Geology* (2013)
- *Vedanta Ltd. v. Union of India (2013) (Niyamgiri Bauxite Mining Case)*

Primary Texts:

- Mines and Minerals (Development and Regulation) Act, 1957 (including 2021 amendments).
- National Mineral Policy 2019.
- Coal Mines (Special Provisions) Act, 2015
- Environment (Protection) Act, 1986.
- Forest (Conservation) Act, 1980.
- Panchayats (Extension to Scheduled Areas) Act, 1996 (PESA).
- Forest Rights Act, 2006 (FRA).

Key International Conventions and Legal Documents

- United Nations. (1982). United Nations Convention on the Law of the Sea (UNCLOS). Retrieved from https://www.un.org/Depts/los/
- United Nations Environment Programme. (2013). Minamata Convention on Mercury.

Retrieved from https://www.mercuryconvention.org/
- International Labour Organization. (1995). Safety and Health in Mines Convention (No. 176). Retrieved from https://www.ilo.org/
- Organisation for Economic Co-operation and Development. (2011). OECD guidelines for multinational enterprises. Retrieved from https://www.oecd.org/corporate/mne/
- Extractive Industries Transparency Initiative. (n.d.). EITI framework. Retrieved from https://eiti.org/

Books/Articles/Online Resources

- Anton, D., & VanderZwaag, D. L. (2019). Mining and the law of the sea. Cheltenham: Edward Elgar Publishing.
- Asir, N.G.G., Kumar, P.D., Arasamuthu, A. et al. Eroding islands of Gulf of Mannar, Southeast India: a consequence of long-term impact of coral mining and climate change. Nat Hazards 103, 103–119 (2020). https://doi.org/10.1007/s11069-020-03961-6
- Bastida, E. (2020). International and comparative mineral law and policy: Trends and prospects. Cheltenham: Edward Elgar Publishing.
- Bastida, E., Wälde, T., & Warden-Fernandez, J. (2005). Mining law and policy: International perspectives. London: Routledge.
- Dalton Debbarma and Yash Yadav, A Critical Evaluation of the Adequacy of Current Mining Laws in India: A Legal Study, International Journal of Law and Social Sciences, Vol. 9 Issue 1, 2023
- Dhavan, R. (1992). MINING POLICY IN INDIA : PATRONAGE OR CONTROL ? Journal of the Indian Law Institute, 34(2), 218–246. http://www.jstor.org/stable/43951425
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- Hilson, G. (2012). The resource curse revisited: Environmental justice and the extractive industries. Development Studies Research, 9(3), 310–330.
- Humphreys, D. (2019). Critical minerals and resource security: Policy approaches and international cooperation. Mineral Economics, 32(2), 145–159.
- Humphreys, D. (2019). Critical minerals and resource security: Policy approaches and international cooperation. Mineral Economics, 32(2), 145–159.
- ISID (2012), *Sustainable Development: Emerging Issues in India's Mineral Sector*, New Delhi: Planning Commission.
- Jane H. Hodgkinson, Michael H. Smith, Climate change and sustainability as drivers for the next mining and metals boom: The need for climate-smart mining and recycling, Resources Policy, Volume 74, 2021.
- Jenkins, V. (2016). Environmental regulation and the mining industry: Balancing risks and rewards. Environmental Law Review, 18(4), 255–268.
- Jenkins, V. (2016). Environmental regulation and the mining industry: Balancing risks and rewards. Environmental Law Review, 18(4), 255–268.
- Khanna, Arpita A. (2013), "Governance in Coal Mining: Issues and Challenges",
- Lukasiewicz, A., et al. (Eds.). (2017). Natural resources and environmental justice. New York: Routledge.
- Morrison, J. (2014). Corporate social responsibility in the mining sector: The case of social license to operate. Journal of Cleaner Production, 84(1), 122–131.
- Morrison, J. (2014). Corporate social responsibility in the mining sector: The case of social license to operate. Journal of Cleaner Production, 84(1), 122–131.

- Otto, J. (2020). The future of mining law in a low-carbon world. Resources Policy, 65, Article 101567.
- Otto, J. (2020). The future of mining law in a low-carbon world. Resources Policy, 65, Article 101567.
- Sen, Raj Kumar, "Mining and Environmental Law in India", 2nd ed., Eastern Book Company, 2020.
- Seth, D. D. (2012), *Encyclopaedia of Mining Laws*, Fifth Edition, Lucknow: Eastern Book Company.
- Singh, A.K. "Sustainable Mining: The Law and Practice", 1st ed., Oxford University Press, 2018.
- Sreejith, S. G. (2015), "Vedanta and the philosophy of international law: From human sociality to ahuman reality", *Indian Journal of International Law*, 55 (1): 3-38.
- Szablowski, David (2007), *Transnational Law and Local Struggles: Mining Communities and the World Bank*, Oxford: Hart Publishing.
- *TERI – NFA Working Paper*, New Delhi: TERI.
- Zillman, D. N., McHarg, A., Barrera-Hernandez, L., & Bradbrook, A. (Eds.). (2014). The law of energy underground: Understanding new developments in subsurface production, transmission, and storage. Oxford: Oxford University Press.

Additional information (if any):

Student responsibilities: 75% attendance

Course Reviewers

1. Prof Gurujit Singh, Professor, USLLS, Guru Gobind Singh Indraprastha University, Delhi
2. Ms Chhaya Bharadwaj, Associate Professor, Jindal Global Law School, Sonepat

Course title: Contracts law and management			
Course Code:	**No. of credits** : 3	**L-T-P**: 26-19-0	**Learning Hours :** 45
Pre-requisite course code and title (if any): None			
Course coordinator :		**Course Instructor:**	
Contact Details:			
Course type: Core		**Course offered in :** Semester 2	

Course Description :

Contract gives the foundation of infrastructure projects. This course provides an advanced understanding of contract laws with respect to the infrastructure projects. Students will be exposed to foundations of contractual liability. The course will look into specific infrastructure contracts to get an understanding as to how different industries work. Infrastructure contracts of big projects need proper contract management. Students will be given an in depth understanding of contract management and the various processes attached with it. The course will go into professional understanding of possible conflict scenarios in project cycle and conflict resolution through case studies. The course taught through various case studies expose students to various sets of contract laws in infrastructure business.

Course objectives

- To provide an advanced understanding of contract law and its implications.
- To analyse specific types of infrastructure contracts and its various forms.
- To understand contract management and dispute resolution

Course Content	**L**	**T**	**P**
Module 1: Principles of Contract Law	8	2	
• Basic principles for Formation of Contract; • Implied terms of Contract: Nabha Power Ltd. vs. PSPCL and Ors. (2018); • Discharge of contracts: Force Majeure, Change Order, Change of Law, Jurisprudence on 'Time is of the Essence'; • Compensation in Infrastructure Contracts; • Specific Contracts; Agency, Indemnity, Guarantee, Bailment			
Module 2: Infrastructure Contracts	6	8	
• Public Private Partnership Models(PPP); • Joint Ventures; • Management Contract; • Work & Cost Contracts; • Leasing out; • Model Concession Agreements; • Fee- Sharing Agreements; • State Support Contracts; • Security Trust Contracts; • Share Pledge Contracts • Powe Purchase Agreements (PPA) • Green and Sustainable Infrastructure Contracts • Drafting Specific Contracts : Types of Contract Clauses • Mock Activity (Negotiating Contracts)			

Module 3: Contract Management	5	5	
• Importance of Contract management • Contract Management Theory: processes from a conceptual perspective • Success Criteria for processes • Upstream or Pre-award activities • Creating Functional Team(s) for Risk Analysis & Contract Management • Creating Templates for Contracts • Creating Contract Management Processes • Contract exit strategy – • Dispute Resolution Planning and Processes • Contract Training • Hypothetical Case Scenarios			
Module 4: Conflict Resolution	7	4	
• Alternative dispute resolution mechanisms – Arbitration, Mediation, Conciliation and Negotiation • Arbitration and Conciliation Act, 1996 • Arbitral Award • Appeal • Conciliation • Forum Inconvenience (multijurisdictional issues) • International Arbitration in Infrastructure Contracts: UNCITRAL, ICC, or LCIA rules • Multi-Tiered Dispute Resolution Clauses • International Investments and Infrastructure Projects			
Total	**26**	**19**	

Evaluation criteria:

- Minor Test: Written Examination- 20% [Syllabus: Module 1 and 2]
- Written Assignment: Drafting Specific Contracts- 20 % [Entire Syllabus]
- Mock Negotiation-20 % [Entire Syllabus]
- Major Test: Written Examination-40 % [Syllabus: Module 3-4]

- **Learning Outcomes:**
- *Understand and Recall* fundamental principles of contract law, particularly as applied to infrastructure projects, including key contractual concepts such as formation, discharge, and performance. [Minor Test, Major Exam]
- *Apply* contract law principles to real-world scenarios, effectively using legal reasoning to draft, negotiate, and manage infrastructure contracts, taking into account risk allocation, regulatory requirements, and commercial interests.[Minor Test, Major Exam, Contract Drafting Exercise, Role Play]
- *Analyze* various types of infrastructure contracts (e.g., PPP models, EPC contracts) and critique their strengths and weaknesses in achieving project goals. Identify potential legal issues and areas for improvement within contract management frameworks. [Research Paper, Presentation]
- *Evaluate* contract management practices and dispute resolution mechanisms within infrastructure projects, considering the implications of contractual frameworks on project success, stakeholder interests, and legal compliance. [Minor Test, Major Exam, Case Study Analysis, Presentation]
- *Create* structured, well-supported legal arguments and contract management strategies, formulating solutions to complex issues such as dispute resolution, risk mitigation, and regulatory compliance in infrastructure projects. [Research Paper, Contract Drafting Exercise, Presentation]

Pedagogical approach:
A combination of lecture based and problem based learning would be used. Case studies would be used for initiating discussions in the module on specific sectors.

Materials:

Module 1: Principles of Contract Law

Key Readings:

- Anson's Law of Contract – Sir Jack Beatson FBA, Andrew Burrows FBA QC (Hon), and John Cartwright, 30th edn, OUP, 2016.
  Chapters on Formation of Contracts and Discharge of Contracts
- Law of Business Contracts in India – Sairam Bhatt, Sage, 2009.
  Chapters on Specific Contracts (Agency, Indemnity, Guarantee, Bailment)
- Keating on Construction Contracts – Stephen Furst & Sir Vivian Ramsey, 9th edn, Sweet & Maxwell, 2012.
  Section on Contractual Clauses and Dispute Mechanisms
- Chitty on Contracts – H.G. Beale, 33rd edn, Sweet & Maxwell, 2018.
  Relevant sections on General Principles of Contract Law

Module 2: Infrastructure Contracts

Key Readings:

- Law Relating to Infrastructure Projects – Piyush Joshi, Butterworths, 2003.
  Chapters on Public-Private Partnership Models and Joint Ventures
- FIDIC Contracts: Law and Practice – Ellis Baker, Ben Mellors, Scott Chalmers, Anthony Lavers, Informa Law, 2019.
  Sections on EPC and BOT contracts
- The Law and Business of International Project Finance – Scott L. Hoffman, 4th edn, Cambridge University Press, 2017.
  Relevant sections on concession agreements and financial structuring in infrastructure projects
- Public-Private Partnerships: Principles of Policy and Finance – E. R. Yescombe, 2nd edn, Butterworth-Heinemann, 2011.
  Chapters on various PPP models and contractual frameworks

Module 3: Contract Management

Key Readings:

- Contract Management: Core Business Competence – Ralf Steger and Bert Verworn, Springer, 2013.
  Chapters on Contract Creation, Templates, and Contract Management Processes
- The NEC4 Contract – Nicholas Gould, ICE Publishing, 2017.
  Chapter on Contract Management and Risk Allocation
- Contract and Commercial Management: The Operational Guide – International Association for Contract and Commercial Management (IACCM), Van Haren Publishing, 2013.
  Section on Contract Performance, Risk Management, and Claim Management
- Building Contract Claims – David Chappell, 5th ed, Wiley Blackwell, 2018.
  Chapter on Claims Management in Infrastructure Projects

Course Reviewers:

1. Dr. Ghazala Abidin, Associate Professor, School of Law, Manav Rachna University
2. Ms. Bunu Ghimire, Assistant Director (Legal), Nepal Insurance Authority, Government of Nepal

Course title: Forest Law and Policy			
Course Code:	**No. of credits** : 3	**L-T-P:** 39-6-0	**Learning Hours :** 45
Pre-requisite course code and title (if any): None			
Course coordinator :		**Course Instructor:**	
Contact Details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description :

State's approach towards forests has changed over a period of time. From being considered as an impediment to agriculture during the initial years of colonization, forests were seen as an important source of revenue during a significant part of the colonial rule. The discourse on climate change has forced to view forests as carbon sinks. This course is an attempt to provide an overview of the forest laws and policies both at the national and international level.

Course objectives

- To understand the legal regime on forestry in India and the changes in the policy over a period of time.
- To analyse the role of local communities in forest management under various laws and policies.
- To appreciate the evolving international law in the field and the concerns of the developing countries.

Course Content	L	T	P
Module 1: Introduction : History, Evolution and Basic Concepts of Forest Law and Policy	7		
• History of forest laws and policies in India: Different stages • British Colonial Forest Policies • Impact of British Policies on Forest Dwellers • National Forest Policy 1952 and 1988 • Functions of forests: ecological, social, and economic functions(legal perspectives), Purposes of forest management • Forest Governance Structures a. Definition of forests and its importance			
Module 2: Overview of the legal regime	9	2	
Constitutional Provisions – Indian Forest Act 1927, Classification of forests – Forest (Conservation) Act, 1980 –Non-forest purpose- national security and forest conservation- CAMPA, 2016 –Forest Rights Act, 2006 – Interface between Forest Laws and Land Acquisition Laws; Role of Judiciary: Forest Conservation case ; Divergent Views of the Courts			
Module 3: Forest dwellers and forest governance	7	1	
Van Panchayats, Joint Forest Management, Forest Rights Act, 2006 PESA and its impact on forest governance, Rights of Indigenous Peoples in Forest Governance: international legal framework protecting indigenous rights, Gender intersectionality in Forest Governance Economic aspects of forest governance: Van Dhan Yojna			
Module 4: Wildlife conservation and forests	7	1	
Wildlife (Protection) Act, 1972 – Protected Areas – Forest dwellers and wildlife conservation, Interface with FRA Environment (Protection) Act, 1986 – ESA Notifications – Eco-sensitive Zones			

(ESZs) around protected area: judicial contribution – Eco-tourism activities in Protected Areas : regulation Resource Conflict: Coal bed Methane in Fringe Areas; Human-Animal Conflict			
Module 5: International Legal regime on forests	9	2	
Regional Agreements: Trends; Soft law instruments: Stockholm Declaration, World Charter for Nature, Rio Declaration, Agenda 21, Forest Principles 1992, Forestry Principles, 2007, SDGs – Goal 15. Treaties: Ramsar Convention, CITES, CBD, UNFCCC, Kyoto Protocol, Paris Agreement, World Heritage Convention, International Tropical Timber Agreement REDD+, Economic Law and Forests; Forest Based Solutions for Climate Resilience; Forest Governance and Space Technology ; Transboundary Forest Management			
Total	**39**	**6**	**0**

Evaluation criteria

- Minor Test: Written Examination- 20% [Syllabus: Module 1]
- Written Assignment: Research Paper or Case Comment – 20 % [Entire Syllabus]
- Presentation on the Assignment -20 % [Entire Syllabus]
- Major Test: Written Examination-40 % [Syllabus: Module 2-4]

Learning outcomes

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

- Understand and Recall key principles of forest law and policy, including the historical evolution of forest governance, international agreements, and national frameworks for forest conservation and management. *[Minor Test, Major Test]*
- Apply this knowledge to real-world scenarios in forest conservation and management, effectively using legal reasoning to assess policy implications, regulatory decisions, and sustainable forest practices. *[Minor Test, Major Test, Case Comment, Presentation]*
- Analyze and Critique forest laws, policies, and reforms at national and international levels, identifying potential areas for improvement in forest management, indigenous rights, and sustainable use of forest resources.
  [Research Paper, Presentation]
- Evaluate the role of forests in broader environmental and socio-economic contexts, considering the implications of legal frameworks on biodiversity conservation, climate change, indigenous rights, and sustainable development.
  [Minor Test, Major Test, Research Paper or Case Comment, Presentation]
- Create well-reasoned arguments and proposals for policy or legal reform to address contemporary challenges in forest law, such as deforestation, wildlife conservation, climate change, and community rights.
  [Research Paper, Presentation]

Pedagogical approach

Predominantly based on classroom teaching. A lot of emphasis will be given for self-study.
For this module wise reading material will be distributed in advance.

Module 1: History of Forest Laws and Policies in India

Key Readings:

- Sivaramakrishnan, K. (1999), *Modern Forests: Statemaking and Environmental Change in Colonial Eastern India*, Stanford University Press.
- Gadgil, M. & Guha, R. (1992), *This Fissured Land: An Ecological History of India*, University of California Press.

Module 2: Forest Governance and Communities
Key Readings:

- Forest Rights Act, 2006
- Lele, S., & Menon, A. (2014), *Democratizing Forest Governance in India*, Oxford University Press.
- Government of India (1996), *Panchayats (Extension to Scheduled Areas) Act, 1996 (PESA)*.
- Agarwal, A., & Gibson, C. (1999), *Community and the Environment: Ethnicity,*
- *Gender, and the State in Community-Based Conservation*, Rutgers University Press.
    - Saravanan, V. (2009), *Decentralized Governance and Natural Resource Management in India: The Role of Van Panchayats in Uttarakhand*, Natural Resources Forum, Vol. 33, Issue 1.

Module 3: Forest Dwellers and Forest Governance
Key Readings:

- Springate-Baginski, O. (2010), *Forest Rights Act 2006: Recognizing the Rights of Forest Dependent Communities in India*, University of East Anglia.
- Menon, A., & Kohli, K. (2014), *Ecology, Equity, and Rights: Forest Governance through Forest Rights Act, 2006*, Journal of Indian Law and Society.
    - Shiva, V. (1993), *Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology*, Zed Books.
- Vasant Saberwal & Mahesh Rangarajan (2003), *Battles over Nature: Science and the Politics of Conservation*, Permanent Black.
- Sarin, M. (2005), *The Joint Forest Management Program in India: Some Critical Issues*, in *Forests, People and Power*, Earthscan.

Module 4: Wildlife Conservation and Forests
Key Readings:

- Wildlife Protection Act (1972):
- Rangarajan, M. (2006), *India's Wildlife History: An Introduction*, Permanent Black.
- Madhusudan, M.D. & Karanth, K.U. (2002), *Local Hunting and the Conservation of Large Mammals in India*, Ambio.
- Shahabuddin, G. (2010), *Conservation at the Crossroads: Science, Society, and the Future of India's Wildlife*, Permanent Black.
- Kothari, A., & Pathak, N. (2006), *Protected Areas and People: The Future of the Wildlife Conservation Strategy in India*, Economic and Political Weekly.

Module 5: International Forest Law and Policy
Key Readings:

- United Nations (1992), *Rio Declaration on Environment and Development*:
- United Nations (1997), *Kyoto Protocol to the United Nations Framework Convention on Climate Change*.
- FAO (2010), *Global Forest Resources Assessment 2010*, Food and Agriculture Organization of the United Nations.
- International Tropical Timber Agreement (ITTA, 2006):
- Humphreys, D. (2006), *Logjam: Deforestation and the Crisis of Global Governance*, Earthscan.

Additional information (if any)

Course Reviewer:

Prof. Dr. M. Sakthivel, Professor, Tamil Nadu National Law University
Ms. Nidhi Singh, Programme Officer, Asian Forum for Human Rights and Development (FORUM-ASIA)

Course title: Competition Law and Policy			
Course Code: MPL 165	**No. of credits :** 3	**L-T-P** : 33-12-0	**Learning Hours** : 45
Pre-requisite course code and title (if any): Infrastructure Law and Policy (MPL 157)			
Course coordinator :		**Course Instructor:**	
Contact Details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description

Competition law is aimed at protecting the process of competition within the market. Since the nineties, almost all developing countries have enacted competition laws in the lines of the laws of developed countries. This course is an attempt to address some of the issues in competition law that are of interest to countries like India. This course builds on the basic course on *Competition law* at the undergraduate level and the *Infrastructure Law and Policy* course offered in the I Semester.

- **Course objectives**
- To understand the need and rationale for competition law from a developmental perspective.
- To critically examine some of the crucial issues like the interface with IPR laws, regulatory laws, environmental laws, and public procurement laws.
- To critically analyse the emerging international competition law and its impact on developing countries.

Course Content	**L**	**T**	**P**
Module 1: Introduction	12	1	0
• Objectives of competition law and policy • Evolution of Competition Law and Policy in India : MRTP Act, Raghavan Committee Report, Competition Commission • Basic concepts: relevant market, anti-competitive agreements, abuse of dominant position and anti-competitive combinations • Digital Markets and Competition Law • Emerging International Competition Law • Developing Countries and Competition Law			
Module 2: Competition Law and Regulation	7	4	
• Competition issues in network industries • Role of sectoral regulators in competition issues: case studies of infrastructure sector • Cross-Border Infrastructure Projects and Competition Regulation: role of international organizations, • Fintech and Competition Law –Data Portability and Competition Regulation			
Module 3: Competition Law and IPRs	6	4	
• Objectives: complimentary or contradictory? • Competition law remedies for IPR abuses • TRIPS provisions • Compulsory Licensing and Public Interest • Standard Essential Patents (SEPs) and FRAND Terms • IPR pools and Joint Ventures • Patent Trolls and Competition Law			

• Digital Copyrights and Competition Law			
Module 4: Competition Law and other Government Policies	8	3	
• Competition law and public procurement ; methods of public • procurement • bid rigging, collusive bidding and cartelization • International Guidelines on Public Procurement: WTO's Government Procurement Agreement (GPA)- • Competition law and environmental policy – the impact of environmental policy on environment; Climate Change and Competition Law and Policy • Types of governmental interventions and their impact on competition - Competition law and labour law – freedom of Association and collective bargaining - Competition Law and Healthcare Policy- Competition Law and Tax Policies- Competition Law and Consumer Protection			
Total	**33**	**12**	**0**

Evaluation criteria:

- Minor Test: Written Examination- 20% [Syllabus: Module 1]
- Written Assignment: Research Paper or Case Comment – 20 % [Entire Syllabus]
- Presentation on the Assignment -20 % [Entire Syllabus]
- Major Test: Written Examination-40 % [Syllabus: Module 2-4]

Learning outcomes

- Understand and Recall key principles of competition law and its policy implications, particularly in the context of developing countries like India. *[Minor Test, Major Test]*
- Apply competition law principles to real-world market scenarios, using legal reasoning to assess regulatory decisions, anti-competitive practices, and policy implications in various sectors. *[Minor Test, Major Test, Case Comment, Presentation]*
- Analyze and Critique competition laws, policies, and reforms across different sectors, identifying potential areas for improvement and drawing comparisons with international practices. *[Research Paper, Presentation]*
- Evaluate the intersection of competition law with other socio-economic policies, such as public procurement, labor rights, and environmental sustainability, considering the broader economic and societal impact.
  [Minor Test, Major Test, Research Paper or Case Comment, Presentation]
- Create well-supported arguments and proposals for legal or policy reforms to address contemporary competition law challenges, including emerging issues in digital markets, public procurement, and international trade.
  [Research Paper, Presentation]

Pedagogical approach

Predominantly based on classroom teaching. In addition, role play and moot courts will be used. A lot of emphasis will be given on self-study. For this, study materials for each module will be circulated in advance.

Readings :

Module 1: Objectives of Competition Law and Policy

Key Readings:

- Amelia Fletcher, *'Digital Competition Policy and Big Tech Regulation'* (2023).
- Cristina Caffarra et al., *'Enforcing Competition Law in Digital Markets and Ecosystems'* (UNCTAD, 2024).

- Eleanor Fox and Mor Bakhoum, *"Antitrust in Developing Economies"* (2023).
    - Government of India (2000), *Report of the High-Level Committee on Competition Policy and Law*.
- Kumar, A. (2007), *The Evolution of Competition Law in India*, in Vinod Dhall (ed.), *Competition Law Today: Concepts, Issues, and the Law in Practice*, New Delhi: Oxford University Press.
- Noonan, Chris (2008), *The Emerging Principles of International Competition Law*, Oxford: Oxford University Press.
- Singh, A. (1999), *Competition Policy, Development and Developing Countries*, South Centre.
- Vinod Dhall, *"Competition Law in India: Developments and Challenges"* (2023).

Module 2: Competition Law and Regulation
Key Readings:

- Ioannis Kokkoris, *"Cross-Border Infrastructure and Antitrust Regulation"* (2023).
- Nordic Competition Authorities (2010), *Competition Policy and Green Growth: Interactions and Challenges*.
- OECD (2006), *Environmental Regulation and Competition*, *OECD Policy Roundtables*.
- Philippe Aghion et al., *"Green Growth and Competition Policy"* (OECD, 2023).
- Rupprecht Podszun, *"Data Portability and Digital Competition"* (2024).
- Sands, Philippe et.al. (2012), *Principles of International Environmental Law*, 3rd Edition, Cambridge: Cambridge University Press.
- Simonetta Vezzoso, *"Regulatory Sandboxes and Innovation in Competition Law"* (2023).
- Vagstad, S. (1995), *Promoting fair competition in public procurement*, *Journal of Public Economics*, 58(2), 283-307.

Module 3: Competition Law and IPRs (Intellectual Property Rights)
Key Readings:

- Beatriz Gallego, *"Competition and Copyright in the Digital Economy"* (2023).
- Carlos Correa, *"Compulsory Licensing in TRIPS-Compliant Jurisdictions"* (2023).
- Gallego, Beatriz C. (2010), *Intellectual Property Rights and Competition Policy*, in Carlos M. Correa (Ed.) *Research Handbook on the Protection of Intellectual Property under WTO Rules*, Volume I, Cheltenham: Edward Elgar.
- Herbert Hovenkamp, *"Antitrust and Patent Aggregation"* (2023).
- Jorge Padilla, *"Standard Essential Patents and FRAND Obligations"* (2023).
- Korah, Valentine (2007), *Competition Law and Intellectual Property Rights*, in Vinod Dhall (ed.), *Competition Law Today: Concepts, Issues, and the Law in Practice*, New Delhi: Oxford University Press.
- Taylor, Martyn D. (2006), *International Competition Law*, Cambridge: Cambridge University Press.

Module 4: Competition Law and Other Government Policies
Key Readings:

- Anders Aslund, "Public Procurement and Bid Rigging: International Guidelines" (OECD, 2024).
- Eleanor Fox, "Competition Policy and Social Justice" (2023).
- Ioannis Lianos, "Competition Law and Labor Markets" (2023).
- Mazhuvanchery, Shiju (2010), *Indian Competition Act: A Historical and Developmental Perspective*, *The Law and Development Review*, Vol. 3, No. 2, Article 8.
- Nordic Competition Authorities (2010), *Competition Policy and Green Growth: Interactions and Challenges*.
- Philippe Sands, "Competition Policy and Environmental Sustainability" (2023).

- Rubiano, Camilo (2013), *Collective Bargaining and Competition Law: A Comparative Study on the Media, Arts and the Entertainment Sectors*.
- Singh, A. (1999), *Competition Policy, Development and Developing Countries*, South Centre.

Landmark Judgments:

International Judgments

- United States v. Standard Oil Co. (1911)
- United States v. Microsoft Corp. (2001)
- Continental Can Company Case (ECJ, 1973)
- Hoffmann-La Roche v. Commission (ECJ, 1979)
- Intel v. European Commission (ECJ, 2022)
- EU Google Shopping Case (2017)
- United Brands v. Commission (ECJ, 1978)
- AstraZeneca v. European Commission (ECJ, 2012)
- Cartes Bancaires v. Commission (ECJ, 2014)
- Facebook (Meta) v. German Competition Authority (2023)

Indian Judgments

- Brahm Dutt v. Union of India (2005)
- CCI v. SAIL (2010)
- Competition Commission of India v. Excel Crop Care Limited (2017)
- DLF Ltd. v. Competition Commission of India (2014)
- CCI v. Bharti Airtel Ltd. (2019)
- Uber v. Competition Commission of India (2020)
- Amazon v. Future Retail (2021)
- Grasim Industries v. Competition Commission of India (2023)
- Google LLC v. Competition Commission of India (2023)
- Hindustan Zinc Ltd. v. Vedanta Ltd. (2023)

Course Reviewers:

Prof. Dr. Rashmi Salpekar, Dean and Professor, Vivekananda School of Law and Legal Studies

Dr. Narender Kumar, Assistant Professor, Allahabad University

Course title: Urban Infrastructure Law and Management			
Course Code: MPL 165	**No. of credits** : 3	**L-T-P Distribution** : 33-12-0	**Learning Hours** : 45
Pre-requisite course code and title (if any): Infrastructure Law and Policy (MPL 157)			
Department: Centre for Postgraduate Legal Studies			
Course coordinator :		**Course Instructor:**	
Contact Details:			
Course type: Elective		**Course offered in:** Semester 2	

Course Description

It is expected that the increasing urbanization in India will exert tremendous pressure on urban infrastructure. Laws and policies play a significant role in improving urban infrastructure. In this context, this course is an attempt to provide an overview of the laws and policies relating to urban infrastructure. The course provides an introduction to the urban governance structure in India, an overview of different policies and a critical analysis of the laws and policies in the particular sector.

Course objectives

- To provide an overview of the urban governance system in India and the various policies at the national level having a bearing on urban infrastructure.
- To analyse various laws and policies applicable in different sectors of urban infrastructure.

Course Content	**L**	**T**	**P**
Module 1: Urbanization and Governance	5	6	0
Urbanization – Theories - Trends – Basic urban infrastructure services Urban Governance: 74th Constitutional Amendment – Different state and municipal laws – Different types of local bodies – Mayor in council – standing committees – ward committees Reforms – Area sabhas – public disclosure law – community participation law – e – governance – financial reforms An Overview of Urban Development Policies and Programmes: Smart Cities, AMRUT, JNNURM, Pradhan Mantri Awas Yojana-Housing for All (PMAY-HFA), Shyama Prasad Mukherji National Rurban Mission (NRuM) etc. Accessibility SDGs and Urban Infrastructure: Goal 11 Climate Resilience and Disaster Proofing of Urban Infrastructure Digital Infrastructure and Smart Cities • Social and Environmental Justice in Urbanization			
Module 2: Urban Planning	6	2	
Town and country planning laws – Development Authorities - Master plans – Land acquisition – land pooling – land ceiling laws – Heritage Conservation and Urban			

Planning- Right to Shelter and Housing Laws- Urban Redevelopment and Slum Rehabilitation			
Module 3: Urban Environment	6	2	
Air and water pollution – solid waste management – public spaces – sustainable urban water management- circular economy- urban bio-diversity and eco-system services -nature based solutions			
Module 4: Urban Mobility	4	2	
Metro – BRT – Mono rail – last mile connectivity- electric public transport- Public-Private Partnerships (PPPs) in Urban Transport			
Module 5: Housing	3	2	
Apartment legislations – Rent control – stamp duty – Real Estate Law – Model Building Bye Laws Slum development			
Module 6: Provision of services	5	2	
Role of Sectoral Regulators including Electricity Regulators and TRAI (Universal Service Obligations)- Para statals – Private participation – FDI- Labour Rights in Private Participation			
Total	**29**	**16**	**0**

Evaluation criteria

- Minor Test: Written Examination- 20% [Syllabus: Module 1]
- Written Assignment: Research Paper or Case Comment – 20 % [Entire Syllabus]
- Presentation on the Assignment -20 % [Entire Syllabus]
- Major Test: Written Examination-40 % [Syllabus: Module 2-4]

Learning outcomes

By the end of the course, it is expected that the students will:

Understand and Recall the key legal principles, regulatory frameworks, and governance mechanisms governing urban infrastructure, including urbanization trends, planning laws, environmental regulations, and service provision policies.

[Minor Test, Major Test]

Apply legal and analytical reasoning to real-world urban infrastructure challenges, interpreting policies and regulations related to urban planning, mobility, housing, and public services, while proposing practical solutions.

[Case Comment, Presentation]

Critically Analyze urban infrastructure laws and reforms, assessing their effectiveness in promoting sustainable urban development, social equity, and environmental protection, and identifying areas for legal and policy improvement.

[Research Paper, Presentation]

Evaluate the impact of public-private partnerships (PPPs), para-statals, and private sector involvement in urban infrastructure, considering legal frameworks, risk management, labor rights, and the provision of essential services.

[Major Test, Research Paper, Case Study]

Pedagogical approach

A mixture of lecture and discussion methods will be adopted. The topics under each module will be introduced through an introductory lecture, followed by discussions by students. Students are expected to come prepared and initiate discussions on topics that have been assigned beforehand.

Landmark Judgments:

International Judgments

- United States v. Standard Oil Co. (1911)
- United States v. Microsoft Corp. (2001)
- Continental Can Company Case (ECJ, 1973)
- Hoffmann-La Roche v. Commission (ECJ, 1979)
- Intel v. European Commission (ECJ, 2022)
- EU Google Shopping Case (2017)
- United Brands v. Commission (ECJ, 1978)
- AstraZeneca v. European Commission (ECJ, 2012)
- Cartes Bancaires v. Commission (ECJ, 2014)
- Facebook (Meta) v. German Competition Authority (2023)

Indian Judgments:

- Brahm Dutt v. Union of India (2005)
- CCI v. SAIL (2010)
- Competition Commission of India v. Excel Crop Care Limited (2017)
- DLF Ltd. v. Competition Commission of India (2014)
- CCI v. Bharti Airtel Ltd. (2019)
- Uber v. Competition Commission of India (2020)
- Amazon v. Future Retail (2021)
- Grasim Industries v. Competition Commission of India (2023)
- Google LLC v. Competition Commission of India (2023)
- Hindustan Zinc Ltd. v. Vedanta Ltd. (2023)

Additional information (if any)

Student responsibilities

Course Reviewers :

Prof. Dr. Rashmi Salpekar, Dean and Professor, Vivekananda School of Law and Legal Studies, Delhi

Dr. Mayank Tyagi, Assistant Professor, National Law Institute University, Bhopal

Course title: Climate Change and Law			
Course Code: MPL 134	**No. of credits :** 3	**L-T-P Distribution :** 30-15-0	**Learning Hours :** 45
Pre-requisite course code and title (if any): Infrastructure Law and Policy (MPL 157)			
Department: Centre for Postgraduate Legal Studies			
Course coordinator :		**Course Instructor:**	
Contact Details:			
Course type: Elective		**Course offered in:** Semester 2	

Course Description

Climate change is one of the main challenges facing humanity today. It has severe implications for the social, economic, and political life of people around the world. An attempt is made in this course to look at the legal responses both at the national and international level to this grave crisis. In addition, the course also looks at the impact of this phenomenon on other branches of law like the law of the sea and human rights.

Course objectives

- To create a new idea for bringing a new legal regime relating to climate change.
- To evaluate the existing law and policy relating to climate change.
- To analyze the role of the different national and international institutions that are dealing with climate change globally and nationally.
- To practically apply the existing legislation and policies.
- To understand the development of climate change law both nationally and internationally.
- To remember the laws, judgments, and so on relating to climate change

Course Content	**L**	**T**	**P**
Module 1: Introduction	6	3	0
-**Climate Change:** meaning, causes and effects, science & international politics. -**Triple planetary crisis:** Triple Planetary Crisis: Climate Change, Pollution and Biodiversity Loss. -**Basic terminologies:** Adaptation, Mitigation, Loss and Damage, Climate Finance. -Planning for Climate Change - Early Warning System, Impact Assessment.			
Module 2: International Legal Regime on Climate Change:	9	3	
• Sources of General International Law • Relationship between international law and municipal law • Sources of International Climate Change Law • UN Framework Convention on Climate Change • Kyoto Protocol - Doha Amendment • Paris Agreement- New Collective Quantified Goal on Climate Finance (NCQGCF) • Top-Down and Bottom-Up approach, Nationally Determined Contributions (NDCs) – Enforcement • Montreal Protocol and the Kigali -Amendment • Conference of the Parties (COPs) • International Organizations and Institutions: World Meteorological Organization (WMO), Intergovernmental Panel on Climate Change (IPCC),			

United Nations Environment Programme (UNEP).			
Module 3: National Scenario	6	3	
• India's obligations under International law • National Action Plan for Climate Change (NAPCC) & State Action Plan for Climate Change • NDCs under the Paris Agreement. • Energy Policies-Marine and Mountain Development Policies and Projects. • COPs and India's Participation • Just Transition: Transitioning away from fossil fuels in energy systems • Supreme Court of India & National Green Tribunal (NGT)			
Module 4: Impact on other areas of law and litigation	3	3	
• Climate Change and the Law of the Sea: Implications for Sovereignty, Marine Biodiversity. • Climate Change, Global Health, Agriculture and Food Security. • Trade issues-Technology Transfer-IPRs • The International Tribunal for the Law of the Sea			
Module 5: Climate Justice	6	3	
• Equity Concerns to Climate Change, Environmental Justice, and Climate Justice. • Use of Environmentally Sound Technologies (ESTs) and Climate Change • Clean Development Mechanism and REDD+CDM-Past and Future • Climate change as a human rights issue: Indigenous people, gender. • Climate Change and Third World Approach • Role of the International Court of Justice • Decisions of Regional Human Rights Courts (EU, USA)			
Total	**30**	**15**	**0**

Evaluation criteria

- Class participation: 10
- Minor test: 20 [Unit 1]
- Term Papers: 10 [Unit 1-5]
- Presentations: 10 [Unit 1-5]
- Major Test: 50 [Unit 2-5]

Learning outcomes

By the end of the course, it is expected that the students will:

- To create a new idea for bringing a new legal regime relating to climate change [Research paper and presentation]
- To evaluate the existing law and policy relating to climate change [Minor and major tests].
- To analyze the role of the different national and international institutions that are dealing with climate change globally and nationally. [Class participation and minor and major tests]
- To practically apply the existing legislation and policies [Research paper writing].
- To understand the development of climate change law both nationally and internationally [minor and major tests].
- To remember the laws, judgments, and so on relating to climate change [minor and major tests]

Pedagogical approach

A mixture of lecture and discussion methods will be adopted. The topics under each module will be introduced through an introductory lecture, followed by discussions by students. Students are expected to come prepared and

initiate discussions on topics that have been assigned beforehand.

Materials
Suggested Readings
Books:

- Carlarne,Cinnamon P., Gray,Kevin R., and Tarasofsky,Richard (eds) (2016), *The Oxford Handbook of International Climate Change Law*, Oxford: Oxford University Press.
- French, Duncan and Rajamani, Lavanya(2013), "Climate Change and International Environmental Law: Musings on a Journey to Somewhere", *Journal of Environmental Law* 25 (3): 437-461.
- Carlarne, Cinnamon (2014), "Delinking International Environmental Law and Climate Change", *MichiganJournal of Environmental and Administrative Law*,4: 1.
- Bodansky,Daniel (2016),"The Legal Character of the Paris Agreement", *Review of European, Comparative and International Environmental Law*, 25 (2): 142-150.
- DeSombre, Elizabeth R. (2000), "The Experience of the Montreal Protocol: Particularly Remarkable, and Remarkably Particular", *UCLA Journal of Environmental Law & Policy* 19(1): 49.
- Bhullar ,Lovleen (2013), "CDM and REDD+: A Comparative Perspective", *International Journal of Rural Law and Policy*, 3 (1): Article 3.
- Savaresi, Annalisa (2016), "A Glimpse into the Future of the Climate Regime: Lessons from the REDD+ Architecture", *Review of European, Comparative and International Environmental Law*, 25 (2): 186–196.
- David D.Caron (2013),"Climate Change and the Oceans", in Harry N. Scheiber and Jin-Hyun Paik, eds,*Regions, Institutions, and the Law of the Sea: Studies in Ocean Governance*, Leiden: Brill Press.
- McInerney-Lankford, Siobh´an (2009). "Climate Change and Human Rights: An Introduction to Legal Issues", *Harvard Environmental Law Review*, 33: 431 – 437.
- Kavita Kapoor,(2011). "Climate Change, Intellectual Property and the Scope of Human Rights Obligations," Sustainable Development Law and Policy, 11 (2): 58-68.
- Usha Tandon and Amrendra Kumar, (2022). "Cliamte Adaptation Finance as Legal Obligation and Insiutional Facilitation: Botched Commitments for Developing Nations," South Asian Journal of Enviornmental Law and Policy, 1 (1): 11-28.
- Patrick Toussaint (2023). "Loss and Damage, Climate Victims and International Climate Law: Looking Back, Looking Forward", Transnational Enviornmental Law, 1: 1-16.

List of cases

-Obligations of States in respect of Climate Change, ICJ, 2023; https://www.icj-cij.org/case/187

- Request for an Advisory Opinion Submitted by the Commission of Small Island States on Climate Change and International Law, ITLOS, 2024 ; https://www.itlos.org/fileadmin/itlos/documents/cases/31/Advisory_Opinion/C31_Adv_Op_21.05.2024_orig.pdf

- MK Ranjitsinh and Ors Vs Union of India-WPC No.838 of 2019

Additional information (if any)

Student responsibilities

Reviewers comments:

Dr. Sujith K, Associate Professor, CILS, SIS, Jawaharlal Nehru University, New Delhi

Dr. Amrendra Kumar, Assistant Profesor (Sr. Scale), Law Centre-II, Faculty of Law, University of Delhi.

Course title: Environmental Aspects of Business Activities			
Course Code: MPL 156	**No. of credits :** 3	**L-T-P Distribution :** 30-15-0	**Learning Hours :** 45
Pre-requisite course code and title (if any):			
Department: Centre for Postgraduate Legal Studies			
Course coordinator :		**Course Instructor:**	
Contact Details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description

Business organizations have to comply with various environmental regulations on a daily basis. These regulations start operating from the inception stage onwards. In addition, the growing environmental consciousness and consumer preferences have forced businesses to go green. In this context, this course is intended to introduce the students to the legal issues in the interface between environment and business. In that process, it introduces various environmental regulations that directly affect business operations. The environmental standards and the liability issues in mergers and acquisitions are also discussed. The course will build on the knowledge gained in the basic course on Environmental Law and Policy.

Course objectives

- To create a new idea for bringing a new legal regime for business for the protection environment.
- To evaluate the existing law and policy relating to business and the environment in India.
- To analyze the role of the different national and international institutions which are dealing with the issues of business and environment.
- To practically apply the existing legislation and policies.
- To understand the development of Laws and policies both nationally and internationally.
- To remember the laws, judgments, and so on relating to the environment and business.

Course Content	L	T	P
Module 1: Introduction	6	3	0
• The Changing Nature of Business and Its Interaction with Nature and Sustainable Development • Nature as a Commodity, Valuation Issues, Property Rights • Greening of Business: Environmental Standards and Management • Forest Stewardship Council, Marine Stewardship Council • Sustainable Stock Exchange Initiative, • Sustainability Reporting under the Existing Law • CSR Requirements under the Companies Act			
Module 2: Consent and Industrial Sitting	6	3	0
• Consent requirements: Consent to operate and establish • Water (Prevention and Control of Pollution) Act, 1974; Air (Prevention and Control of Pollution) Act, 1981-uniform consent rules • Environment (Sitting for Industrial Projects) Rules • Legal Regulation of Manufacture, Storage and Import of Hazardous Chemical • Green Business Guide by ITCILO, GIZ, UNEP and ILO			
Module 3: Environmental Clearance	4	3	0

• Environmental scanning • Concept of Environmental Impact Assessment (EIA)-mandatory, discretionary & debate • Environment (Protection) Act, 1986, EIA notification- categorization, steps involved, general conditions, validity and monitoring; • Appeal – role of National Green Tribunal (NGT)			
Module 4: Clearances under the Forest and Wildlife Protection Laws	6	3	0
• Forest (Conservation) Act, 1980; Procedure for forest clearance; different stages; valuation, -Compensatory afforestation • The Central Empowered Committee (CEC) • Wildlife (Protection) Act, 1972 and clearances			
Module 5: Climate Justice	6	3	
• Equity Concerns to Climate Change, Environmental Justice, and Climate Justice. • Use of Environmentally Sound Technologies (ESTs) and Climate Change • Clean Development Mechanism and REDD+CDM-Past and Future • Climate change as a human rights issue: Indigenous people, gender. • Climate Change and Third World Approach • Role of the International Court of Justice • Decisions of Regional Human Rights Courts (EU, USA)			
Total	**30**	**15**	**0**

Evaluation criteria *Weightage*

- Class participation : 10
- Minor test : 20 [Unit 1]
- Term Paper : 10 [Unit 1-6]
- Presentations : 10 [Unit 1-6]]
- Major Test : 50[Unit 2-6]

Learning outcomes

By the end of the course, it is expected that the students will be able to:

- To create a new idea for bringing a new legal regime for business for the protection environment (Research paper writing).
- To evaluate the existing law and policy relating to business and the environment in India (minor and major tests).
- To analyze the role of the different national and international institutions which are dealing with the issues of business and environment (class participation).
- To practically apply the existing legislation and policies (minor and major tests).
- To understand the development of Laws and policies both nationally and internationally (Research paper and presentation).
- To remember the laws, judgments, and so on relating to the environment and business (minor and major tests).

Pedagogical approach

A mixture of lecture and discussion methods will be adopted. The topics under each module will be introduced through an introductory lecture, followed by discussions by students. Students are expected to come prepared and initiate discussions on topics that have been assigned beforehand.

Materials

Suggested Readings

- Kohli, Kanchiand Menon, Manju (eds.) (2016), *Business Interests and Environmental Crisis*, New Delhi: Sage.
- UNEP (2015), *Stock exchanges and Sustainability*, Geneva: International Environment House.
- OECD (2006), *Environmental Compliance and Enforcement in India: Rapid Assessment*, New Delhi: OECD India.
- Pratima Bansal and Andrew J. Hoffman (ed.) (2011), The Oxford Handbook of Business and the Natural Environment: Oxford OUP.
- Purva Mhatre, Vidyadhar V. Gedam, Seema Unnikrishnan, Rakesh D. Raut, "Circular economy adoption barriers in built environment- a case of emerging economy,"*Journal of Cleaner Production,* Volume 392, 2023
- Purva Mhatre, Vidyadhar Gedam, Seema Unnikrishnan, Sanjeev Verma, "Circular economy in built environment – Literature review and theory development," *Journal of Building Engineering*, Volume 35,2021
- Guidance Note UNDP Social and Environmental Standards (SES), 2022; https://ses-toolkit.info.undp.org/sites/g/files/zskgke446/files/2023-03/UNDP%20Social%20and%20Environmental%20Screening%20Procedure_JULY2022_ENGLISH.pdf
- World Bank, Environmental and Social Screening Checklist; https://documents1.worldbank.org/curated/en/471791594632799255/pdf/Appendix-1-Environmental-and-Social-Screening-Checklist.pdf
- MEF&CC, Environmental impact assessment (EIA); https://moef.gov.in/environmental-impact-assessment-eia
- ILO, What is a green job?; https://www.ilo.org/resource/article/what-green-job
- ILO, Green jobs, Just transition towards environmentally sustainable economies and societies; https://www.ilo.org/media/252966/download
- The Green Business Guide is developed by ITCILO, GIZ, UNEP and ILO; https://www.ilo.org/publications/green-business-guide

Case laws:

- *Abhilash Textile and Ors. vs. The Rajkot Municipal Corporation (05.08.1987 - GUJHC): MANU/GJ/0095/1988*
- *M.C. Mehta vs. Kamal Nath and Ors. (Span Motel Case) (13.12.1996 - SC)*
- *Indian Council for Enviro-Legal Action and Ors. vs. Union of India (UOI) and Ors. (Bichhri Case) (13.02.1996 - SC)*
- *Union Carbide Corporation and Ors. vs. Union of India (UOI) and Ors. (Bhopal Gas Leak Case) (03.10.1991 - SC)*
- *M.C. Mehta and Ors. vs. Union of India (UOI) and Ors. (Shriram GasLeak Case) (17.02.1986 – SC*
- *Rural Litigation and Entitlement Kendra, Dehradun and Ors. vs. State of U.P. and Ors. (Dehradun Quarrying case)*
- *T.N. Godavarman Thirumulkpad vs. Union of India (UOI) and Ors. (12.12.1996 - SC)*

Additional information (if any)

Student responsibilities

Reviewers:

1. Shiju M V, Professor, Sai University, Chennai.
2. Dr. Tahir Qureshi, Assistant Professor, Symbiosis Law School Hyderabad.

Course title: Infrastructure Project Finance Law			
Course Code: MPL 146	**No. of credits :** 3	**L-T-P Distribution :** 30-15-0	**Learning Hours :** 45
Pre-requisite course code and title (if any):			
Department: Centre for Postgraduate Legal Studies			
Course coordinator :		**Course Instructor:**	
Contact Details:			
Course type: Core		**Course offered in:** Semester 2	

Course Description

This course aims to provide an overview of the commercial and general legal context in which financing of the infrastructure sector, or project financing is undertaken. The course also covers the legislative and policy framework within which the project finance market operates in India. The course will explore and examine, methods and sources of project financing particularly in India, risks attached with financing of large-scale infrastructure projects and project finance documentation in India.

Course objectives

- To create a new idea for bringing a new legal regime regarding infrastructure project finance law.
- To evaluate the existing law and policy relating to Infrastructure Project.
- To analyze the role of the different financial institutions that are dealing with the issue of project finance.
- To practically apply the existing legislation and policies.
- To understand the development of infrastructure project law.
- To remember the laws, judgments, and so on relating to infrastructure project finance.

Course Content	**L**	**T**	**P**
Module 1: Topic	9	0	0
1. Overview • Infrastructure: definitions, stakeholders, macroeconomic benefits, requirements • Who pays for the cost of infrastructure? • Kinds & Key risks in developing large-scale infrastructure projects • The project finance and structured finance market in India • Regulatory overview of project finance in India - the role of Reserve Bank of India. • Project Finance methods and structures • Project Finance – risk management, including cross border risks Case studies			
2. Project Finance Issues & Legal Regulations • The Constitution of India • National legislation and Policies • Other legal mechanism: he Insolvency and Bankruptcy Code, 2016 • Governance, Transparency and The Rule of Law	6	3	0

• National and International Environmental and Climate Change Regulations • Role of Judiciary Case studies			
3. Security • Securities in Project Finance – overview • Security Documents • Security Creation and Perfection • Key Environmental, social and governance (ESG) factors and project risk Case studies	6	6	0
4. Fortifying a Stationary Target • Sub-debt • 'Material Adverse Change' and other market clauses • External Commercial Borrowings • Assessing political and sovereign risk over long-term investment Climate mitigation projects and the impact of government subsidies	6	3	0
Project Finance Documentation • Term Sheets • Project Financing Documentation • Loan Agreements • Sponsor Support Agreements and Guarantees • Trust and Retention/Escrow Agreements • Inter-Creditor Agreements Case studies	3	0	0
Total	**30**	**15**	**0**

Evaluation criteria

• Class Participation	10
• Minor Examination	20 (Module 1)
• Assignment	10 (Module 1-5)
• Presentations	10 (Module 1-5)
• Major Examination	50 (Module 2-5)

Learning outcomes

At the end of the course, it is expected that the students will:

- Understand the legal basis and methods for project financing of infrastructure projects in India.
- Gain knowledge and understanding of international project finance methodologies and issues, as relevant in the Indian context.
- Understand the role of various players involved in a project finance transaction, the unique risks of a project finance transaction and ways and means to address such risks through the project finance documentation.
- Apply the knowledge gained in professional practice.

Pedagogical approach
A combination of lecture-based and tutorial-based learning would be used. Case studies/sample documents would be used for initiating discussions on specific aspects of the Course.

Materials

Suggested Readings

- Dr Kumar V Pratap, Manshi Gupta (2024), *Infrastructure Financing in India: Trends, Challenges, and Way Forward,* Oxford.
- Vikas Srivastava, V. Rajaraman (2017), *Project and Infrastructure Finance*, Oxford.
- Joshi, Piyush (2003), *Law Relating to Infrastructure Projects*, 2nd Edn, New Delhi: Butterworths.
- Hoffman, Scott L. (2007), *The Law and Business of International Project Finance*, 3rd Edition, Cambridge: Cambridge University Press.
- Vinter, Graham (2013) *Project Finance*, 4th Edition, London: Sweet and Maxwell.
- Dewar, John (2015) *International Project Finance: Law and Practice*, 2nd Edition, Oxford: Oxford University Press
- Reserve Bank of India (RBI) Master Circulars
- Indian Banks Associations (IBA) – standard drafts of lending documents.

Additional information (if any): Students will be provided with hard copies of sample projects and credit documents/clauses from time to time.

Student Responsibilities
Students are expected to come prepared with readings and actively participate in the discussions.
Students are expected to have a basic understanding of Contract Law and Transfer of Property Law.

Reviewers
-Shiju M V, Professor, Sai University, Chennai.
- Dr. Prakash Sharma, Assistant Professor, RGSOIPL, IIT Kharagpur

Course Title: Energy Law			
Course Code: MPL 159	**No. of Credits:**3	**L-T-P Distribution:** 30-15-0	**Learning Hours:** 45
Pre-requisite course code and title (if any) :			
Department: Centre for Postgraduate Legal Studies			
Course Coordinator (s):		**Course Instructor (s):**	
Contact Details:			
Course Type	Elective		
Course Offered in	Semester 2		

Course Description:

Energy availability and access form the backbone of the new modern economy. Many conventional energy sources that have existed for a long timeare seen as polluting in the context of climate commitments. The alternative forms are still in the process of development. The energy law course will cover major energy sources and their legal aspects relating to access, regulatory environment, business, and environmental aspects.

Course Objectives:

The energy law course provides students with an overview of applicable laws relating to the energy sector in India and also undertakes a critical legal analysis of specific areas of the energy sector. The main objectives are,

- To create a new idea for bringing a new legal regime relating to energy.
- To evaluate the existing law and policy relating to energy.
- To analyze the role of the different national and international institutions dealing with energy globally and nationally.
- To practically apply the existing legislation and policies.
- To understand the development of energy law both nationally and internationally.
- To remember the laws, judgments, and so on relating to energy.

Course Contents:

Module	Topic	L	T	P
1.	**Introduction: Law, Policy and Governance** • Basics of the Energy Sector • Historical Growth • Interlinkage: Environmental, Energy and Climate Change Law • Law, Policy, and Governance Framework - International, National and Local Contexts- Energy Regulation in India- Regulatory Framework & Clean Energy Policies • Financing Heavy Energy Projects.	6	5	

2.	**Law, Policy, and Governance Relating to Oil, Gas, and Petroleum**
	• Oil &Gas Regulation in Energy Transition: Global and India.
	• Legal Basis for OG&P Sector Regulation in India:
	  • Pre &New Exploration Licensing Policy (NELP);
	  • NELP and Production Sharing Contracts;
	  • Open Acreage License Policy;
	  • Laws Governing Pricing Mechanisms (including competition laws);
	  • Hydrocarbon Exploration Licensing Policy (HELP)and Revenue Sharing Contracts;
	  • Policies and guidelines related to Unconventional Gases (CBM and shale gas);
	  • Proposed Reforms (*Post-Rangarajan Committee Report on Petroleum Pricing*.)
	• Maritime Boundary Disputes & Implications for Seabed Energy Investments
	
	Case study: (groups to choose two)
	• *Petroleum pricing and legal issues*
	• *Gas price dispute between Government and Reliance Industries*
	• *BP Oil spill disaster and liability issues*
		9	5	

3.	**Law, Policy, and Governance Relating to the Coal Sector** • Coal Sector in India • Broad Outlines of the Laws Applicable • Legislative Powers Pertaining to The Coal Sector and Regulation of Mines and Mineral Development; • Nationalization of Coal Sector and Post-Liberalisation Reforms; -Coal Sector and Environmental Issues • MMDR Act (and its amendments); • Compensatory Afforestation Fund Management and Planning Authority and Forest Rights issues Case study (groups to choose two) • *Coal sector and NGT- Bhopal NGT Bench as an example* • *Health and safety in coal industry* • *Coal thermal power plant and consenting process* • *The Coal Mines (Special Provisions) Act, 2015*	6	5	

4.	**Law Policy and Governance in the Electricity Sector** • Requirement and Sources of Electricity in India • Development of laws relating to Electricity-the Electricity Act, 2003-the National Electricity Policy • National Electricity Plan. • The Energy Conservation Act (EC Act) of 2001 • Climate Change and Renewable Energy Promotion-National and State level Renewable Energy Policies and Programmes • General Legal issues in the Renewable Energy Sector • Draft National Renewable Energy Act 2015 • Pricing of Renewable Energy by State Electricity Regulatory Commissions • *Bio fuel, Biogas, and Green Hydrogen Mission in India* *Case study:* (groups to choose two) • *Structuring and legal issues in setting up a Renewable Energy Project. Students can choose any one of the project* • *WTO Solar Panel Case* • *Subsidy and taxation in RE projects*	6	5	
5.	**Nuclear Energy and Law** • Nuclear Energy Programme and Plans • Institutions Involved inthePromotion and Regulation of Nuclear Energy Issues and Challenges of Nuclear Energy • Environmental Concerns; International Regulation of Nuclear Energy • Framework of Nuclear Energy Promotion, Regulation, and Safety inIndia • International Legal Regime for Civil Nuclear Liability • U.S.–India Civil Nuclear Agreement (The 123 Agreement) Case study: (groups to choose two) • *Kudankulam Project judgment of Madras High Court/Supreme Court* • *Public participation in nuclear projects* • *Nuclear regulatory regime and safe handling of a radioactive substance (Delhi University case as example)* • *Discussion of an EIA of one of the NPPs*	3	5	
Total		**30**	**15**	**0**
Evaluation procedure: Weightage (%)				

- Class participation: 10
- Minor:20 [Module 1]
- Assignment:10 [Entire Module]
- Presentation:10 [Entire Module]
- Final examination:50 [Module 2-5]

Learning outcomes :

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

- To create a new idea for bringing a new legal regime relating to energy [Research paper riting and presentation]
- To evaluate the existing law and policy relating to energy [Minor& major examinations]
- To analyze the role of the different national and international institutions that are dealing with energy globally and nationally [Minor & major examinations]
- To practically apply the existing legislation and policies [Minor & major examinations and research papers]
- To understand the development of energy law nationally and internationally [Research paper writing and presentation].
- To remember the laws, judgments, and so on relating to energy [Minor and major examinations]

Pedagogical approach :

The energy law course will be taught through interactive sessions based on prior circulated readings. Many legal principles have a strong relation with sector policies and politics, and also court decisions. An introductory lecture on specific sector issues and legal frameworkswill be given in each module. Subsequent classes will be based on tutorials where students will have a central role in identifying and discussing and legal issues.

Suggested Readings :

Basic readings are provided below. Other than basic reading, literatures and case study will be circulated in advance to prepare the tutorials.

A.

- A Marhold, Externalizing Europe's Energy Policy in EU Free Trade Agreements: A Cognitive Dissonance between Promoting Sustainable Development and Ensuring Security of Supply? Europe and the World: A Law Review, 2019.
- Chornyi and AA Marhold, 'In Uncharted Waters: The Contested Legal and Political Landscape of Nord Stream 2' forthcoming in: European Energy Law Report (EELR), Vol. XIV, 2020.
- European Parliament: Fact Sheets on the European Union: - Internal Energy Market; https://www.europarl.europa.eu/factsheets/en/sheet/45/internal-energy-market
- Nawneet Vibhaw, Energy Law and Policy in India, LexisNexis, 2014.
- S Bruce, International Energy Law, Max Planck Encyclopedia of Public International Law (MPEPIL), Oxford Public International Law, 2014.

B.

- *Evaluation Report on Rajiv Gandhi GrameenVidyutikaranYojana (RGGVY), Planning Commission 2014*

- *Governance of the Petroleum and Natural Gas Sector in India: A Status Note, TERI-NFA Working Paper Series No. 15*
- *India Energy Outlook, World Energy Outlook Special Report, 2015*
- *Indian Brand Equity Fund Foundation, Oil & Gas sectoral reports (Monthly updates)Policies Governing Regulation of Nuclear and Radiation Safety,http://www.aerb.gov.in/AERBPortal/pages/English/prsrel/policies.pdf*
- *PwC reports, http://www.pwc.in/government-reforms-and-infrastructure-development/oil-and-gas-publications.html*
- *Regulations & Tariff Orders Issued By Regulatory Commissions For Renewable Energy Sources In India (http://mnre.gov.in/file-manager/Compendium/Program.htm)*
- *Renewable Energy Policies and Guidelines.(Wind, solar, hydro, biofuels and others-Centre and States)*
- *Report of expert committeeExpert Committee on integrated energy policy, 2006*
- *Report of the Committee on Gas Pricing – 2014, http://petroleum.nic.in/docs/committee_report_on_gas_pricing_2014.pdf*
- *Report of the Committee on the Production Sharing Contract Mechanism in Petroleum Industry http://eac.gov.in/reports/rep_psc0201.pdf*
- *Statutory updates by Ministry of petroleum & Natural Gas official website (http://petroleum.nic.in)*
- *The Final Report of the Expert Group on Low Carbon Strategies for Inclusive Growth, Planning Commission, 2014*
- *National Green Hydrogen Mission, https://www.india.gov.in/spotlight/national-green-hydrogen-mission#:~:text=India%20has%20set%20its%20sight,central%20to%20India's%20Energy%20Transition.*
- *123 Agreements for Peaceful Cooperation, https://www.energy.gov/nnsa/123-agreements-peaceful-cooperation*

Sector laws will be discussed throughout the modules

Additional information (if any) :

- *Judgement of the Court of 5 February 1963, Van Gend & Loos v. Netherlands*
- *Judgement of the Court of 15 July 1964, Costa v. ENEL*
- *Case C-204/12, Judgement by the Court and Opinion of 11 September 2014, Essent Belgium NV v. Vlaamse Reguleringsinstantie*

Student responsibilities :

Attendance: At least 75% attendance will be necessary to be able to appear for the final exam.

Course Reviewers:

Dr. Vinai Kumar Singh, Associate Professor, CILS, SIS, Jawaharlal Nehru University, New Delhi)

Dr. Rohin Koul, Assistant Professor, India International University of Legal Education and Research, Goa.

Enclosure 13

Course title: Gender in Development Practice			
Course code:	**No. of credits:** 3	**L-T-P:** 35-10-0	**Learning hours:** 45
Pre-requisite course code and title (if any):			
Department: Department of Policy and Management Studies			
Course coordinator(s):	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course description: This course addresses an in-depth understanding of various issues related to gender and development. It starts with the introduction of the basic concepts of gender and gender socialization and provides logical understanding of gender roles, gender-based inequality, intersectionality, etc. Subsequently, the course highlights various approaches of gender and development including welfare approach; WID approach, antipoverty and efficiency approach; WAD and GAD Approach etc. The students will be skilled in using various gender analysis frameworks to address gender development challenges. After that the students will explore various gender-based developmental challenges like access to healthcare, education, employment, etc. by analyzing various case studies. This will help them to critically explore the impact of gender disparities in various development interventions. Further, Lastly, the course highlights gender and policy with special attention on gender mainstreaming and this will unravel the role of mainstreaming gender equality in the transformation of unequal social and institutional structures into equal and just structures for men, women, and others in the society.

Course objectives

The objectives of the course are –

- to provide conceptual understanding of gender, gender socialization, and gender inequality in society
- to enable students to acquire comprehensive knowledge in various theoretical perspectives on gender and development.
- to understand gender-based development challenges in a few specific areas like education, health, employment etc.
- to develop skills in analyzing various gender-related tools and frameworks used commonly in national and international development.

Module	Topic	L	T	P
1	**Understanding Gender:** Concept of gender; Gender Roles; Gender socialization (meaning, gender learning, and agents); Theory of Gender Socialization (biological theory, psychoanalytic theory, social learning theory, cognitive theory, and gender schema theory); understanding patriarchy and inequality; understanding intersectionality of gender, caste, and class	12	0	0
2	**Various approaches to Gender and Development:** Welfare approach; Women in Development - Equity Approach; Antipoverty Approach; and Efficiency Approach; Women and Development (WAD), Gender and Development (GAD); Empowerment Approach;	9	0	0
3	**Frameworks of Gender analysis:** Harvard Analytical Framework and People-oriented planning; Moser Framework (by Caroline Moser); Gender Analysis Matrix (by Rani Parker); Capacities and Vulnerabilities	10	5	0

	framework Anderson and Woodrow); Women Empowerment Framework (by Sara Hlufekile Longwe); Social Relations Framework (by Naila Kabeer)			
4	**Gender and Development Challenges:** Gender, health and nutrition; Gender and WASH. Gender and education, Gender and work (gender inequality in labour market and informal sector); Gender and Environment; The students will select any topic related to gender and development challenge and will conduct an in-depth analysis of various case studies will present the report accordingly.	0	5	0
5	**Gender, policies, and gender Mainstreaming: experience from India** Concept, definition, and rationale of Gender mainstreaming; Evolution of gender mainstreaming in India; Policies and strategies in relation to gender mainstreaming; Principles of gender mainstreaming; steps of gender mainstreaming	4	0	0
	Total	**35**	**10**	**0**

Evaluation criteria

- Minor Test **(30%) (Module 1 and 2)**
- Case study presentation **(30%) (Module 4)**
- Major exam **(40%) (Module 3 & 5)**

Learning outcomes

- **From Module-1**, the students will be able to understand gender and development interface and intersectionality.
- **From Module-2,** the students, students will be able to construct productive research questions using various approaches of gender and development.
- **From Module-3-5,** the students will develop skill to critically conduct gender analysis in various development project.

Pedagogical approach

- Class sessions will entail a lecture component, combined with discussion of assigned readings and the documentaries shown. Students would have to write an assignment which will be evaluated on the basis of empirical understanding as well as the critical review of the subject, which would be evaluated by the instructor.

Course Reading

Suggested books

- Bhasin, Kamla (1993) What is patriarchy? Kali primaries Delhi
- Spary, Carole. (2019), Gender, Development, and the State in India. Routledge: UK
- Buckingham-Hatfield, Susan (2000), Gender and Environment. Routledge: UK
- Tasli, Kaan (2007) A Conceptual Framework for Gender and Development Studies: From Welfare to Empowerment, Österreichische Forschungsstiftung für Entwicklungshilfe (ÖFSE).
- Momsen Janet, (2020) Gender and Development. (3rd edition). Routledge Perspective of Development. Routledge: UK
- Omvedt, G. and Geetha, V. (2006) Patriarchy. Bhatkal & Sen: Delhi

Suggested readings:

- Anderson, Mary. (1990). “Women on the Agenda: UNIFEM’s Experience in Mainstreaming with Women 1985-1990.” Monograph. pp. 27
- Batliwala, Srilatha (1994) "The Meaning of Women's Empowerment: New Concepts from Action", in Gita Sen, Adrienne Germain and Lincoln C. Chen (eds.), Population Policies Reconsidered: Health, Empowerment, and Rights, Boston: Harvard University Press, 127-138.
- Boserup, Esther (1970) Woman's Role in Economic Development, London: Earthscan Publications.
- Buvinic, Mayra (1986) "Projects for Women in the Third World: Explaining their Misbehavior", in World Development 14 (5), 653-664.
- Friedman, J. (1992) Empowerment: The Politics of Alternative Development, Cambridge, MA. and Oxford, UK: Blackwell.
- El-Bushra, Judy (2000) "Rethinking Gender and Development Practice for the Twenty-First Century", in Gender and Development 8 (1), 55-62.
- Global Gender Gap Report 2023, World Economic Forum
- Kabeer, Naila (1994) "Empowerment from Below: Learning from the Grassroots", in Naila Kabeer (ed.), Reversed Realities: Gender Hierarchies in Development Thought, London: Verso, 223-263.
- Kabeer, Naila (2001) "Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment", in Discussing Women's Empowerment: Theory and Practice (SIDA Studies, No: 3), Stockholm: SIDA, 17-57.
- Moser, Caroline O.N. (1989) "Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs", in World Development 17 (11), 1799-1825.
- Moser, Caroline O.N. (1993) Gender Planning and Development: Theory, Practice and Training, London and New York: Routledge.
- Oxaal, Zoë and Baden, Sally (1997) Gender and Empowerment: Definitions, Approaches and Implications for Policy (Briefing prepared for the Swedish International Development Office – SIDA), SIDA report No. 40.
- Rathgeber, Eva (1990) "WID, WAD, GAD: Trends in Research and Practice", in The Journal of Developing Areas 24 (July 1990), 498-502.
- Rowlands, Jo (1995) "Empowerment Examined", in Development in Practice 5 (2), 101-107.
- Rowlands, Jo (1997) Questioning Empowerment: Working with Women in Honduras, Oxford: Oxfam.
- Rowlands, Jo (1998) "A Word of the Times, but What Does it Mean? Empowerment in the Discourse and Practice of Development", in Haleh Afshar (ed.), Women and Empowerment: Illustrations from the Third World, London and New York: St. Martin Press, 11-34
- Sen, Gita and Crown, Caren for DAWN (1988) Development, Crisis and Alternative Visions: Third World Women's Perspectives, London: Earthscan Publications.
- Shahrashoub Razavi and Carol Miller, (1995) From WID to GAD Conceptual Shift in the Women and Development Discourse, UNRISD and UNDP 1995.
- Sparr, Pamela (1994a) "What is Structural Adjustment", in Pamela Sparr (ed.), Mortgaging Women's Lives: Feminist Critiques of Structural Adjustment, London and New Jersey: Zed Books, 1-12.
- Young, Kate (1993) Planning Development with Women: Making a World of Difference, London: Macmillan.
- Young, Kate (1997) "Gender and Development", in Nalini Visvanathan et. al. (eds.), The Women, Gender and Development Reader, London and New Jersey: Zed Books, 51-54.
- Wierenga, Saskia (1994) "Women's Interests and Empowerment: Gender Planning Reconsidered", in Development and Change 25 (1994), 829-848.
- Williams, Suzanne, Seed, Janet and Mwau, Adelina (1994) The Oxfam Gender Training Manual, Oxford: Oxfam (UK and Ireland).

- March, C., Smyth, I., & Mukhopadhyay, M. (1999). A Guide to Gender-Analysis Frameworks. Oxfam. Retrieved from Oxford. www.ndi.org/files/Guide%20to%20Gender%20Analysis%20Frameworks.pdf

Student responsibilities

- Attendance: At-least 75% attendance will be necessary to be able to appear for the final exam.

Additional Information

This Course outline was prepared by Dr Swarup Dutta and approved in the …… Academic Council Meeting on ……at TERI School of Advanced Studies, New Delhi.

Course Reviewer

Prof. Bijayalaxmi Nanda, Professor and Principal, Miranda House, University of Delhi

Prof. Manasi Mishra, Head of Research Division, Centre for Social Research, New Delhi

Course title: Management of Development Organizations			
Course code: MPD 150	**No. of credits**: 3	**L-T-P:** 40-05-00	**Learning hours:** 45
Pre-requisite course code and title (if any): NA			
Department: Policy and Management Studies			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Compulsory Core		**Course offered in:** Semester 2	

Course description: This course discusses the diverse aspects of Development Organizations. This is based on the interdisciplinary framework to deconstruct the management and administration of development organizations. It revolves around the questions on how the various Organizations play in the notions of Development alongside the global associational revolution in which 'third sector organizations' have come to play increased roles in public policies. A variety of development organizations are an essential constituent of 'third sector'. These include community-based organizations and civil society actors, international non- governmental organizations, state and other national-based actors, global forms of governance, international financial institutions, and transnational corporations. The contemporary role of each of these actors, explains the complex theoretical debates over their existence and activities, and their relevance in a variety of contexts, while at the same time critically assessing their effectiveness.

Course objectives

- To provide insight into the conceptual complexities of development organizations.
- To understand various development organizations' role in development practice
- To explain relation between global governance and development organizations with special attention on development aid.
- To understand the various types of development organizations and its functioning in India
- To explain various aspects related to the management of development organizations

Module	Topic	L	T	P
1	**Understanding development organization** – understanding the concept of organization and development organization (DO); Various forms of development organizations (state, UN Agencies, International Financial Institutions, International non-governmental organization, National Development research organization, Community-based organization, civil society movement and organization, transnational corporations and other companies, private philanthropic organizations, and foundations; Understating development organization network in global north and south.	3	0	0
2	**Development organizations and its role in development practice** Development project implementation and role of various development organizations; Partnership, and Catalysis (service providers; advocacy, and structural change; and innovation); Business development and role of development organizations.	6	0	0
3	**Development Organization, supra-national governance and development aid:** History of global forms of governance, complexities of UN system (activities, purpose and evolution, global agreements, and global developmental issues; Understanding global aid system; Aid flows and mechanisms of funding in developing nations and role of development organizations; Poverty Reduction Strategies (PRSs) and governance.	9	0	

4	**Development organizations in India:** 1) Government as a development Organization 2) Cooperative societies (evolution of cooperative movements, types of cooperatives, Cooperative laws in India); 3) farmer producer organizations (FPOs) in India (definition type and policies of FPOs in India); 4) Not-for-profit or non-government organizations (NPOs or NGOs) and Section-8 Companies in India; 5) NPO governance in India – policy to practice Registration (Societies' Registration Act 1860/ Indian Trusts Act 1882/ Companies Act 2013 (CSR and Section 8 clauses)); Funding in development organizations; Financial Management: tax Deduction and compliances; case of Non-compliance; FCRA.	12	0	0
5	**Managing not-for-profit organizations in India** Levels and areas of management in the organization; Types of organizational plans (Strategic and operational plans and management policies and processes); Factors influencing effective planning; Organizational design and delegation; development of vision, mission, and goal; leadership and skill and Control (nature and process); Challenges development project managers; accountability.	6	3	0
6	**Development Organizations and Development Projects** Project formulation; Steps in project formulation; Values in development projects (Types of values); Human needs in development projects (Maslow's Hierarchy of Needs; deficiency needs vs growth needs; The original hierarchy of needs five-stage model; Characteristics of Self-Actualizers; Key challenges for development organization in India	4	2	0
		40	5	0

Evaluation Criteria

- **Case study presentation** (30%)
- **Minor-2:** (30%) (module-1-3)
- **Major test:** (40%) (modules 4-6)

Learning outcomes

By the end of the course,

- From module-1 the students will be able to understand the conceptual complexities of development organizations.
- From modules-2 to 4, the students will be able to understand the various functional aspects of various development organizations.
- From the modules 5-6, the students will be to understand the development management from the perspective of development organization.

Pedagogical approach:

- The course will be taught through discussion-centric lectures moderated through relevant academic readings. In addition, contemporary issues will be conceptualized as Case Studies to deconstruct the complexities of Development Institutions.

Readings:

Suggested Books:

- Schaaf, R. (2013), Development Organizations. Routledge: UK
- Lewis, D. and Kanji, N. (2009). Non-government Organizations and Development. Routledge: UK
- Lewis, D. (2001). Management of Non-government Development Organizations. Routledge: UK
- Kilby, Patrick. (2021) Philanthropic Foundations in International Development Rockefeller,

Ford, and Gates. Routledge: UK

- Kilby, Patrick. (2011) NGOs in India: The challenges of women's empowerment and accountability. Routledge: UK

Key Readings

- Banks, Nicola and David Hulme David (2013) The role of NGOs and civil society in development and poverty reduction. preparatory paper for the book: M. Turner, W. McCourt and D. Hulme (2013), Governance,
- Bliss, Frank and Neumann, Stefan (2008) Participation in International Development Discourse and Practice. "State of the Art" and Challenges. Duisburg: Institute for Development and Peace,

University of Duisburg-Essen (INEF-Report, 94/2008).

- Dash, SP. (2001). The State, Civil Society and Democracy: A Note. The Indian Journal of Political Science, Vol. 62, No. 2
- Ghosh. B. (2012) Development through Voluntary Actions: The Paradigm of NGO-isation. In Biswajit Ghosh (Eds.): Discourses on Development (104-128), Rawat Publication: Jaipur
- Ghosh, B. (2009). NGOs, Civil Society and Social Reconstruction in Contemporary India. Journal of Developing Societies, 25(2), 229–252. https://doi.org/10.1177/0169796X0902500205

Islam, Baharul K.M (2013). Paradigm shift in engaging civil society for development initiatives: the Indian experience. United Nations. Economic Commission for Africa (2013).

- James, Rick (n.d.) How to do Strategic Planning? A Guide for Small and Diaspora NGOs published by INTRAC Peer Learning
- Lavanya LK and Prabhakar, K. (2011) Non-Government Organizations: Problems & Remedies in India. Serbian Journal of Management 6 (1) 109 – 121
- Lewis, David (2015) NGOs and civil society. In Riaz, Ali and Rahman, Mohammad Sajjadur (eds.) Routledge handbook of contemporary Bangladesh. Routledge, London, UK: Routledge, 2015
- Matthew Eagleton-Pierce (2020) The rise of managerialism in international NGOs, Review of International Political Economy, 27:4, 970-994, DOI: 10.1080/09692290.2019.1657478
- Pandey, Omkareshwar (2012) Under Scanner. In Governance Watch Issue May-June 2012.
- Unerman, Jeffrey and O'Dwyer, Brendan (2006) Theorising accountability for NGO advocacy. Accounting, Auditing & Accountability Journal. Vol. 19 No. 3, pp. 349-376
- Wessel, MV; Rajeshwari, B; Naz, F., Mishra, Y., Katyaini, S., Sahoo, S., Syal, R., Deo, N. (2018) Navigating possibilities of collaboration How representative roles of diverse CSOs take shape. A literature reviews.

Student responsibilities:

- As the University has the policy of minimum 75% of physical presence, the students are expected to plan their academic activities considering the learning goals and evaluation criterion of the Course [The Course Evaluation will be correlated in terms of all the academic factors including the class participation and punctuality and sincerity in learning.
- We shall follow a closed laptop, no mobile phone policy during the class hours.
- Assignment submissions shall be done one-day before the deadline; Lastly, any sorts of academic dishonesty including cheating, copying, inappropriate collaboration and plagiarism will not acceptable

- Additional Information
- This Course outline was prepared by Dr Swarup Dutta and approved in the …… Academic Council Meeting on …….. at TERI School of Advanced Studies, New Delhi.

Course Reviewers:

Prof. G. Krishnamurthy, Former Professor, IRMA, Anand, Gujarat

Prof. Nalini Ranganathan, Professor and Head, Department of Social Work, Pondicherry University

Course title: Themes and Perspectives of Development			
Course code:	**No. of credits:** 3	**L-T-P: 45**-0-0	**Learning hours:** 45
Pre-requisite course code and title (if any):			
Department: Department of Policy and Management Studies			
Course coordinator(s):	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in** 1st Semester		

Course description: This is a foundation course for any development practitioner. The course provides a base for other subjects in MA-SDP Programme in TERI SAS. Hence, basic social science lexicons of Development will be introduced to the students. Examples from diverse global and regional contexts will be used to facilitate discussions in the classroom.

Course objectives: This course introduces the conceptual foundations of Development and demonstrates the complexities of 'development' and 'development theories'. The course enables the students –

- to develop a critical understanding on both historical and contemporary perspectives of development - both mainstream and alternative
- to understand theoretical and empirical notions of development.
- to engage the students in various discourses of development practice through debate and discussion

Course content

Module	Topic	L	T	P
1	**Understanding Development:** This module introduces the notion of 'development' conceptualized by various development thinkers and practitioners. The following topics will be covered in this module: • Basic concepts of Change and development • Development as dominant discourse of western modernity • Growth versus Development debate • Agencies of development (state and non-state actors)	8	0	0
2	**Models of Development:** Through this module, the students will be able to understand two dominant models of development – capitalist and socialist model. In the socialist model both the utopian and the scientific socialism will be discussed along with various types of socialist models like social democratic model (Keynesianism and Nordic Model); Centrally planned or Command Economy; Socialist Market economy. Hence, two major topics will be covered – • Capitalism • Socialism	12	0	0
3	**Perspectives of Development (mainstream)** The module will be dedicated to the debate and discussion on the emergence of the Post-war growth-centric development theories like modernization, underdevelopment and neoliberalism and post development which shapes contemporary perspectives of Development. • Modernization (Traditional vs. Modern; Stages of Growth) • Theories of Underdevelopment (Dependency, and world system) • Neoliberalism • Theories of Globalization (Theories of Liberalism, Political Realism, Marxism, Constructivism, Postmodernism, Feminism, Transformationalism, Eclectism)	18	0	0

	• Post development			
4	**Alternative Perspectives of Development** The alternative approaches and their methodologies have emerged as development paradigm indicating a theoretical break from the mainstream development approaches with the emergence of an idea of Regional Development. The following topics will be covered. • Human development (Definitions and indices and various approaches of human development) • Social development (definitions and parameters of social development) • Sustainable development (evolution of the concept, definition and concept of capital assets) • Gender and development (WID, WAD and Gender development approaches) • Participatory Development (definition and types of participation)	7	0	0
		45	0	0

Evaluation criteria

- **Class participation [10%]:** based on active participation (like debate, discussion and presentation and attentiveness. [Learning outcomes-1-2]
- **Minor-2: Assignment submission and Presentation** [40%]: the students will submit an assignment by taking any developmental challenges as a case for the assignment. [Learning outcomes 1-3]
- **Major test: written exam** [50%] [Learning outcomes 1-3]

Learning outcomes:

Upon successful completion of the course students should be able to –

- understand the basic concepts of development and its necessity as a process in social change. (Module-1-2)
- critically reflect on the diverse discourses of development. (module-2 and 3)
- undertake research and formulate arguments on various contemporary development challenges to and exclusion and be able to present a substantiated opinion. (module-1-4)

Pedagogical approach: The course will be taught through discussion-centric lectures augmented through relevant academic readings. In addition, contemporary issues will be conceptualized as a practical component to deconstruct the complexities of Development. Various documentary movies on history of Development and emergence of development theories will be shown for debate and discussion on contemporary development challenges

Essential Readings

- Amartya Sen (n.d.) Concept of Development. Harvard University
- Agarwal, B. (2018). Gender equality, food security and the sustainable development goals. Current Opinion in Environmental Sustainability. https://doi.org/10.1016/j.cosust.2018.07.002
- Beteille, Andre (1996), "Sociology and Common Sense", *Economic and Political Weekly*, Vol. 31, No. 35/37, (pp. 2361-2365).
- Baden, H. R. (2000). Gender and Development: Concepts and Definitions. UK: BRIDGE.
- Boellstorff, D. L. (1995). Women in Development: The need for a Grassroots Gender Planning Approach. Nebraska Anthropologist, pp. 45-55.

- Burgess, G. (2008). Planning and the Gender Equality Duty- Why does gender matter? People, Place and Policy Online, 112-121.
- Chambers R. Idea of Development: Reflecting forward, IDS working paper. Institute of Development Studies: England
- Chaudhary A. (2013). Modernization: Impact, Theory, Advantages and Disadvantages. International Journal for Research in Education. Vol. 2 (2).
- Christine Saulnier, S. B. (1999). Gender Planning: Developing an Operational Framework for En- Gendering Healthy Public Policy. Canada: MCEWH.
- Engelhard, Karl (1983) Theories of Development and Underdevelopment and Chances of their Practical Application. Journal of Geography. Vol. 10 (12) pp. 383-89
- Escobar, Arturo (1995), *Encountering development: the making and unmaking of the Third World*, Princeton, N.J.: Princeton University Press. Harvard
- Frank, A.G. (1966) The Development of Underdevelopment, Monthly Review Monthly review. Vol.41(2), p.37-51
- Patnaik U. and Patnaik P. (2021) Capital and Imperialism: Theory History and Present. Monthly Review Press: New York
- Perry, John A & Erna K Perry (2016), *Contemporary Society: An Introduction to Social Science*, Routledge, New York.
- Pieterse, J. N. (1998). My Paradigm or Yours? Alternative Development, Post-Development, Reflexive Development. Development and Change. Vol. 29. pp. 343-73.
- Pieterse, Jan Nederveen, (2010) Development Theory (2nd edition). Sage.
- Przeworski Adam and Papaterra Fernando - Modernization: Theories and Facts (1997 *World Politics* 49.2 (1997) 155-183
- Reyes, G. E. (2001). Four main theories of Development: Modernization, Dependency, World system and Globalization. Nómadas. Revista Crítica de Ciencias Sociales y Jurídicas. Vol.4 (2)
- Rapley, J.2007. Understanding development: theory and Practice in the Third World. Boulder: lynee Reinner Publishers.
- Roberts, J.T. and Hite A. (eds) (2000) From modernization to globalization Perspective on Development and Social Change. Blackwell Publishing: US
- Schuurman, F.J. (2000) Paradigms Lost, Paradigms Regained? Development Studies in 21st century. *Third World Quarterly*, Vol 21, No 1, pp 7- 20.
- Summer, Andy and Tribe, Michael (2008). International Developmental Studies: Theories and Methods in Research and Practice. Sage Publication
- Taylor, V. (1999). Gender Mainstreaming in Development Planning. United Kingdom: Commonwealth Secretariat
- Webster, Andrew. (1984). Introduction to Sociology of Development McMillan Publishers: UK
- Venugopal, R. (2015). Neoliberalism as Concept. *Economy and Society.* Vol.44 (2)
- Willis, Katie (2005). Theories and Practices of Development. Routledge: UK

Recommended journals [for reference]

- Economic and Political Weekly / Journal of Human Development and Capabilities
- Indian Journal of Human Development
- World Development / Journal of Development Studies
- Oxford Development Studies/ Third World Quarterly

Student responsibilities

- As the University has the policy of minimum 75% of physical presence, the students are expected to plan their academic activities considering the learning goals and evaluation criterion of the Course.
- Lastly, any sort of academic dishonesty including cheating, copying, inappropriate collaboration and plagiarism will NOT be acceptable.

This Course outline was prepared by Dr Swarup Dutta and approved by the ……Academic Council Meeting on ……at TERI School of Advanced Studies, New Delhi.

Course reviewers:

Prof. Abhijit Guha, Former Professor of Anthropology, Vidyasagar University, and Senior ICSSR Fellow, Government of India

Prof Manasi Mishra, Head of Research Division, Center for Social Research, New Delhi

Dr Snigdha Bishnoi, Asst. Professor, School of Liberal Studies, Ambedkar University, Delhi

Enclosure 14

Course title: Sustainable Urbanization			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 22-08-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** 2nd Semester	

Course description

This course delves into the principles and practices of sustainable urbanization, highlighting the imperative to create urban environments that are economically viable, socially inclusive, and environmentally responsible. The course also examines the phenomenon of sustainable consumption and production (SCP) as it relates to urban areas. Urban centers have emerged as the primary hubs for economic growth and expansion. In 2023, over 55% of the global population resided in urban areas, and this figure is projected to rise to 70% by 2050. Urban areas, thus, need to prepare to accommodate this anticipated population surge. Cities depend on natural resources, energy, raw materials, food, and goods to sustain the daily lives of residents and support economic activities. The rapid urbanization and population growth in Indian cities have placed significant pressure on natural resources within urban areas and their surrounding rural regions. To progress toward sustainability, cities are striving to implement policies and strategies that promote efficient resource utilization, mitigate the impacts of climate change, and foster the development of a circular economy that balances escalating consumption patterns with a shift toward sustainable lifestyles. This approach necessitates the integration of SCP practices across key development sectors within cities.

Learning objectives:

- To orient students on the trends and patterns of urbanization and the concept of sustainable urbanization along with assessing strength and weaknesses of existing urban development and management policies in India.
- To discuss key global and Indian initiatives, policy processes, planning and governance for sustainable urbanization.
- To explore and discuss innovative urban governance and management strategies promoting sustainability across the sectors (such as built environment, transport, and basic services).

Course content

Module	Topic	L	T	P

1.	**Introduction to Urbanization and Sustainability Issues** • Trends and Patterns of Global & Indian Urbanization: component of urban population growth, emergence of megacities, urban sprawl and suburbanization, informal settlements, environmental concerns • The trajectories of urban policy in India • Strengths and weaknesses of existing urban development and management policies • Concept of sustainability in urban context • Phenomenon of Sustainable Consumption Practices (SCP) in relation to urban centres; discourse relating to resource efficient, smart and productive, and climate compatible cities	6	2	0
2.	**Planning and Governance for Sustainable Urbanization** • Overview of global and national movements/initiatives for sustainable urban development • Policy processes, planning, governance, and role of key actors and institutions (as citizens, planners, politicians, officials, consultants, developers, contractors, non-governmental organizations, etc.) towards resource efficiency and decoupling and in realizing transitions towards sustainable living and behavioural change. • SDG 11 • Role of organizations such as International Council for Local Environmental Initiatives (ICLEI), UN HABITAT. • Challenges and opportunities of sustainable urbanization	6	2	0
3.	**Innovative Design, Strategies & Best Practices for Urban Sustainability** • Principles of inclusive and participatory urban planning • Smart cities mission and sustainability linkages • Overview of housing & building construction sector in India • Sustainable urban transport and policy linkages and strategies • Municipal waste management: strengths and weaknesses of existing policies, regulations; national and global best practices • Water supply and sanitation: water demand management; wastewater management initiatives • Energy scenario of cities in India, current and future energy consumption and energy mix, appraisal of policy initiatives • Urban design strategies and examples • Service level benchmarking and performance measurement	6	2	0
4.	**Future Trends and Prospects in Sustainable Urbanization** • Future trends of urbanization and their implications for sustainability • Technological advancements shaping future urban landscapes • Key aspects of Nature-Based Solutions (NbS) and its integration in India's Urban Development Policies • Competitiveness of cities, key dimensions and strategies	4	2	0
	Total	**22**	**8**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs/Article structure (on identification and rapid appraisal of an urban theme) (30%)
- **Minor Test-2:** Seminar/Debate Sessions on preliminary analysis of data and relevant case examples (20%)
- **Major Test:** Written Test/Term Paper submission & presentation on sectoral analysis and recommendations relating to an identified urban phenomenon (50%)

Learning outcomes

Upon completion of this course, candidates would be able to:

1. appreciate the significance of sustainable consumption and production and resource efficiency in context of complexities relating to urbanisation and its linkages to sustainable development in urban areas (All evaluations)
2. examine city development sectoral policies and strategies and their linkages to SDGs such as the SDG 11 (Sustainable Cities and Communities) and SDG 12 (Responsible Consumption and Production) (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Brainstorming Tutorials; Case studies.

Suggested Readings

Module 1:

- Lehmann, H., & Rajan, S. C. (2015). Sustainable Lifestyles. Pathways and Choices for India and Germany. https://www.researchgate.net/profile/Sudhir_Rajan/publication/289522018_Sustainable_Lifestyles/links/568e3f6108ae78cc0515575a.pdf.
- Low-Carbon Green Growth in Asia Policies and Practices: A Joint Study of the Asian Development Bank and the Asian Development Bank Institute. 2013. http://www.adb.org/publications/low-carbon-green-growth-asia-policies-and-practices.
- Rebitzer, G., Ekvall, T., Frischknecht, R., Hunkeler, D., Norris, G., Rydberg, T., Schmidt, W. –P., Suh, S., Weidema, B. P., & Pennington D. W. (2004). Life cycle assessment: Part 1: Framework, goal and scope definition, inventory analysis, and applications. *Environment International*, *30*(5), 701-720. http://www.sciencedirect.com/science/article/pii/S0160412003002459.
- Singhal, S. Berry, J., & McGreal, S. (2010). Linking regeneration and business with competitiveness for low carbon cities: lessons for India. In India Infrastructure Report 2010: Infrastructure.
- Smith, A. (2007). *Sustainable cities*. London: Franklin Watts.
- Tukker, A., Cohen, M.J., Hubacek, K., & Mont, O. (2010). Sustainable consumption and production. *Journal of Industrial Ecology*, *14*(1), 1-3. https://s3.amazonaws.com/academia.edu.documents/34557519/JIE_SCP_Editorial.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1507887160&Signature=4QPrIQ2BqPrVvtEePsF%2FmCORdsU%3D&response-contentdisposition=inline%3B%20filename%3D2010_Editorial_Sustainable_Consumption_a.pdf.
- Vergragt, P.J., Dendler, L., de Jong, M., & Matus, K. (2016). Transitions to sustainable consumption and production in cities. Journal of Cleaner Production, 134, 1-12. http://www.sciencedirect.com/science/article/pii/S0959652616305054.

- Akenji, L., & Bengtsson, M. (2014). Making Sustainable Consumption and Production the Core of the Sustainable Development Goals. *Sustainability*, *6*, 513-529. http://www.mdpi.com/2071-1050/6/2/513.
- Bhattacharya, S., Rathi, S., Patro, S.A., & Tepa, N. (2015). Reconceptualising smart cities: a reference framework for India. Bangalore: Center for Study of Science, Technology and Policy (STEP). http://niti.gov.in/writereaddata/files/document_publication/NITI%20Aayog%20Workshop%2002092015%20Presentation%20by%20CSTEP.pdf.
- Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J.R., Mellouli, S., Nahon, K., Pardo, T.A. and Scholl, H.J., 2012, January. Understanding smart cities: An integrative framework. In System Science (HICSS), 2012 45th Hawaii International Conference on (pp. 2289-2297). IEEE. http://ieeexplore.ieee.org/abstract/document/6149291/?reload=true.
- Hasan Rashed, A. (2024). Sustainable Urbanization between Two Ambitious Global Agendas: An Integration Approach. *IntechOpen*. https://www.intechopen.com/chapters/1176306.

Module 2:

- Fedrigo, D., & Hontelez, J. (2010). Sustainable consumption and production. *Journal of Industrial Ecology*, 14(1), 10-12.
- Cohen, B., & Muñoz, P. (2016). Sharing cities and sustainable consumption and production: Towards an integrated framework. *Journal of Cleaner Production*, *134*, 87-97. https://doi.org/10.1016/j.jclepro.2015.07.133.
- Leal Filho, W., Platje, J., Gerstlberger, W., Ciegis, R., Kääriä, J., Klavins, M., & Kliucininkas, L. (2016). The role of governance in realising the transition towards sustainable societies. *Journal of Cleaner Production*, *113*, 755-766. https://doi.org/10.1016/j.jclepro.2015.11.060.
- Kandpal, R., & Okitasari, M. (2023). Governance transformation towards localisation of sustainable development goal 11 in India. *World Development Sustainability*, *2*, 100069. https://doi.org/10.1016/j.wds.2023.100069.
- Salvador, M., & Sancho, D. (2020). The Role of Local Government in the Drive for Sustainable Development Public Policies. An Analytical Framework Based on Institutional Capacities. *Sustainability*, *13*(11), 5978. https://doi.org/10.3390/su13115978.

Module 3:

- Singhal, S., & Kapur, A. (2002). Industrial Estate Planning and Management in India - an Integrated Approach towards Industrial Ecology. Journal of Environmental Management, Elsevier.
- UNEP. (2015). District energy in cities: unlocking the potential of energy efficiency and renewable energy. http://districtenergyinitiative.org/report/DistrictEnergyReportBook.pdf.
- Von Weizsäcker, E. U., de Larderel, J., Hargroves, K., Hudson, C., Smith, M., & Rodrigues, M. (2014). Decoupling 2: technologies, opportunities and policy options. A Report of the Working Group on Decoupling to the International Resource Panel.

Module 4:

- Chan, F. K. S., & Chan, H. K. (2022). Recent research and challenges in sustainable urbanisation. *Resources, Conservation and Recycling*, *184*, 106346. https://doi.org/10.1016/j.resconrec.2022.106346.
- Wang, J., Cao, J., & Yu, C. W. (2020). Development trend and challenges of

sustainable urban design in the digital age. *Indoor and Built Environment*. https://doi.org/10.1177/1420326X20976058.
- Cohen, B. (2005). Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability. *Technology in Society*, *28*(1-2), 63-80. https://doi.org/10.1016/j.techsoc.2005.10.005.
- Kundu, D., & Pandey, A. (2021). Sustainable Urbanisation in India and Delhi: Challenges and Way Forward. ASEFSU23 Background Paper, Asia-Europe Foundation. https://asef.org/wp-content/uploads/2021/11/ASEFSU23_Background-Paper_Sustainable-Urbanisation-in-India.pdf.
- Abedalrhman, K., Alzaydi, A., & Shiban, Y. (2024). The Convergence of Artificial Intelligence (AI) and Financial Technologies (FinTech) in Shaping Future Urban Landscape Planning. *Advances in Research*, 25(5), 337-352. https://doi.org/10.9734/air/2024/v25i51166.
- Yan, Z., Jiang, L., Huang, X., Zhang, L., & Zhou, X. (2023). Intelligent urbanism with artificial intelligence in shaping tomorrow's smart cities: Current developments, trends, and future directions. *Journal of Cloud Computing*, *12*(1), 1-13. https://doi.org/10.1186/s13677-023-00569-6.
- Mehmood, R., Yigitcanlar, T., & Corchado, J. M. (2023). Smart Technologies for Sustainable Urban and Regional Development. *Sustainability*, *16*(3), 1171. https://doi.org/10.3390/su16031171.
- Shen, L., Ochoa, J. J., & Bao, H. (2023). Strategies for Sustainable Urban Development—Addressing the Challenges of the 21st Century. *Buildings*, *13*(4), 847. https://doi.org/10.3390/buildings13040847.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Prof. Shaleen Singhal

Course Reviewers

1. Prof. Shrawan K. Acharya, Centre for the Study of Regional Development, School of Social Sciences, Jawaharlal Nehru University, New Delhi, India.
2. Mr Arab Hoballah, Senior Expert, SWITCH-Asia SCP Facility, Bangkok (Former Chief, Sustainable Lifestyles, Cities and Industry, UNEP)

Additional Information

This Course outline was approved in the …… Academic Council Meeting on ……at TERI School of Advanced Studies, New Delhi.

Course title: Water and Sustainable Development: Policies & Management			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 24-06-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** 2nd Semester	

Course description

Water governance and management are integral to sustainable development as they directly influence human health, economic prosperity, environmental sustainability, and social equity. Effective governance frameworks and management practices facilitate the responsible use of water resources, ensuring that they can support current and future generations while fostering resilience to climate change and enhancing overall community well-being. Prioritizing water governance is crucial for achieving a more just, sustainable, and equitable world.

This course offers an in-depth examination of the critical relationship between water resources, sustainability, and governance. As global water challenges continue to escalate, understanding the fundamental water-related issues from a management and policy perspective is essential for future leaders and practitioners in the field. Through a combination of theoretical frameworks, practical insights, and real-world case studies, students will explore how effective water management and innovative policies can contribute to sustainable development goals.

The course is divided into four modules. The first module discusses the role of water as component of ecosystem and sustainability. Students will explore the integral role of water in sustainable development frameworks, interconnections between water, ecosystems, health, and economic stability, as well as the social justice dimensions associated with water access and equity. Focusing on water governance and management, the second module examines institutional frameworks, approaches, policy instruments, and stakeholder engagement mechanisms that shape water management practices. Students will investigate various governance models, including integrated water resources management (IWRM), participatory approaches, and the roles played by governmental and non-governmental entities in ensuring effective and equitable water management. This module also assesses the water management in India. The third module addresses the multifaceted challenges in water policy, including climate change, pollution, over-extraction, and competing demands. Students will critically analyse existing policies and frameworks that govern water use and sustainability while exploring innovative solutions, such as advanced technologies, public-private partnerships, and community-led initiatives aimed at enhancing resilience and addressing water scarcity. The final module will engage students with real-world case studies from various regions to understand best practices and effective policy initiatives in water management.

Learning objectives:

- To help students understand and analyze the role of water in sustainability discourse and its implications for sustainable development.
- To orient students to water governance frameworks and management strategies that influence water resource allocation and use.
- To help students identify the key challenges facing water policy and explore innovative solutions and technological advancements.
- To assist students to apply knowledge from case studies of successful water management practices and policy initiatives to develop actionable strategies for diverse contexts.

Course content

Module	Topic	L	T	P
1.	**Water in Sustainability Discourse** • Water as component of Ecosystem: Aquatic Ecosystems, Terrestrial Ecosystem; Nutrient Cycling; Hydrological Cycle; Climate Regulation; Soil Formation and Quality; Ecosystem Services • Global and national water distribution and availability issues • Linkages between water management and other sectors (health, agriculture, energy); Water-Energy-Food nexus	7	0	0
2.	**Political Economy of Water and its Governance** • Evolution of understanding of water security and governance • Transboundary water conflicts; Water access, ownership and rights; Privatization and commercialization of water • Water Governance Frameworks: Institutional frameworks for water management; Stakeholder roles: government, communities, NGOs, and private sector • Water Management Approaches: River basin approach; Watershed approach; Community management; Integrated Water Resources Management (IWRM) • Policy Instruments for Water Management: Economic instruments - pricing, taxes, and subsidies; Regulatory measures and compliance mechanisms • Water Management in India: Assessing water availability and quality (Water Stress, Water Quality Index); Status and Trends of Surface Water and Ground Water exploitation and pollution; Responsible factors – technical, policy and institutional factors; Sectoral analysis of water management (Agriculture, Domestic, Industry, Power – Thermal and Hydro); Water Interlinking; Regional consciousness and inter-state issues (water sharing)	10	0	0
3.	**Challenges and Innovations in Water Policy** • Climate Change impacts; Pollution; Overexploitation; Water scarcity and competing demands; Habitat alteration due to human activities, including dam construction, land use change, and urbanization; Inequity in Access to Water; Fragmented Governance and Institutional Challenges; Public Awareness and Engagement; Infrastructure Gaps; Regulatory	7	0	0

	and Legislative Challenges • Adaptive water management strategies • Role of technology in enhancing water efficiency (smart water management) • Innovative practices in water recycling and desalination			
4.	**Case Studies on Best Practices & Policy Initiatives** • International Cases, such as, Singapore: Integrated Water Management; Netherlands: Delta Works; Australia: Water Reform in the Murray-Darling Basin; Israel: Innovative Water Technologies; South Africa: The National Water Act; Ghana: Community-Based Water Management • Indian Cases, such as, *Jal Jeevan* Mission; Sustainable Groundwater Management in Rajasthan; Narmada River Valley Project; Andhra Pradesh: Krishna River Management; Integrated Watershed Management in Maharashtra; Karnataka: *Neeravari Naital* Scheme	0	6	0
	Total	**24**	**6**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (30%)
- **Minor Test-2:** Case Study Presentation on select cases based on Module-4 (20%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates will:

1. have a comprehensive understanding of the complexities surrounding water resources in the context of sustainable development (All evaluations)
2. develop critical thinking and innovative approaches essential for addressing contemporary water challenges, thereby preparing students for impactful careers in water management, policy-making, and sustainable development (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Experts in particular domains including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

Module 1:

- Loucks, D. P., & Gladwell, J. S. (1999). *Sustainability Criteria for Water Resource Systems*. Cambridge, UK: Cambridge University Press.
- Chorley, R. J. (1969). *Water, earth and man: a synthesis of hydrology, geomorphology and socioeconomic geography*. London: Methuen Young Books.
- Ehrlich, P. R., Holdren, J. P., & Ehrlich, A. H. (1978). *Ecoscience: population, resources, environment, 3rd edition*. San Franscisco: W. H. Freeman.
- Shaw, E. M. (1994). *Hydrology in Practice, 3rd edition*. London: Chapman & Hall.
- Rodríguez-Iturbe, I., & Porporato, A. (2005). *Ecohydrology of Water-Controlled Ecosystems: Soil Moisture and Plant Dynamics*. Cambridge: Cambridge University Press.
- Horne, A. C., Webb, J. A., Stewardson, M. J., Richter, B., & Acreman, M. (Eds.) (2017). *Water for the Environment: From Policy and Science to Implementation*

and Management. London, UK: Academic Press (Elsevier).
- Gunawardena, E. R. N., Gopal, B., & Kotagama, H. (Eds.) (2012). *Ecosystem and Integrated Water Resources Management in South Asia*. New Delhi: Routledge.
- Chakraborty, S., Chatterjee, A., & Kumar, P. (Eds.) (2025). *Urban Water Ecosystems in Africa and Asia: Challenges and Opportunities for Conservation and Restoration*. Oxon & New York: Routledge.
- Arya, M. (2019). *Spatial Ecology of Water*. AADI Centre.
- Polunin, N. V. C. (Ed.) (2010). *Aquatic Ecosystems: Trends and Global Prospects*. Cambridge: Cambridge University Press.
- Wohl, E. (2017). *Sustaining River Ecosystems and Water Resources*. Cham, Switzerland: Springer.
- Kholod, N., Evans, M., Khan, Z., Hejazi, M., & Chaturvedi, V. (2021). Water-energy-food nexus in India: A critical review. *Energy and Climate Change*, *2*, 100060. https://doi.org/10.1016/j.egycc.2021.100060

Module 2:

- Pahl-Wostl, C. (2015). *Water Governance in the Face of Global Change: From Understanding to Transformation*. Cham: Springer Nature Switzerland AG.
- Chadha, G., & Pandya, A. B. (Eds.) (2021). *Water Governance and Management in India: Issues and Perspectives, Volume 2*. Singapore: Springer Verlag.
- Katko, T. S., Juuti, P. S., Schwartz, K., & Rajala, R. P. (Eds.) (2013). *Water Services Management and Governance: Lessons for a Sustainable Future*. London, UK: IWA Publishing.
- Grigg, N. S. (2010). *Governance and Management for Sustainable Water Systems*. London, UK: IWA Publishing.
- Varis, O., Tortajada, C., & Biswas, A. K. (Eds.) (2008). *Management of Transboundary Rivers and Lakes*. Springer.
- Biswas, A. K., Tortajada, C., & Rohner, P. (Eds.) (2018). *Assessing Global Water Megatrends*. Singapore: Springer Nature Singapore Pte. Ltd.
- World Water Council (Ed.) (2018). *Global Water Security: Lessons Learnt and Long-Term Implications*. Singapore: Springer Nature Singapore Pte. Ltd.
- Scudder, T. (2019). *Large Dams: Long Term Impacts on Riverine Communities and Free Flowing Rivers*. Singapore: Springer Nature Singapore Pte. Ltd.
- Haie, N. (2021). *Transparent Water Management Theory: Sufficiency in Sequity*. Singapore: Springer Nature Singapore Pte. Ltd.
- Kumar, M. D., Bassi, N., & Kumar, S. (2022). *Drinking Water Security in Rural India: Dynamics, Influencing Factors, and Improvement Strategy*. Singapore: Springer Nature Singapore Pte. Ltd.
- Loucks, D. P., Stedinger, J. R., & Haith, D. A. (1981). *Water Resource Systems Planning and Analysis*. Englewood Cliffs, NJ: Prentice Hall.
- Simonvic, S. P. (2009), *Managing water resources: Methods and tools for a system approach*. UNESCO Publishing, France.
- Prakash, A., Kumar, N., Chhatre, A., Thakkar, S., & Dar, A. (2024). Navigating India's groundwater crisis: legal and institutional perspectives on regulation and conservation. *Water Policy*, *26*(8), 835–855. https://doi.org/10.2166/wp.2024.123.
- Mukherji, A. (2022). Sustainable Groundwater Management in India Needs a Water-Energy-Food Nexus Approach. *Applied Economic Perspectives and Policy*, *44*(1), 394-410. https://doi.org/10.1002/aepp.13123.

Module 3:

- Hüttl, R. F., Bens, O., Bismuth, C., & Hoechstetter, S. (Eds.) (2016). *Society -*

Water - Technology: A Critical Appraisal of Major Water Engineering Projects. Cham, Switzerland: Springer International Publishing AG.

- Biswas, A. K., & Tortajada, C. (Eds.) (2022). *Water Security Under Climate Change*. Singapore: Springer Nature Singapore Pte. Ltd.
- Biswas, A. K., & Tortajada, C. (Eds.) (2016). *Water Security, Climate Change and Sustainable Development*. Singapore: Springer Science + Business Media Singapore.
- Edalat, F. D., & Abdi, M. R. (2017). *Adaptive Water Management: Concepts, Principles and Applications for Sustainable Development*. Cham, Switzerland: Springer International Publishing AG.
- Mysiak, J., Henrikson, H. J., Sullivan, C., Bromley, J. & Pahl-Wostl, C. (Eds.) (2010). *The Adaptive Water Resource Management Handbook*. London, UK: Earthscan. https://www.pseau.org/outils/ouvrages/earthscan_ltd_the_adaptive_water_resource_management_handbook_2010.pdf.
- Pahl-Wostl, C., Kabat, P., & Möltgen, J. (Eds.) (2007). *Adaptive and Integrated Water Management: Coping with Complexity and Uncertainty*. Heidelberg: Springer-Verlag Berlin.
- Evans, R. G., & Sadler, E. J. (2008). Methods and technologies to improve efficiency of water use. *Water Resources Research*, *44*(7). https://doi.org/10.1029/2007WR006200.
- Geetha Varma, V. (2021). Water-efficient technologies for sustainable development. *Current Directions in Water Scarcity Research*, *6*, 101-128. https://doi.org/10.1016/B978-0-323-91838-1.00009-9.
- Antu, U. B., Islam, M. S., Ahmed, S., Arifuzzaman, M., Saha, S., Mitu, P. R., Sarkar, A. R., Mahiddin, N. A., Ismail, Z., Ibrahim, K. A., & Idris, A. M. (2024). Emerging technologies for efficient water use in agriculture: A review of current trends and future directions. *Journal of Water Process Engineering*, *68*, 106317. https://doi.org/10.1016/j.jwpe.2024.106317.
- Pérez-Urdiales, M., & García-Valiñas, M. Á. (2016). Efficient water-using technologies and habits: A disaggregated analysis in the water sector. *Ecological Economics*, *128*, 117-129. https://doi.org/10.1016/j.ecolecon.2016.04.011.
- Shokri, A., & Sanavi Fard, M. (2022). A sustainable approach in water desalination with the integration of renewable energy sources: Environmental engineering challenges and perspectives. *Environmental Advances*, *9*, 100281. https://doi.org/10.1016/j.envadv.2022.100281.
- Shiferaw, B. A., Reddy, V. R., & Sharma, B. (2023). Groundwater governance under climate change in India: lessons based on evaluation of World Bank interventions. *International Journal of Water Resources Development*, *40*(3), 401–424. https://doi.org/10.1080/07900627.2023.2207694.
- Hong, S., Park, K., Kim, J., Alayande, A. B., & Kim, Y. (Eds.) (2023). *Seawater Reverse Osmosis (SWRO) Desalination: Energy consumption in plants, advanced low-energy technologies, and future developments for improving energy efficiency*. London, UK: IWA Publishing.
- Salinas-Rodriguez, S. G., & Villacorte, L. O. (Eds.) (2023). *Experimental Methods in Desalination and Water Treatment*. London, UK: IWA Publishing.
- Bhattacharya, P., Armienta, M. A., Mahlknecht, J., & Kumar, M. (Eds.) (2023). *Best Practice Guide on Control of Fluoride in Drinking Water*. London, UK: IWA Publishing.
- Bryjak, M., Kabay, N., Rivas, B. L., & Bundschuh, J. (Eds.) (2016). *Innovative Materials and Methods for Water Treatment: Solutions for Arsenic and Chromium*

Removal. London, UK: Taylor & Francis Group.

Module 4:

- Chen, D. C., Maksimovic, C., & Voulvoulis, N. (2011). Institutional capacity and policy options for integrated urban water management: a Singapore case study. *Water Policy*, *13*(1), 53–68. https://doi.org/10.2166/wp.2010.073.
- Jensen, O., & Nair, S. (2019). Integrated Urban Water Management and Water Security: A Comparison of Singapore and Hong Kong. *Water*, *11*(4), 785. https://doi.org/10.3390/w11040785.
- Hu, X. (2020). Sustainable Water Demand Management: A Case Study of Singapore's Accommodation Sector. *IOP Conference Series: Earth and Environmental Science*, *576*, 012005. https://iopscience.iop.org/article/10.1088/1755-1315/576/1/012005.
- Banerjee, C., Bhaduri, A., & Saraswat, C. (2022). Digitalization in Urban Water Governance: Case Study of Bengaluru and Singapore. *Frontiers in Environmental Science*, *10*, 816824. https://doi.org/10.3389/fenvs.2022.816824.
- Verdon-Kidd, D. C., Sandi, S. G., Metcalfe, A. G., & Kidd, L. J. (2023). Challenges of classifying and mapping perennial freshwater systems within highly variable climate zones: A case study in the Murray Darling Basin, Australia. *Science of The Total Environment*, *905*, 167260. https://doi.org/10.1016/j.scitotenv.2023.167260.
- Connell, D., & Grafton, R. Q. (2011). Water reform in the Murray-Darling Basin. *Water Resources Research*, *47*(12). https://doi.org/10.1029/2010WR009820.
- Samnakay, N., Alexandra, J., Wyborn, C. A., & Bender, I. (2024). Climate adaptive water policy in Australia's Murray Darling basin: soft options or hard commitments? *Ecology & Society*, *29*(1), 1. https://doi.org/10.5751/ES-14578-290101.
- Marin, P., Tal, S., Yeres, J., & Ringskog, K. (2017). *Water Management in Israel: Key Innovations and Lessons Learned for Water-Scarce Countries*. Washington, DC: World Bank. https://openknowledge.worldbank.org/server/api/core/bitstreams/2577d429-0114-5d64-884e-8ba80ecd82f6/content.
- Friedler, E. (2000). Water reuse — An integral part of water resources management:: Israel as a case study. *Water Policy*, *3*(1), 29-39. https://doi.org/10.1016/S1366-7017(01)00003-4.
- Kramer, I., Tsairi, Y., Roth, M. B., Tal, A., & Mau, Y. (2022). Effects of population growth on Israel's demand for desalinated water. *Npj Clean Water*, *5*(1), 1-7. https://doi.org/10.1038/s41545-022-00215-9.
- Svahn, K. (2011). Women's Role and Participation in Water Supply Management - The Case Study of the Republic of Ghana. Institutionen för Geovetenskaper, Uppsala Universitet. https://www.diva-portal.org/smash/get/diva2:482130/FULLTEXT01.pdf4.
- Sedegah, D. D., Agyekum, M. W., & Kyeremeh, B. (2023). Local-level water conservation and management practices in rural communities: A case study in Dormaa Municipality, Bono Region, Ghana. *Irrigation and Drainage*, *72*(4), 1095-1108. https://doi.org/10.1002/ird.2849.
- Abunyewah, M., Erdiaw-Kwasie, M. O., Arhin, P., Acheampong, M. Y., & Okyere, S. A. (2022). Rural water project planning and evaluation in Ghana: a new methodological perspective. *Water Policy*, *24*(12), 1913–1929. https://doi.org/10.2166/wp.2022.157.
- Maphela, B., & Cloete, F. (2019). Johannesburg's implementation of the National Water Act, 1998 in Soweto, South Africa. *Development Southern Africa*, *37*(4),

535–552. https://doi.org/10.1080/0376835X.2019.1647834.
- Stein, R. (2002). Water Law in a Democratic South Africa: A Country Case Study Examining the Introduction of a Public Rights System. Allocating and Managing Water for a Sustainable Future: Lessons from Around the World (Summer Conference, June 11-14). https://scholar.law.colorado.edu/allocating-and-managing-water-for-sustainable-future/66.
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- Bhaduri, A., Amarasinghe, U. A., & Shah, T. (2008). Benefits of irrigation water transfers in the National River Linking Project: a case study of Godavari (Polavaram)-Krishna link in Andhra Pradesh. Conference Papers h041803, International Water Management Institute.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.

- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Prof. Arun Kansal

Course Reviewers

1. Prof. Ajay R. Tembhurkar, Professor of Environmental Engineering, Department of Civil Engineering, Visvesvaraya National Institute of Technology (VNIT), Nagpur, Maharashtra, India.
2. Dr Geoff Goodwin, Faculty of Global Political Economy, School of Politics and International Studies (POLIS), University of Leeds, Leeds, United Kingdom.

Additional Information

This Course outline was approved in the …… Academic Council Meeting on ……at TERI School of Advanced Studies, New Delhi.

Course title: Energy and Sustainable Development			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 28-02-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** 2nd Semester	

Course description

Energy policies are vital for achieving sustainable development as they directly impact environmental sustainability, economic prosperity, and social equity. Energy is at the centre of achieving both the climate and the sustainable development goals that the world has committed to. At the same time ensuring its availability, efficient use and access is critically important to the growth and development of any country. The course is designed to enable the student to understand the challenges of understanding energy security, its complex interactions with the economy and society as well as the tools available to assess impact on multiple, often competing goals.

Learning objectives:

The objective of the course is to sensitize the student to the role of energy in society, the multiple means of meeting energy service demands, global energy linkages, emerging scenarios of vulnerability and the instruments and tools available for effective energy policy formulation. At the end of the course, the student will have an enhanced understanding of the need for an integrated energy policy and the impact of alternative policies on the energy security of a country and its populace. By the end of the course, the students will be able to:

- frame issues from a public policy energy and sustainability perspective
- create a matrix of cross-sectoral issues and linkages
- assess unintended outcomes and risks
- assess Policy implementation challenges
- have an understanding of path dependencies

Course content

Module	Topic	L	T	P
1.	**Foundation on Energy and Sustainability** • Comprehensive overview of different forms and sources of energy being used, particularly in the context of India • Distinction between primary and secondary forms of energy; Different units of measurement used conventionally and their equivalence. • Total energy mix of the country with regard to the availability of different forms of energy, distribution, supply mechanism and end-uses. • Linkages of Energy with Sustainable Development • Linkages of energy with other critical sectors health, education, water, agriculture, livelihood, urban, transport, and	4	0	0

	climate change			
2.	**Energy Access, Poverty, Security, and Sustainability** • Energy transition issues and sustainability considerations such as transition to green energy regime, transition at different scales, etc. Case of coal transition in India, transition in DRE space, policy instruments level transitions • Energy Poverty and energy vulnerabilities: Concepts of energy poverty and energy access challenges in developing regions; Impact of energy access on health, gender, education, and economic opportunities. • Energy Security: Energy security and energy dependence at different levels in the society such as – household, community, company and a country; Geopolitics associated with energy security concerns; Trading and Transnational flow, issues of CBAM and energy, Control over strategic areas from an energy security perspective. • Gender and Energy: Examination of the gender dimensions of energy access and use; Empowering women through sustainable energy initiatives.	10	0	0
3.	**Energy Market, Pricing and Finance** • Energy demand and supply; Energy demand theories, elasticities of energy demand, energy demand at sectoral and aggregated level, demand side management (DSM) techniques; energy efficiency and energy demand, economic theories and principles of energy supply; economics of power generation both renewables and non-renewables; case studies from India • Changing structure and forms of energy market; different pricing principles; pricing under regulation; pricing under competition, pricing of energy and instruments of energy pricing in Indian context such as open access, green open access, bidding and auctions, pricing in open markets • Theories of energy finance, Source of energy financing, Energy project financing, Discounted cash flow analysis, Estimating Net Present Value (NPV), Estimating cost of capital, Financing of renewable energy, Renewable policy instruments and institutions for renewable energy and climate finance, Energy transition financing, financial risk management for energy projects, Carbon market as an instrument of climate finance.	10	0	0
4.	**Energy Case Studies and Business Models** • Analysis of case studies to examine linkages with other sectors, risks, dependencies, sustainable development, scale etc. For example: DRE cases studies and business models, Case studies and business models on energy pricing and market such as renewable energy certificate (REC) and Energy savings certificate (ESCerts), Case studies on green tariffs and green energy trading.	4	2	0

	Total	**28**	**2**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (20%)
- **Minor Test-2:** Case Study Presentation on select cases based on Module-4 (30%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates will be:

1. equipped with the knowledge and skills necessary to navigate the complexities of energy systems in the context of sustainable development (All evaluations)
2. developing critical thinking and innovative approaches essential for contributing to the development of effective energy policies that address current challenges while promoting a sustainable future for all (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Experts in particular domains including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

- Statista. Energy consumption worldwide from 2000 to 2022, with a forecast until 2050, by energy source. https://www.statista.com/statistics/222066/projected-global-energy-consumption-by-source/
- Dar-Mousa, R. N., & Makhamreh, Z. (2019). Analysis of the pattern of energy consumptions and its impact on urban environmental sustainability in Jordan: Amman City as a case study. *Energy, Sustainability and Society*, *9*, 15. https://doi.org/10.1186/s13705-019-0197-0.
- Thomson, G. (2016). *Environment, Energy and Sustainable Development*. Syrawood Publishing House.
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- Collins, L. (2016). *Energy and Sustainability*. Callisto Reference.
- Mentel, G., & Majewski, S. (Eds.) (2023). *Energy Policy, Regulation and Sustainable Development*. MDPI AG.
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- Vyas, D., & Gupta, R. K. (2020). *Bio-hydrogen Energy and Sustainable Development*. New Delhi: Daya Publishing House.
- Azad, K. A., & Sharma, S. (Eds.) (2016). *Clean Energy for Sustainable Development: Comparisons and Contrasts of New Approaches*. Academic Press.
- Kumar. J, C. R., & Majid, M. A. (2020). Renewable energy for sustainable development in India: current status, future prospects, challenges, employment, and investment opportunities. *Energy, Sustainability and Society*, *10*, 2. https://doi.org/10.1186/s13705-019-0232-1.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Gopal Sarangi

Course Reviewers

1. Prof. Atul Kumar, Professor of Energy Studies Programme, School of International Studies, Jawaharlal Nehru University, New Delhi, India.
2. Dr Arunabha Ghosh, Public Policy Expert & CEO, Council on Energy, Environment and Water (CEEW), New Delhi, India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting on ……at TERI School of Advanced Studies, New Delhi.

Course title: Digital Economy: Dividends, Disputes & Dimensions			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 22-08-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** 2nd Semester		

Course description

The digital economy is a major driver of economic growth in recent times, contributing to productivity gains, job creation, and innovation. It generates vast amounts of data that can be leveraged for evidence-based policy formulation. The digital economy enables improved governance through e-governance systems that enhance service delivery, increase transparency, and facilitate citizen engagement. Understanding the digital economy is also crucial for promoting sustainable industrial practices, digital transformation in energy management, and resource efficiency. Public policy students must understand these trends to effectively engage in economic planning and other development initiatives.

This course is designed to explore the multifaceted landscape of the digital economy, examining the benefits, challenges, and complexities associated with its rapid integration into various aspects of society, commerce and governance. Providing an understanding of the implications of digital transformation, this course combines theoretical concepts with practical insights, fostering a comprehensive understanding of the digital economy's impacts on individuals, businesses, and governments.

This course is divided into four modules. The first module provides a foundational understanding of the digital economy, exploring key concepts, components, and the significance of digital technologies in modern trading and economic paradigms. The second module explores disputes, policy and governance challenges that arise within the digital economy, emphasizing regulatory frameworks and ethical considerations. The third module examines future trends and opportunities within the digital economy, exploring the innovations that are shaping its trajectory. The final module presents in-depth case studies to illustrate practical applications of digital economy concepts in various sectors, analysing successful integrations and lessons learned.

Learning objectives:

- To help students understand the fundamental principles and dynamics of the digital economy and analyze the economic benefits and potential drawbacks of digital transformation.
- To orient students to disputes arising from digital business practices and the governance challenges they present.
- To discuss emerging technologies and evaluate future prospects and trends shaping the digital economy.
- To assist students to examine real-world case studies to understand practical implications and integration of digital economy strategies.

Course content

Module	Topic	L	T	P

1.	**Introduction to Digital Economy** • Overview of digital economy and its components (e.g., e-commerce, digital services, fintech) • Evolution of digital technologies and their impact on global economies • Exploration of economic benefits: productivity, efficiency, and innovation. • Data as an Economic Asset: The role of big data and analytics in driving economic growth; Understanding data ownership, usage, management, and commercialization • Overview of how different government departments and ministries are adapting to the digital economy. • Importance of digital infrastructure: broadband, cloud computing, and IoT. • Global disparities in digital connectivity and its economic implications.	8	0	0
2.	**Digital Economy: Disputes, Policy & Governance Challenges** • Overview of existing laws and regulations governing the digital economy in India • Data privacy, intellectual property rights, and security concerns • Challenges in effective governance and enforcement; Challenges posed by bureaucratic processes and compliance issues for businesses • Cybersecurity and Ethical Considerations: Understanding cybersecurity threats and their impact on the digital economy; Ethical dilemmas surrounding data collection, usage, artificial intelligence and surveillance in the digital economy • Digital divide and its effects on socioeconomic disparities; Strategies for promoting inclusivity and access to digital resources • Challenges posed by foreign digital platforms and large tech companies; Global competition and its effects on local industries in the digital economy • Impact of automation and digital technologies on employment in various sectors; Skill gaps and workforce readiness for the digital economy	8	0	0
3.	**Prospects for Digital Economy** • Global Market Access: E-commerce Expansion; Digital Trade • Increased Consumer Connectivity and Engagement: Personalized Services; Improved Customer Experience • Financial Inclusion and FinTech Innovations: Access to Financial Services; Rise of FinTech • Smart Infrastructure and Urban Development: Smart Cities; Investment in digital infrastructure • Data-Driven Decision Making: Enhanced Analytics; Agility and Responsiveness • Environmental Sustainability: Resource Optimization; Reduction in Physical Footprint • Exploration of emerging technologies: blockchain, AI, and	6	0	0

	their potential impacts on the economy. • Predictions and challenges for the future of the digital economy			
4.	**Case Studies on Digital Economy Integration** • International Cases, such as, Estonia: Digital Society and E-Government; China: E-Commerce and Mobile Payments, largely driven by platforms like Alibaba and Tencent; South Korea: Broadband and Internet Connectivity; Singapore: Smart Nation Initiative; Finland: Education and Digital Competency • Indian Cases, such as, Aadhaar and Digital Identification; Unified Payments Interface (UPI); E-Governance and Digital Services; M-Kisan: Mobile-Based Agricultural Extension; E-commerce Expansion (e.g., through Flipkart, Amazon India, Snapdeal etc.); Telemedicine and Digital Health (National Digital Health Mission (NDHM)); Startup Ecosystem and Innovation (in sectors like Fintech, Edtech, Healthtech, and Agritech)	0	8	0
	Total	**22**	**8**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (30%)
- **Minor Test-2:** Case Study Presentation on select cases based on Module-4 (20%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates would be:

1. having a comprehensive understanding of the complexities and opportunities within the digital economy (All evaluations)
2. well-equipped to engage with current trends in the digital landscape and contribute meaningfully to discussions and decision-making processes surrounding the future of the digital economy (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Experts in particular domains including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

Module 1:

- Tapscott, D. (1997). *The Digital Economy: Promise and Peril in The Age of Networked Intelligence*. McGraw-Hill Education.
- Lynn, T., Rosati, P., Conway, E., Curran, D., Fox, G., & O'Gorman, C. (2022). The Digital Economy and Digital Business. In: *Digital Towns*. Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-91247-5_4.
- Letiagina, E. N., Trifonov, Y. V., Vizgunov, A. N., Tanchuk, R. S., & Brykalov, S. M. (2022). Digital Economy: Research, Approaches, and Development Strategies. In: Popkova, E.G. (eds.) *Business 4.0 as a Subject of the Digital Economy. Advances in Science, Technology & Innovation*. Cham: Springer. https://doi.org/10.1007/978-3-030-90324-4_140.
- Nosova, S., Norkina, A., Makar, S., & Fadeicheva, G. (2020). Digital transformation

as a new paradigm of economic policy. *Procedia Computer Science*, *190*, 657-665. https://doi.org/10.1016/j.procs.2021.06.077.

- Tretyakov O. V. (2022). *Digital Economy as a new Development Paradigm: Opportunities, Challenges and Prospects*. Melbourne: AUS Publishers. https://auspublishers.com.au/en/nauka/monography/2406/view.
- Kalf, W. (2024). Economic Development in the Digital Economy: A Bibliometric Review. *Economies*, *12*(3), 53. https://doi.org/10.3390/economies12030053.

Module 2:

- Lynn, T., Rosati, P., Conway, E., Curran, D., Fox, G., & O'Gorman, C. (2022). *Infrastructure for Digital Connectivity. In: Digital Tow*ns. Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-91247-5_6.
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- Baporikar, N. (2024). Barriers and Impact of the Digital Economy. In P. Ordóñez de Pablos, M. Almunawar, & M. Anshari (Eds.), *Strengthening Sustainable Digitalization of Asian Economy and Society* (pp. 38-53). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-1942-0.ch003
- Graham, M. (Ed.) (2019). Digital Economies at Global Margins. The MIT Press. https://doi.org/10.7551/mitpress/10890.001.0001.
- ITU (2017). Social and Economic Impact of Deigital Transformation on the Economy. GSR-17 Discussion Paper. https://www.itu.int/en/ITU-D/Conferences/GSR/Documents/GSR2017/Soc_Eco_impact_Digital_transformation_finalGSR.pdf.
- Friederici, N. (2019). The Global Digital Economy: Worsening Inequality vs. Pockets of Innovation. https://www.orfonline.org/expert-speak/the-global-digital-economy-worsening-inequality-vs-pockets-of-innovation-54180.
- Morris, J., Morris, W., & Bowen, R. (2021). Implications of the digital divide on rural SME resilience. *Journal of Rural Studies*, *89*, 369-377. https://doi.org/10.1016/j.jrurstud.2022.01.005.
- Mukherjee, A. (2024). Navigating the Digital Divide in a Hyper connected World: Strategies for Bridging Inequalities and Promoting Equitable Access to Digital Opportunities. *International Research Journal of Engineering and Technology (IRJET)*, *11*(2), 360-369. https://www.irjet.net/archives/V11/i2/IRJET-V11I261.pdf
- Laskar, M. H. (2023). Examining the emergence of digital society and the digital divide in India: A comparative evaluation between urban and rural areas. *Frontiers in Sociology*, *8*, 1145221. https://doi.org/10.3389/fsoc.2023.1145221.
- Xiao, A., Xu, Z., Skare, M., Qin, Y., & Wang, X. (2024). Bridging the digital divide: The impact of technological innovation on income inequality and human interactions. *Humanities and Social Sciences Communications*, *11*(1), 1-18. https://doi.org/10.1057/s41599-024-03307-8.
- Dewani, N. D., Khan, Z. A., Agarwal, A., Sharma, M., & Khan, S. A. (Eds.). (2022). *Handbook of Research on Cyber Law, Data Protection, and Privacy*. IGI Global Scientific Publishing. https://doi.org/10.4018/978-1-7998-8641-9.

- Nimmer, R., & Towle, H. K. (2013). *Data Privacy, Protection, and Security Law*. LexisNexis.
- Christen, M., Gordijn, B., & Loi, M. (Eds.) (2020). *The Ethics of Cybersecurity*. Cham: Springer. https://link.springer.com/book/10.1007/978-3-030-29053-5.
- Macnish, K., & Van der Ham, J. (2020). Ethics in cybersecurity research and practice. *Technology in Society*, *63*, 101382. https://doi.org/10.1016/j.techsoc.2020.101382.
- Priyadarshini, I., & Cotton, C. (2022). *Cybersecurity: Ethics, Legal, Risks, and Policies*. Apple Academic Press, Inc.

Module 3:

- Kumar, S., Lim, W.M., Sivarajah, U., & Kaur, J. (2023). Artificial Intelligence and Blockchain Integration in Business: Trends from a Bibliometric-Content Analysis. *Information Systems Frontiers*, *25*, 871–896. https://doi.org/10.1007/s10796-022-10279-0.
- Hong, Z., & Xiao, K. (2024). Digital economy structuring for sustainable development: The role of blockchain and artificial intelligence in improving supply chain and reducing negative environmental impacts. *Scientific Reports*, *14*(1), 1-12. https://doi.org/10.1038/s41598-024-53760-3.
- Charles, V., Emrouznejad, A. & Gherman, T. (2023). A critical analysis of the integration of blockchain and artificial intelligence for supply chain. *Annals of Operations Research*, *327*, 7–47. https://doi.org/10.1007/s10479-023-05169-w.
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- Gupta, S., Modgil, S., Choi, T., Kumar, A., & Antony, J. (2023). Influences of artificial intelligence and blockchain technology on financial resilience of supply chains. *International Journal of Production Economics*, *261*, 108868. https://doi.org/10.1016/j.ijpe.2023.108868.
- Huria, A. (2019). Facilitating Trade and Logistics for ECommerce: Building Blocks, Challenges and Ways Forward. The World Bank. https://documents1.worldbank.org/curated/es/645791578285992456/pdf/Facilitating-Trade-and-Logistics-for-E-Commerce-Building-Blocks-Challenges-and-Ways-Forward.pdf.
- Jaller, L. D., Gaillard, S., & Molinuevo, M. (n.d.). The regulation of Digital Trade: Key policies and international trends. World Bank Group. https://documents1.worldbank.org/curated/en/998881578289921641/pdf/The-Regulation-of-Digital-Trade-Key-Policies-and-International-Trends.pdf.
- Tolstoy, D., Melén Hånell, S., & Özbek, N. (2022). Effectual market creation in the cross-border e-commerce of small-and medium-sized enterprises. *International Small Business Journal*. https://doi.org/10.1177_02662426211072999.
- Ahi, A. A., Sinkovics, N., & Sinkovics, R. R. (2023). E-commerce Policy and the Global Economy: A Path to More Inclusive Development?. *Management International Review*, *63*, 27–56. https://doi.org/10.1007/s11575-022-00490-1.
- Meyer, K. E., Li, J., Brouthers, K. D., & Jean, R. (2023). International business in the digital age: Global strategies in a world of national institutions. *Journal of International Business Studies*, *54*, 577–598. https://doi.org/10.1057/s41267-023-00618-x
- Janow, M. E., & Mavroidis, P. C. (2019). Digital Trade, E-Commerce, the WTO and Regional Frameworks. *World Trade Review*, *18*(S1), S1–S7. https://doi.org/10.1017/S1474745618000526.
- Sharma, V., Gupta, M., Arora, N., & Shaikh, A. A. (Eds.) (2025). *FinTech and*

Financial Inclusion: Leveraging Digital Finance for Economic Empowerment and Sustainable Growth. London & New York: Routledge.
- Asif, M., Khan, M. N., Tiwari, S., Wani, S. K., & Alam, F. (2023). The Impact of Fintech and Digital Financial Services on Financial Inclusion in India. *Journal of Risk and Financial Management*, *16*(2), 122. https://doi.org/10.3390/jrfm16020122.
- Amnas, M. B., Selvam, M., & Parayitam, S. (2024). FinTech and Financial Inclusion: Exploring the Mediating Role of Digital Financial Literacy and the Moderating Influence of Perceived Regulatory Support. *Journal of Risk and Financial Management*, *17*(3), 108. https://doi.org/10.3390/jrfm17030108.
- Shukla, S., & Gupta, K. (Eds.) (2019). *Futue of FinTech: Innovative Business Model for Financial Inclusion*. New Delhi: Book Bazooka Publication.
- Mhlanga, D. (2024). *FinTech, Financial Inclusion, and Sustainable Development: Disruption, Innovation, and Growth*. Oxon & New York: Routledge.
- Malik, S. (2023). Data-Driven Decision-Making: Leveraging the IoT for Real-Time Sustainability in Organizational Behavior. *Sustainability*, *16*(15), 6302. https://doi.org/10.3390/su16156302.
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- Chatfield, A. T., & Reddick, C. G. (2018). Customer agility and responsiveness through big data analytics for public value creation: A case study of Houston 311 on-demand services. *Government Information Quarterly*, *35*(2), 336-347. https://doi.org/10.1016/j.giq.2017.11.002.
- Xia, L., Baghaie, S., & Mohammad Sajadi, S. (2024). The digital economy: Challenges and opportunities in the new era of technology and electronic communications. *Ain Shams Engineering Journal*, *15*(2), 102411. https://doi.org/10.1016/j.asej.2023.102411.
- Rosário, A. T., & Dias, J. C. (2022). The New Digital Economy and Sustainability: Challenges and Opportunities. *Sustainability*, *15*(14), 10902. https://doi.org/10.3390/su151410902.
- Güldenberg, S., Ernst, E., & North, K. (Eds.) (2021). *Managing Work in the Digital Economy: Challenges, Strategies and Practices for the Next Decade*. Cham, Switzerland: Springer Nature Switzerland AG.
- Almunawar, M. N., Islam, M. Z., & de Pablos, P. O. (2022). *Digital Transformation Management: Challenges and Futures in the Asian Digital Economy*. Oxon & New York: Routledge.
- Dridi, A., & Telmoudi, F. (2025). Digital Economy and Digital Maturity: A Comprehensive Review. In M. A. Bach Tobji, R. Jallouli, H. Sadok, K. Lajfari, D. Mafamane, & H. Mahboub (eds). *Digital Economy. Emerging Technologies and Business Innovation*. ICDEc 2024. Lecture Notes in Business Information Processing, vol 530. Cham: Springer. https://doi.org/10.1007/978-3-031-76365-6_5.

Module 4:

- Hardy, A. (2024). Estonia's digital diplomacy: Nordic interoperability and the challenges of cross-border e-governance. *Internet Policy Review*, *13*(3). https://doi.org/10.14763/2024.3.1785
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Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Chandan Kumar

Course reviewers

1. Dr. Rajiv Kumar, Former Vice-Chairman, NITI Aayog, Govt. of India; Chairman of the Current Board of Governors of the Giri Institute of Development Studies (GIDS), Lucknow, Uttar Pradesh, India.
2. Prof. S. P. Singh, Professor, Department of Humanities & Social Sciences, Indian

Institute of Technology Roorkee (IITR), Roorkee, Uttarakhand, India.
Additional Information This Course outline was approved in the …… Academic Council Meeting on ……at TERI School of Advanced Studies, New Delhi.

Course title: Infrastructure Development and Sustainability: Issues & Policy Perspectives			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 22-08-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** 2nd Semester	

Course description

Transportation, energy and telecommunications infrastructure are essential for effective functioning and growth across various sectors in an economy. Together, they facilitate commerce, enhance connectivity, enable communication, and play a critical role in promoting sustainability and development. The integration of sustainability into infrastructure planning and implementation is crucial for addressing the environmental, social, and economic challenges associated with rapid urbanization, climate change, and resource depletion.

This course examines the critical relationship between infrastructure development and sustainability, focusing on how policies and practices can address contemporary infrastructure challenges while promoting environmental stewardship, social equity, and economic viability. Students will engage with various issues related to infrastructure and explore policy frameworks designed to create sustainable infrastructure solutions.

This course is divided into four modules. The first module introduces the fundamental concepts of infrastructure development, covering its importance in economic growth, social equity, and environmental management. Focusing on the principles of sustainability, the second module examines how infrastructure development can incorporate environmental, social, and economic considerations. It covers sustainable design practices, resource efficiency, climate resilience, and methodologies for assessing infrastructure sustainability. The third module analyses the policy landscapes and regulatory frameworks that govern infrastructure development. It covers key policies at international, national, and local levels, focusing on their implications for sustainability. In the final module, students will examine recent and relevant real-world examples of innovative infrastructure projects that successfully integrate sustainability principles. Through international and Indian case studies, participants will analyse different initiatives, focusing on their design, execution, outcomes, and lessons learned. The module encourages critical thinking about how innovative practices can be scaled and replicated, addressing current industry challenges and contributing to a sustainable future in infrastructure development.

Learning objectives:

- To orient students on the fundamentals of infrastructure development and its role in economic growth and sustainable development, analyzing the interplay between infrastructure, sustainability, and public policy.
- To help students identify and assess the challenges associated with traditional infrastructure development practices.
- To explore and discuss regulatory frameworks and innovative strategies for promoting sustainable infrastructure solutions.

• To assist students to examine case studies to inform discussions on best practices and lessons learned in infrastructure sustainability.				
Course content				
Module	**Topic**	**L**	**T**	**P**
1.	**Introduction to Infrastructure Development Issues** • Role of Basic Infrastructure (Transportation, Energy and Telecommunication) in economic development and quality of life. • Changing demands for infrastructure in light of urban growth, climate change, and globalization. • Overview of historical trends and recent patterns in the development of basic infrastructures in India: Transportation (e.g., Roads & Highways, Railways, Shipping, Aviation); Energy (e.g., Power Plants, Transmission Lines, Distribution Networks, Renewable Energy Installations); Telecommunication (e.g., Mobile Networks, Broadband Networks, Data Centers) • Challenges of infrastructure development in India: Funding, Land acquisition, Land laws, Public Private Participation, Role of multilateral and bilateral agencies	10	0	0
2.	**Sustainability in Infrastructure** • Importance of integrating sustainability considerations into infrastructure development. • Introduction to smart technologies and their role in sustainable infrastructure. • Assessing the environmental repercussions of infrastructure projects • Evaluating social equity and community impacts associated with infrastructure development.	6	0	0
3.	**Policy Frameworks and Regulatory Challenges** • Assessment of international, national and state or local-level policies aimed at promoting sustainable infrastructure. • Policy perspectives on sustainable transportation systems. • Innovations in renewable energy and their potential for infrastructure development. • Sustainable practices within the telecommunication sector • Overview of funding mechanisms, incentives, and public-private partnerships. • Understanding regulatory frameworks governing infrastructure projects (e.g., Environmental Impact Assessment). • Navigating compliance challenges and enforcing environmental regulations.	8	0	0

4.	**Case Studies of Innovative Practices & Initiatives** • International Cases, such as, Copenhagen, Denmark: Cycling Infrastructure and Policy; Portland, Oregon, USA: Integrated Transit System; Singapore: Integrated Public Transportation System; Curitiba, Brazil: Bus Rapid Transit (BRT) System; Los Angeles, California, USA: Sustainable Transportation Initiatives; Ottawa, Canada: Light Rail Transit (LRT) Implementation; Sweden: Eco-Friendly Mobile Network Deployment; Canada: Broadband Infrastructure Expansion; Netherlands: 5G Implementation for Sustainable Development; United Kingdom: National Health Service (NHS) Digital Transformation • Indian Cases, such as, Bengaluru: *Namma* Metro Project; Delhi: The Bus Rapid Transit System (BRT); Mumbai: Mumbai Local Train Network and the Suburban Rail Plan; Pune: Smart City Mobility Initiatives; Ahmedabad: *Janmarg* Bus Rapid Transit System (BRTS); Kerala: Sustainable Urban Transport Project (KSTP); Airtel's Green Initiatives; BSNL's Rural Connectivity Projects; Telecom Regulatory Authority of India (TRAI) Initiatives; Telecom and Disaster Management Initiatives	0	6	0
	Total	**24**	**6**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (30%)
- **Minor Test-2:** Case Study Presentation on select cases based on Module-4 (20%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates will be:

1. having a comprehensive understanding of the challenges and opportunities in integrating sustainability into infrastructure development (All evaluations)
2. equipped with the knowledge and skills necessary to advocate for and implement sustainable infrastructure solutions in their future careers (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Experts in particular domains including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

Module 1:

- Babu, A., & Gupta, V. S. N. (2023). *Sustainable Infrastructure: Challenges and Opportunities*. Allied Publishers Pvt. Ltd.
- Indira, A., & Chandrasekaran, N. (2023). Infrastructure development in India: a systematic review. *Letters in Spatial and Resource Sciences*, *16*, 35. https://doi.org/10.1007/s12076-023-00357-5
- The Economist Intelligence Unit Limited (2019). The Critical Role of Infrastructure for the Sustainable Development Goals. https://content.unops.org/publications/The-critical-role-of-infrastructure-for-the-SDGs_EN.pdf.
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Development Goals Through Infrastructure Development. IGI Global. https://doi.org/10.4018/979-8-3693-0794-6.
- Ascher, W., & Krupp, C. (2010). *Physical Infrastructure Development Balancing the Growth, Equity, and Environmental Imperatives*. New York: Palgrave Macmillan.

Module 2:

- Fenner, R. A., Sykes, J., & Ainger, C. (2022). *Sustainable Infrastructure: Principles into Practice*. Emerald Publishing Ltd.
- Eisinger Balassa, B., Nagy, N. G., & Gyurián, N. (2024). Perception and social acceptance of 5G technology for sustainability development. *Journal of Cleaner Production*, *467*, 142964. https://doi.org/10.1016/j.jclepro.2024.142964.
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- Goel, R., & Tiwari, G. (2014). Promoting Low Carbon Transport in India: Case Study on Metro Rails in Indian Cities. https://unepccc.org/wp-content/uploads/2014/08/case-study-of-metro-final.pdf.
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Module 3:

- OECD (2015). Towards a Framework for the Governance of Infrastructure. Public Governance and Territorial Development, Directorate Public Governance Committee Report. https://ppp.worldbank.org/public-private-partnership/sites/default/files/2022-03/Towards-a-Framework-for-the-Governance-of-Infrastructure.pdf.
- Mehta, P. S., & CUTS Institute for Regulation & Competition. (2009). *Developing infrastructure through an ideal regulatory framework*. CUTS Institute for Regulation & Competition. https://catalogtest.lib.uchicago.edu/vufind/Record/8915079.
- Mani, N. (2012). *Infrastructure development and financing in India: An exhaustive analytical account of various policies and programmes for development of infrastructure in India, covering the following areas ...* New Century Publications. https://catalogtest.lib.uchicago.edu/vufind/Record/9291171.
- IC Centre for Governance. (2013). *"Governance issues in infrastructure development" Lecture series, September 2012-February 2013*. IC Centre for Governance. https://catalogtest.lib.uchicago.edu/vufind/Record/10361588.
- Satyanarayana, G., & Madhusudana, H. S. (2017). *Infrastructure development and the role of Public-Private-Partnership (PPP): An exhaustive, descriptive and analytical account of policies and programmes for the development and upgradation of infrastructure in India*. New Century Publications. https://catalogtest.lib.uchicago.edu/vufind/Record/11667974.
- Mehta, P. S., & CUTS Centre for Competition, I. &. E. R. (2010). *Comparative study of regulatory framework in infrastructure sector: Lessons for India*. CUTS Centre for Competition, Investment & Economic Regulation. https://catalogtest.lib.uchicago.edu/vufind/Record/8602829.

- Haldea, G. (2011). *Infrastructure at crossroads: The challenges of governance*. Oxford University Press. https://catalogtest.lib.uchicago.edu/vufind/Record/8854091.
- CUTS Institute for Regulation & Competition. (2005). *Regulatory Framework for Infrastructure Sector in India*. Seminar Report. CUTS Institute for Regulation & Competition. https://cuts-ccier.org/wp-content/uploads/2019/01/Regulatory_Framework_for_Infrastructure_Sector_in_India.pdf.

Module 4:

- Emanuel, M. (2019). Making a bicycle city: infrastructure and cycling in Copenhagen since 1880. *Urban History*, *46*(3), 493–517. https://doi.org/10.1017/S0963926818000573.
- Gössling, S. (2013). Urban transport transitions: Copenhagen, City of Cyclists. *Journal of Transport Geography*, *33*, 196-206. https://doi.org/10.1016/j.jtrangeo.2013.10.013.
- Oh, S., & Wang, X. (2018). Urban Rail Transit Provides the Necessary Access to a Metropolitan Area: A Case Study of Portland, Oregon, USA. *Urban Rail Transit*, *4*, 234–248. https://doi.org/10.1007/s40864-018-0095-3.
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- Ibrahim, M. F. (2003). Improvements and integration of a public transport system: The case of Singapore. *Cities*, *20*(3), 205-216. https://doi.org/10.1016/S0264-2751(03)00014-3.
- Manifesty, O. R., & Park, J. Y. (2022). A Case Study of a 15-Minute City Concept in Singapore's 2040 Land Transport Master Plan: 20-Minute Towns and a 45-Minute City. *International Journal of Sustainable Transportation Technology*, *5*(1), 1-11. https://unijourn.com/upload/doc/submission/articleFile-1637923321026-main.pdf.
- Varela, E. N., Öhrling, K., & Moscati, A. (2021). Analysis of the Challenges in the Swedish Urban Planning Process: A Case Study about Digitalization. *Sustainability*, *14*(24), 16333. https://doi.org/10.3390/su142416333.
- Rajabiun, R., & Middleton, C. A. (2013). Multilevel governance and broadband infrastructure development: Evidence from Canada. *Telecommunications Policy*, *37*(9), 702-714. https://doi.org/10.1016/j.telpol.2013.05.001.
- Rajabiun, R. (2019). Technological change, civic engagement and policy legitimization: Perspectives from the rise of broadband Internet as an essential utility in Canada. *Government Information Quarterly*, *37*(1), 101403. https://doi.org/10.1016/j.giq.2019.101403.
- Hallstrom, L. K., Heinrich, A., & Pearson, M. (2017). Beyond Infrastructure: Strategies to Support Adoption and Realize Benefits of Broadband in Rural Canada. ACSRC Report Series # 49-17. https://www.ualberta.ca/en/alberta-centre-sustainable-rural-communities/media-library/reports/acsrc/no-49-17.pdf.
- Oughton, E. J., Frias, Z., Van der Gaast, S., & Van der Berg, R. (2019). Assessing the capacity, coverage and cost of 5G infrastructure strategies: Analysis of the Netherlands. *Telematics and Informatics*, *37*, 50-69. https://doi.org/10.1016/j.tele.2019.01.003.
- Hemasree, R., & Subramanian, C. V. (2022). Understanding the impacts and the influences of Metro rail on urban environment Case studies and the Bengaluru

scenario. *ArXiv*. https://arxiv.org/abs/2209.14210.
- Mamillapalli, R. S., & Pusarla, H. R. (2023). Dreaming of profit: case of Bangalore Metro Rail Corporation Limited. *Emerald Emerging Markets Case Studies*, *13*(2), 1-12. https://www.emerald.com/insight/content/doi/10.1108/eemcs-08-2022-0281/full/html#case-tab.
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- Pathak, S., & Upadhyay, R. K. (2023). Macro level performance study of Ahmadabad bus rapid transit system: Janmarg. *Green Energy and Intelligent Transportation*, *2*(3), 100093. https://doi.org/10.1016/j.geits.2023.100093.
- Kumar, R., & Bose, P. (2022). Case Study Telecom industry and competitive landscape in India: will MTNL and BSNL successfully recover? *IIM Ranchi Journal of Management Studies*, 1(1), 82-98. https://www.emerald.com/insight/content/doi/10.1108/irjms-12-2021-0179/full/pdf.
- Kumar, N., & Singh, M. P. (2018). Telecom Regulatory Authority of India. *Indian Journal of Public Administration*. https://doi.org/10.1177/0019556118783097.
- Karonnon, P., & Rajeev, M. (2023). Policy Impacts on Indian Telecom Services Industry: Sales, Connectivity and Usages. ISEC Working Paper No. 563. https://www.isec.ac.in/wp-content/uploads/2024/04/WP-563-Prajeesh-and-Rajeev_Final.pdf.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Mr. Shri Prakash, and Dr. Chandan Kumar

Course Reviewers

1. Prof. D. K. Nauriyal, Professor, Department of Humanities & Social Sciences, Indian Institute of Technology Roorkee (IITR), Roorkee, Uttarakhand, India.
2. Mr Subodh Kumar Jain, Former Member, Infrastructure, Railway Board, Govt. of India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting held on ……at TERI School of Advanced Studies, New Delhi.

Course title: Industrial Development and Sustainability: Policies, Performance, & Practices			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 25-05-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** 2nd Semester		

Course description

Sustainable industrial development is vital for addressing the complex challenges of the 21st century, including climate change, resource depletion, and social inequities. It aligns with a country's commitment to global responsibilities. By prioritizing sustainability in industrial practices (especially in manufacturing industries), governments and organizations can create resilient economies, foster innovation, protect the environment, and improve the quality of life for current and future generations. In recent times in emerging economies, policymakers have taken a keen interest in the various ways smart industrial policy can help sustain growth and open new possibilities for employment creation. This course offers an in-depth exploration of sustainable industrial development, focusing on industrial ecology, industrial performance, regulatory frameworks, and sustainability practices. It is designed for students to understand the complexities of industrial development in the context of environmental sustainability and social equity.

The course is divided into four modules. The first module introduces major industries, their socioeconomic and environmental impacts, significance of integrating sustainability in industrial practices, and the concept of industrial ecology. The second module provides an overview of India's industrial policy development, assessment of India's industrial performance, and examines the policy challenges that arise from striving for sustainable industrialization, or industrial development in general. The third module provides a discussion about the legal and regulatory frameworks governing industrial practices. It emphasizes the role of governance in promoting sustainability and discusses emerging trends and future prospects for sustainable industrial development. The final module orients to international and Indian cases of successful industrial practices and policy initiatives to promote industrial development with sustainability aspects. Students will explore and discuss diverse case studies to understand the factors that contribute to successful implementation and outcomes.

Learning objectives:

- To help students understand the principles and practices of industrial development and sustainability.
- To orient students to analyze the performance of industries in the context of sustainability and identify key policy challenges.
- To assist students to examine regulatory frameworks and governance mechanisms that promote sustainable industrial practices.
- To capacitate students to discuss and assess case studies to identify the best practices and lessons learned in industrial development.

Course content				
Module	**Topic**	**L**	**T**	**P**
1.	**Introduction to Major Industries, their Impacts, & Sustainability Linkages** • Classification of Industry (based on product type, scale, stage of production, capital investment, ownership, economic function, technology) with basic characteristics • Overview of major industries, their evolution and socioeconomic implications in Indian context • Environmental Implications of Industrial Development: Pollution and Resource Depletion; Ecosystem Services and Biodiversity loss • Idea of a sustainable industrial development- linkages with Sustainable Development Goals • Introduction to Industrial Ecology: Socioeconomic Metabolism; Industrial Symbiosis	6	0	0
2.	**Industrial Policy, Performance & Challenges** • An Overview of India's Industrial Policy: Early Years Post-Independence (1947-1965), Green Revolution and Economic Planning (1965-1980), Liberalization Era (1991-Present), Recent Developments (2000s-Present), Current Challenges • India's Industrial Performance Assessment and Policy Linkages: including Productivity Measures; Efficiency Metrics; Quality Measures; Financial Performance Indicators; Sustainability Metrics; Market Share and Competitive Position; Innovation and Research and Development (R&D); Employment and Labour Metrics; Supply Chain Performance; Regulatory Compliance and Safety Standards Measures & Metrics; Life-Cycle Assessment; Material Flow Analysis. • Global Value Chains (GVCs): Industrial Policy Imperative; Key challenges that GVCs present for Industrial Policy in India • Green Industrial Policy: Advantages of improved environmental quality of products	8	0	0
3.	**Regulatory Frameworks, Governance and Future Prospects for Sustainable Industrial Development** • Environmental Regulations: Emissions Standards; Waste Management Regulations • Resource Efficiency Standards; Circular Economy Incentives • Renewable Energy Standards; Carbon Pricing and Emission Trading Schemes • Sustainability Reporting and Transparency: Mandatory Sustainability Reporting; Corporate Social Responsibility (CSR) • Labour and Social Standards: Labour Rights Regulations; Environmental and Social Impact Assessments (ESIAs) • Public-Private Partnerships (PPPs) for effective governance for Industrial Development • Future Prospects: Technological Innovation; Renewable	9	0	0

	Energy Integration; Circular Economy Models; Sustainable Supply Chains; Policy and Regulation; Green Jobs and Skills Development			
4.	**Cases of Best Practices and Policies in Industrial Development** • International Cases, such as, Kalundborg Industrial Symbiosis, Denmark; Singapore's Industrial Policy; Japan's Kaizen Approach; China's Special Economic Zones (SEZs); Sweden's Focus on Green Technology; Finland's Innovation-Driven Industrial Development; Israel's High-Tech Cluster Development; South Korea's Chaebol Model. • Indian Cases, such as, Make in India Initiative, 2014; National Policy on Electronics (NPE), 2019; Production-Linked Incentive (PLI) Scheme; Start-up India Initiative, 2016; National Industrial Corridor Development Programme (NICDP); Atal Innovation Mission (AIM); Skill India Mission, 2015; National Handloom Development Programme; Tata Group: Sustainable and Diversified Operations; Mahindra & Mahindra: Agro-Tech Innovations; Infosys: Green IT Initiatives.	2	5	0
	Total	**25**	**5**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (30%)
- **Minor Test-2:** Group Presentation of Module-4 based Cases (20%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates will be:

1. having a well-rounded understanding of the principles and practices underlying sustainable industrial development (All evaluations)
2. equipped with the tools necessary to critically analyse industrial policies, assess performance, and propose innovative solutions that align with sustainability goals (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Experts in particular domains including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

Module 1:

- Clift, R., & Druckman, A. (eds.) (2016). *Taking Stock of Industrial Ecology*. Cham, Switzerland: Springer International Publishing AG.
- Graedel, T. E., & Allenby, B. R. (2003). *Industrial Ecology*, *2nd edition*. Prentice Hall.
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- Bianchi, P., Labory, S., & Tomlinson, P. (Eds.). (2023). *Handbook of Industrial Development*. Cheltenham, UK: Edward Elgar Publishing.
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Module 2:

- Yülek, M. A. (Ed.) (2018). *Industrial Policy and Sustainable Growth*. Singapore: Springer Nature Singapore Pte Ltd.
- Nanda, N. (2022). *India's Industrial Policy and Performance: Growth, Competition and Competitiveness*. London & New York: Routledge.
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- Ambec, S. (2017). Gaining competitive advantage with green industrial policy, in Altenburg, T., & Assmann, C. (eds), *Green Industrial Policy: Concept, Policies, Country Experiences* (pp. 38-49). Geneva, Bonn: UN Environment; German Development Institute / Deutsches Institut für Entwicklungspolitk (DIE). https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40ed_emp/documents/publication/wcms_613861.pdf
- Singh, A. (2009). The Past, Present, and Future of Industrial Policy in India: Adapting to the Changing Domestic and International Environment, in Cimoli, M., Dosi, G., & Stiglitz, J. E. (eds), *Industrial Policy and Development: The Political Economy of Capabilities Accumulation*, *Initiative for Policy Dialogue*. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199235261.003.0011.

Module 3:

- Singh, P., Bassin, J. P., Rajkhowa, S., Hussain, C. M., & Oraon, R. (Eds.) (2022). *Environmental Sustainability and Industries: Technologies for Solid Waste, Wastewater, and Air Treatment*. Elsevier Ltd.
- El-Haggar, S. M. (2007). *Sustainable Industrial Design and Waste Management: Cradle-to-cradle for Sustainable Development*. Elsevier Ltd.
- Wallace, D. (1995*). Environmental Policy and Industrial Innovation: Strategies in Europe, the USA and Japan*. London: Routledge. https://doi.org/10.4324/9781315145358.
- Kastelli, I., Mamica, L. & Lee, K. (2023). New perspectives and issues in industrial policy for sustainable development: from developmental and entrepreneurial to environmental state. *Review of Evolutionary Political Economy*, *4*, 1–25.

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- United Nations (2019). *A Framework for Science, Technology and Innovation Policy Reviews: Harnessing innovation for sustainable development*. Geneva: United Nations. https://unctad.org/system/files/official-document/dtlstict2019d4_en.pdf.
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- Ahmad, H., Yaqub, M., & Lee, S. H. (2024). Environmental-, social-, and governance-related factors for business investment and sustainability: a scientometric review of global trends. *Environment, Development and Sustainability*, *26*, 2965–2987. https://doi.org/10.1007/s10668-023-02921-x.
- Cohen, E. (2017). *Sustainability Reporting for SMEs: Competitive Advantage Through Transparency*. Oxon & New York: Routledge.
- Bini, L., & Bellucci, M. (2020). *Integrated Sustainability Reporting: Linking Environmental and Social Information to Value Creation Processes*. Cham, Switzerland: Springer Nature Switzerland AG.
- Wagenhofer, A. (2023). Sustainability Reporting: A Financial Reporting Perspective. *Accounting in Europe*, *21*(1), 1–13. https://doi.org/10.1080/17449480.2023.2218398.
- Rimmel, G., Aras, G., Baboukardos, D., Krasodomska, J., Nielsen, C., & Schiemann, F. (Eds.) (2024). *Research Handbook on Sustainability Reporting*. Cheltenham, UK: Edward Elgar Publishing Ltd.

Module 4:

- Jacobsen, N. B. (2006). Industrial Symbiosis in Kalundborg, Denmark: A Quantitative Assessment of Economic and Environmental Aspects. *Journal of Industrial Ecology*, *10*(1-2), 239-255. https://doi.org/10.1162/108819806775545411.
- Valentine, S. V. (2016). Kalundborg Symbiosis: Fostering progressive innovation in environmental networks. *Journal of Cleaner Production*, *118*, 65-77. https://doi.org/10.1016/j.jclepro.2016.01.061.
- Cheang, B. (2024). What Can Industrial Policy Do? Evidence from Singapore. *The Review of Austrian Economics*, *37*, 1–34. https://doi.org/10.1007/s11138-022-00589-6.
- Berglof, E., & Cable, V. (2018). Back in Business: Industrial Policy for Emerging Economies in the New Globalization. ADB Economics Working Paper Series, No. 537. https://www.adb.org/sites/default/files/publication/401871/ewp-537-industrial-policy-emerging-economies.pdf.
- Pereira, A. A. (2000). State Collaboration with Transnational Corporations: The Case of Singapore's Industrial Programmes (1965–1999). *Competition & Change, 4*(4).

https://doi.org/10.1177/102452940000400403.
- Goh, D. A. (2005). Modelling a Systemic Industrial Policy Ecosystem: A Case Analysis of Singapore.
- Medina, J. C., López, N. A. S., Terrón, M. E. P., & Córdoba, J. V. M. V. (2024). Kaizen: Improving Productivity and Reducing Waste in a Manufacturing Company: a Practical Case Study. *International Journal of Professional Business Review*, *9*(1), e04241. https://doi.org/10.26668/businessreview/2024.v9i1.4241.
- Jin, K. (2018). Role of Kaizen in Japan's Overseas Development Cooperation. In: Otsuka, K., Jin, K., & Sonobe, T. (eds) *Applying the Kaizen in Africa*. Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-319-91400-8_2.
- Sahmi, Z., & El Abbadi, L. (2024). The evolution of Kaizen in the industry: systematic literature review. *International Journal of Production Management and Engineering*, *12*(2), 169–179. https://doi.org/10.4995/ijpme.2024.21143.
- Yuan, Y. (2023). *Studies on China's Special Economic Zones 5*. Singapore: Springer Nature Singapore Pte Ltd.
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- Zeng, D. Z. (2012). China's Special Economic Zones and Industrial Clusters: Success and Challenges. Lincoln Institute of Land Policy Working Paper. https://www.lincolninst.edu/app/uploads/legacy-files/pubfiles/2261_1600_Zeng_WP13DZ1.pdf.
- Sun, M., Song, T., Liu, W., & Cheng, Z. (2022). Rejuvenating SEZs through Internationalization: A Case Study of Chinese Domestic and International SEZs. *Land*, *11*(5), 596. https://doi.org/10.3390/land11050596.
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- Karltorp, K., & Maltais, A. (2024). Financing green industrial transitions: A Swedish case study. *Energy and Climate Change*, *5*, 100138. https://doi.org/10.1016/j.egycc.2024.100138.
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- Wonglimpiyarat, J. (2016). Government policies towards Israel's high-tech powerhouse. *Technovation*, *52-53*, 18-27. https://doi.org/10.1016/j.technovation.2016.02.001.
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- Keunsoo, K. (2013). Chaebols and Their Effect on Economic Growth in South Korea. *Korean Social Sciences Review*, *3*(2), 1-28. https://s-space.snu.ac.kr/bitstream/10371/91035/1/01_Kim%20Keunsoo.pdf.
- Sial, F., & Doucette, J. (2020). Inclusive partners? Internationalising South Korea's *chaebol* through corporate social responsibility-linked development cooperation. *Third World Quarterly*, *41*(10), 1723–1739. https://doi.org/10.1080/01436597.2020.1782185.
- Tripathi, A., & Dastrala, S. M. (2023). Make in India: So Far and Going Ahead. IIMB Working Paper No. 674.

https://repository.iimb.ac.in/bitstream/2074/21798/1/WP_IIMB_674.pdf
- Iyer, A. (2018). Moving from Industry 2.0 to Industry 4.0: A case study from India on leapfrogging in smart manufacturing. *Procedia Manufacturing*, *21*, 663-670.
- Anbarasu, S., George, A., Gupta, S., & Gupta, S. (2023). Efficacy of the Make in India Initiative. In: Cheung, P., George, A., & Zhang, X. *Foreign Direct Investments in Emerging Asia: An Evaluation of Pandemic and Policy Shocks*. London: Routledge.
- Anbarasu, S., George, A., Gupta, S., & Gupta, S. (2023). Efficacy of the Make in India Initiative. In: Cheung, P., George, A., & Zhang, X. *Foreign Direct Investments in Emerging Asia: An Evaluation of Pandemic and Policy Shocks*. London: Routledge.
- Nagarjuna, B. (2022). The Impact of Make in India on Foreign Direct Investment: An Analytical Study. *SEDME (Small Enterprises Development, Management & Extension Journal)*. https://doi.org/10.1177/09708464221084181.
- Patel, P., Patil, S., & Vishwanathan, A. (2023). India's Quest for Defence Indigenisation: A Case Study of the Indian Navy. *Journal of Asian Security and International Affairs*. https://doi.org/10.1177/23477970231207255.
- Ramachandran, H. (2019). Review of Industrial and Development Corridors in India. ISID Working Paper 217. https://isid.org.in/wp-content/uploads/2022/07/WP217.pdf.
- Anand, S., & Sami, N. (2016). Scaling Up, Scaling Down: State Rescaling along the Delhi—Mumbai Industrial Corridor. *Economic and Political Weekly*, *51*(17), 50–58. http://www.jstor.org/stable/44003407.
- Chattaraj, S. (2023). Infrastructure, institutions and industrialisation: The Delhi-Mumbai Industrial Corridor and regional development in Gujarat and Uttar Pradesh. ORF Issue Brief. https://www.orfonline.org/research/infrastructure-institutions-and-industrialisation-the-delhi-mumbai-industrial-corridor-and-regional-development-in-gujarat-and-uttar-pradesh
- Bhandari, B., Bandyopadhyay, S., Bhattacharya, T., Choudhuri, P., Das, M., Parashar, A., Prabhakar, J., Rawat, P., & Sahu, A. K. (2021). Skilling India from the Ground up: Project Case Studies. Working Paper No. 167. National Council of Applied Economic Research, New Delhi. https://www.ncaer.org/wp-content/uploads/2022/09/1624770555WP-127.pdf
- Bishnoi, T., & Rai, D. K. (2022). Case Study: India. The Role of the Skill Council for Green Jobs (SCGJ) in Recognising Green Skills and Upskilling Workers in Micro, Small and Medium Enterprises. In: Pavlova, M., & Singh, M. (eds.) Recognizing Green Skills Through Non-formal Learning. Education for Sustainability, vol 5. Singapore: Springer. https://doi.org/10.1007/978-981-19-2072-1_7.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Chandan Kumar

Course reviewers

1. Prof. S. P. Singh, Professor of Economics, Department of Humanities & Social Sciences, Indian Institute of Technology Roorkee (IITR), Roorkee, Uttarakhand, India.
2. Dr. Anjali Tandon, Associate Professor, Institute for Studies in Industrial Development (ISID), New Delhi, India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting held on ……at TERI School of Advanced Studies, New Delhi.

Course title: Climate Change and Development: Policies & Practices			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 24-06-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** 2nd Semester		

Course description

This course provides a comprehensive exploration of climate change and its multifaceted developmental impacts. It is designed for understanding the interplay of climate science, political frameworks, and policy development while examining strategies for enhancing climate resilience. By offering an in-depth exploration of the interplay between climate change, development, and policymaking, it will equip students with the knowledge, skills, and perspectives to contribute positively to building resilient environments and settings. The insights gained through this course will empower the next generation of policymakers, urban planners, public health officials, and community leaders to create effective and sustainable responses to climate change.

This course is divided into four modules. The first module serves as a foundation for understanding climate change, exploring its scientific basis, causes, and global consequences. The module will also discuss global climate change agreements, equity in climate change, mitigation measures and risk assessment. In the second module, students will delve into politics, policies, key institutions, finance and technology transition surrounding climate change. The third module focuses on identifying and implementing strategies to build climate resilience in development planning. Students will explore various approaches and frameworks for assessing vulnerability and resilience, including green infrastructure, ecosystem-based and community-based approaches and initiatives aimed at mitigating the effects of climate change. In the final module, students will examine real-world case studies of places that have successfully implemented climate resilience strategies. Through collaborative analysis, students will identify key components that contributed to the success of these initiatives.

Learning objectives:

- To provide students with a nuanced understanding of the challenges posed by climate change, the political and policy contexts in which decisions are made.
- To orient students to the effective strategies that cities can employ to promote climate-resilience.
- To equip students with the skills necessary to contribute to climate action and sustainable urban development.

Course content

Module	**Topic**	**L**	**T**	**P**

1.	**Introduction to Climate Change** • Science of Climate Change (causes, effects, and projections): Mainstream view and Alternative view; The IPCC process and global assessments • International Climate Change Agreements: UNFCCC, Kyoto Protocol, Paris Agreement; India's engagement in Global Climate Negotiations • Equity in Climate Change: Approaches of developed and developing countries; Need for formal justification • Climate Change Mitigation: Sectors and Gases, Trends and Projections, GHG abatement costs; Net Zero goal, the theory and practice of the carbon market • Assessing Climate Risks, Vulnerability, Impacts, Adaptation, Loss & Damage; Tools and methods for climate risk assessment in Cities	8	0	0
2.	**Climate Change: Politics and Policy** • Divergence in approach of Developed and Developing Countries; Global geopolitical dynamics on climate change issues • International Climate Policies, Global Net Zero goal and energy transition strategy • National Climate Change Policy: National Action Plan on Climate Change (NAPCC); Nationally Determined Contributions; Roles of local governments in climate action. • Climate Finance: Issues and approaches, Flows, Mechanisms including Green Climate Fund (GCF), and Loss & Damage Fund	6	2	0
3.	**Strategies for Climate Resilience in Development Planning** • Defining adaptation and its significance in the context of climate change • Assessing climate vulnerability and resilience • Green Infrastructure; Climate-Resilient Infrastructure • Ecosystem-based Approaches: Ecosystem Restoration; Biodiversity Conservation • Community Engagement & Empowerment: Community-based Adaptation; Building Social Capital • Technology & Innovation • Education & Capacity Building • Climate action plans	6	2	0
4.	**Case Studies & Best Practices for Climate Resilient Development** • International Cases, such as, Rotterdam, Netherlands: Water Management and Infrastructure; Copenhagen, Denmark: Climate-Adaptive Urban Planning; New York City, USA: Coastal Resilience and Community Involvement; Singapore: Integrating Nature-Based Solutions; Cape Town, South Africa: Water Conservation and Management; Medellín, Colombia: Urban Green Spaces and Social Inclusion • Indian Cases, such as, Ahmedabad: Urban Heat Island	4	2	0

	Mitigation; Bengaluru: Water Management and Lakes Restoration; Chennai: Flood Management and Disaster Preparedness; Mumbai: Coastal Resilience and Protection; Hyderabad: Integrated Urban Planning for Climate Resilience; Visakhapatnam: Coastal Area Management			
	Total	**24**	**6**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (20%)
- **Minor Test-2:** Seminar/Case Study - Group Presentation (30%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates would be able to:

1. possess a comprehensive understanding of climate change and the tools necessary to evaluate, promote, and implement effective climate resilience strategies (All evaluations)
2. develop skills to communicate complex climate change issues and resilience strategies to various audiences, including policymakers, community members, and the general public (Minor Test-2)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Climate Change Experts including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

Module 1:

- Johansen, B. E. (2023). *Global Warming and the Climate Crisis: Science, Spirit, and Solutions*. Springer.
- Dessler, A. E. (2021). *Introduction to Modern Climate Change, 3rd edition*. Cambridge University Press.
- Ingram, A. (2023). *Climate Change Simplified: A Comprehensive Guide to Global Warming and Sustainable Living with 101 Essential Tips for a Greener Future and Reduced Carbon Footprint*. Authentic EcoPress.

Module 2:

- Tondon, U. (2016). *Climate Change: Law, Policy and Governance*. Eastern Book Company.
- Dubash, N. K. (ed.) (2011). *Handbook Of Climate Change and India: Development, Politics, and Governance*. Oxford University Press.
- Hussain, S., Hussain, E., Saxena, P., Sharma, A., Thathola, P., & Sonwani, S. (2024). Navigating the impact of climate change in India: A perspective on climate action (SDG13) and sustainable cities and communities (SDG11). *Frontiers in Sustainable Cities*, *5*, 1308684. https://doi.org/10.3389/frsc.2023.1308684.

Module 3:

- Singh, A. K. (2023). *Global Warming and Climate Change: Story of India's Climate Disaster and How to Avoid it*. Chennai, Notion Press Media Pvt Ltd.
- Pathak, B., & Dubey, R. S. (eds.) (2023). *Climate Change and Urban Environment Sustainability*. Gateway East, Singapore: Springer Nature Singapore Pte Ltd.
- Seto, K., Solecki, W., & Griffith, C. (2020). *The Routledge Handbook of Urbanization and Global Environmental Change*. Routledge.
- Norman, B. (2022). *Urban Planning for Climate Change*. Routledge.
- Bhadouria, R., Upadhyay, U., Tripathi, S., Singh, P. (eds.) (2022). *Urban Ecology and Global Climate Change*. Wiley-Blackwell.
- Dubash, N. K. (ed.) (2019). *India in a Warming World: Integrating Climate Change and Development*. Oxford University Press. https://doi.org/10.1093/oso/9780199498734.001.0001.
- Oktari, R. S., Syamsidik, Idroes, R., Sofyan, H., & Munadi, K. (2020). City Resilience towards Coastal Hazards: An Integrated Bottom-Up and Top-Down Assessment. *Water*, *12*(10), 2823. https://doi.org/10.3390/w12102823.
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- Dakey, S., Deshkar, S., Joshi, S., & Sukhwani, V. (2023). Enhancing Resilience in Coastal Regions from a Socio-Ecological Perspective: A Case Study of Andhra Pradesh, India. *Sustainability*, *15*(12), 9565. https://doi.org/10.3390/su15129565.
- Urban Design Lab. Integrating Nature-Based Solutions (NBS) into Urban Planning Practices. https://urbandesignlab.in/integrating-nature-based-solutions-nbs-into-urban-planning-practices/#:~:text=Case%20Studies%20of%20NBS%20in%20Urban%20Planning&text=In%20Singapore%2C%20vertical%20gardens%20and,rainwater%20to%20reduce%20flooding%20risk.
- Parikh, J., Jindal, P., & Sandal, G. (2013). Climate Resilient Urban Development, Vulnerability Profiles of 20 Indian Cities. COE-IRADe. https://irade.org/Climate_Resilient_Urban_Development.pdf.
- Govindarajulu, D. (2014). Urban green space planning for climate adaptation in Indian cities. *Urban Climate*, *10*, 35-41. https://doi.org/10.1016/j.uclim.2014.09.006.

Module 4:

- Dolman, N., & Verlinde, J. (2024). Achieving a Water-Resilient Rotterdam: Past, Present and Future Perspectives. *Blue Papers*, *3*(1). https://doi.org/10.58981/bluepapers.2024.1.13.
- Graaf R.E. De, Der Brugge R. Van, J. Lankester, Der Vliet W. Van, L. Valkenburg. Local water resources and urban renewal. A Rotterdam case study. https://hal.science/hal-03231425/document.
- Negrello, M. (2023). Designing with Nature Climate-Resilient Cities: A Lesson from Copenhagen. In: Arbizzani, E., et al. *Technological Imagination in the Green and Digital Transition*. CONF.ITECH 2022. The Urban Book Series. Cham: Springer. https://doi.org/10.1007/978-3-031-29515-7_76.
- Jørgensen, G., Fryd, O., Lund, A. A., Andersen, P. S., & Herslund, L. (2022). Nature-based climate adaptation projects, their governance and transitional potential-cases from Copenhagen. *Frontiers in Sustainable Cities*, *4,* 906960. https://www.frontiersin.org/journals/sustainable-cities/articles/10.3389/frsc.2022.906960/full.
- Rudge, K. (2021). Participatory climate adaptation planning in New York City: Analyzing the role of community-based organizations. *Urban Climate*, *40*, 101018. https://doi.org/10.1016/j.uclim.2021.101018.

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- Rosenzweig, C., Solecki, W.D., Blake, R., Bowman, M., Faris, C., Gornitz, V., Horton, R., Jacob, K., LeBlanc, A., Leichenko, R., Linkin, M., Major, D., O'Grady, M., Patrick, L., Sussman, E., Yohe, G., & Zimmerman, R. (2011). Developing coastal adaptation to climate change in the New York City infrastructure-shed: process, approach, tools, and strategies. *Climatic Change*, *106*, 93–127. https://doi.org/10.1007/s10584-010-0002-8.
- U. S. Climate Resilience Toolkit: Case Studies. https://toolkit.climate.gov/case-studies?f%5B0%5D=field_workflow_step%3A58.
- Tan, B. A., Gaw, L. Y., Masoudi, M., & Richards, D. R. (2021). Nature-Based Solutions for Urban Sustainability: An Ecosystem Services Assessment of Plans for Singapore's First "Forest Town". *Frontiers in Environmental Science*, *9*, 610155. https://doi.org/10.3389/fenvs.2021.610155.
- Cui, M., Ferreira, F., Fung, T. K., & Matos, J. S. (2021). Tale of Two Cities: How Nature-Based Solutions Help Create Adaptive and Resilient Urban Water Management Practices in Singapore and Lisbon. *Sustainability*, *13*(18), 10427. https://doi.org/10.3390/su131810427.
- Calverley, C. M., & Walther, S. C. (2022). Drought, water management, and social equity: Analyzing Cape Town, South Africa's water crisis. *Frontiers in Water*, *4*, 910149. https://doi.org/10.3389/frwa.2022.910149.
- Brühl, J., & Visser, M. (2021). The Cape Town drought: A study of the combined effectiveness of measures implemented to prevent "Day Zero". *Water Resources and Economics*, *34*, 100177. https://doi.org/10.1016/j.wre.2021.100177.
- Visser, M., Booysen, M. J., Brühl, J. M., & Berger, K. J. (2021). Saving water at Cape Town schools by using smart metering and behavioral change. *Water Resources and Economics*, *34*, 100175. https://doi.org/10.1016/j.wre.2020.100175.
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- Bremner, L. (2020). Planning the 2015 Chennai floods. *Environment and Planning E: Nature and Space*, *3*(3), 732-760. https://doi.org/10.1177/2514848619880130.
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- Baig, M. R. I., Ahmad, I. A., Shahfahad, Tayyab, M., & Rahman, A. (2020). Analysis of shoreline changes in Vishakhapatnam coastal tract of Andhra Pradesh, India: an application of digital shoreline analysis system (DSAS). *Annals of GIS*, *26*(4), 361–376. https://doi.org/10.1080/19475683.2020.1815839
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- TERI (2014). Planning Climate Resilient Coastal Cities: Learnings from Panaji and Visakhapatnam, India. Working Paper. https://www.teriin.org/eventdocs/files/Working-Paper-climate-resilient.pdf.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Chandan Kumar, Prof. Shaleen Singhal, and Mr. R. R. Rashmi

Course Reviewers

1. Prof. P. K. Joshi, Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, India.
2. Dr Manish Kumar Shrivastava, Associate Director, Earth Science and Climate Change Division, The Energy and Resources Institute (TERI), New Delhi, India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting held on ……at TERI School of Advanced Studies, New Delhi.

Course title: Public Policy Assessment: Methods & Measurements			
Course code: PPS XXX	**No. of credits:** 2	**L-T-P:** 22-06-04	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** 2nd Semester		

Course description

Public Policy Assessment is a fundamental skill for public policy students as it capacitates to critically evaluate and improve policies that directly affect communities and society at large. Understanding assessment methods and measurements enables students to utilize data and evidence to make informed policy decisions. It fosters critical thinking about how policies can be evaluated based on their outcomes, feasibility, and impact. It helps students appreciate the need for transparency in assessing government actions and resource allocation. This course provides an in-depth exploration of policy appraisal and evaluation, equipping students with the theoretical knowledge and practical skills necessary to assess public policies effectively. Emphasizing a range of evaluation methods, this course will enable students to critically analyze the impact of policies and programs on various social, economic, and environmental outcomes.

This course is divided into four modules. The first module focuses on foundations and framework of policy appraisal, types of evaluation, and stages in planning and execution of policy evaluation. The second module discusses experimental and quasi-experimental impact evaluation methods. The third module includes discussion on other evaluation methods including theory-based impact evaluation methods, value-for-money evaluation methods, evidence synthesis methods, and others. The final module exposes students with various real-world case studies assessing different public policies across sectors.

Learning objectives:

- To help students understand the concepts and significance of policy appraisal and evaluation in the policymaking process.
- To explore and discuss various evaluation methods and expose students to analyze and interpret evaluation findings to assess policy effectiveness and impact.
- To engage students with real-world case studies to assess and apply evaluation principles and methodologies.

Course content

Module	Topic	L	T	P
1.	**Introduction to Policy Appraisal and Evaluation** • Appraisal and Evaluation: Meaning, Principles, and Purpose • Appraisal Framework: Rationale for Intervention, Longlist Appraisal, Shortlist Appraisal, Identification of the Preferred Option, Monitoring and Evaluation • The Five Case Model Framework: Strategic, Economic, Commercial, Financial, and Management dimension for Interventional Appraisal	6	0	0

	• Evaluation Considerations: Before, During, and After the Policy Implementation • Types of Evaluation: Process evaluation, Impact evaluation, Value-for-Money evaluation • Stages in Planning and Execution of an Evaluation • Conditions for selection of appropriate evaluation method: Nature of Intervention, Availability of Baseline Data, Presence of Instrument, Selection on Unobservables, Impact Measure of Interest			
2.	**Experimental & Quasi-Experimental Impact Evaluation Methods** • Randomized Controlled Trials (RCT) • Interrupted time series analysis • Difference-in-Difference (DID) • Regression Discontinuity Design • Propensity Score Matching (PSM) • Synthetic control methods • Instrumental Variables (IV)	8	0	4
3.	**Other Evaluation Methods** • Theory-based Evaluation Methods: Contribution analysis; Realist evaluation; Process tracing; Qualitative comparative analysis • Value-for-Money Evaluation Methods: Social Cost-Effectiveness Analysis (CEA); Social Cost-Benefit Analysis (CBA) • Evidence Synthesis Methods: Rapid Evidence Assessment; Systematic Reviews, Meta-Analysis; Meta-Ethnography; Realist Synthesis • Other Evaluation Methods: The Delphi Technique; Critical Incident Method; Root Cause Analysis (RCA)	8	0	0
4.	**Case Studies in Policy Evaluation** • Comparative Analysis of Policy Evaluations: Examination of real-world case studies assessing different public policies across sectors (e.g., environment, infrastructure, employment, healthcare, education, social welfare, etc.). • Discussions on assessment methodologies used and lessons learned.	0	6	0
	Total	**22**	**6**	**4**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (30%)
- **Minor Test-2:** Case Study Presentation (20%)
- **Major Test:** Submission and Presentation of Project Evaluation Planning Protocol (50%)

Learning outcomes

Upon completion of this course, candidates would be able to:

1. get comprehensive understanding of policy appraisal and evaluation, including the essential tools and methodologies used in assessing public policies (All evaluations)

2. develop the skills necessary to critically analyze policy or programme effectiveness (All evaluations)

Pedagogical approach

Classroom lectures; Practical Exercises; Brainstorming Tutorials; Case studies

Suggested Readings

- Damonte, A., & Negri, F. (Eds.) (2023). *Causality in Policy Studies: A Pluralist Toolbox*. Cham, Switzerland: Springer Nature Publishing AG.
- Cerulli, G. (2022). *Econometric Evaluation of Socio-Economic Programs: Theory and Applications, 2nd edition*. Berlin, Germany: Springer-Verlag GmbH.
- Dale, R. (2004). *Evaluating Development Programmes and Projects, 2nd edition*. New Delhi: Sage Publications India Pvt Ltd.
- Varone, F., Jacob, S., & Bundi, P. (Eds.) (2023). *Handbook of Public Policy Evaluation*. Glos, UK: Edward Elgar Publishing Ltd.
- White, H., & Raitzer, D. A. (2017). *Impact Evaluation of Development Interventions: A Practical Guide*. Manila, Philippines: Asian Development Bank.
- Linfield, K. J., & Posavac, E. J. (2019). *Program Evaluation Methods and Case Studies, 9th edition*. New York: Routledge.
- Barrett, N. F. (2016*). Program Evaluation: A Step-by-Step Guide (Revised Edition)*. Springfield, IL: Sunnycrest Press.
- Guo, S., & Fraser, M. W. (2015). *Propensity Score Analysis: Statistical Methods and Applications, 2nd edition*. California, US: SAGE Publications, Inc.
- Reichardt, C. S. (2019). Quasi-Experimentation: A Guide to Design and Analysis. New York: The Guilford Press.
- Cattaneo, M. D., Idrobo, N., & Titiunik, R. (2024). *A Practical Introduction to Regression Discontinuity Designs: Extensions*. Cambridge, UK: Cambridge University Press.
- Woudenberg, F. (1991). An evaluation of Delphi. *Technological Forecasting and Social Change*, *40*(2), 131-150. https://doi.org/10.1016/0040-1625(91)90002-W
- Nasa, P., Jain, R., & Juneja, D. (2021). Delphi methodology in healthcare research: How to decide its appropriateness. *World Journal of Methodology*, *11*(4), 116. https://doi.org/10.5662/wjm.v11.i4.116
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- Serrat, O. (2017). The Critical Incident Technique, in *Knowledge Solution,* pp. 1077–1083. Singapore: Springer. https://doi.org/10.1007/978-981-10-0983-9_123.
- Williams, P. M. (2001). Techniques for root cause analysis. *Proceedings (Baylor University. Medical Center)*, *14*(2), 154. https://doi.org/10.1080/08998280.2001.11927753.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.

- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Chandan Kumar

Course Reviewers

1. Prof. S. P. Singh, Professor of Economics, Department of Humanities and Social Sciences, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, India.
2. Dr. Seema Sangita, Associate Professor, Centre for Economic Studies and Planning, School of Social Sciences, Jawaharlal Nehru University, New Delhi, India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting held on ……at TERI School of Advanced Studies, New Delhi.

Course title: Policy Lab-II: Developing a Policy Paper			
Course code: PPS XXX	**No. of credits:** 3	**L-T-P**: 16-15-28	**Learning hours:** 45
Pre-requisite course code and title (if any): PPS 130. Policy Lab-I: Sectoral Policy Scoping			
Department: Department of Policy & Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** 2nd Semester	

Course Description

This interactive and experiential course is designed to guide students through the process of developing a comprehensive policy paper. It will equip students with the skills necessary to analyze public policy issues, conduct effective research, engage stakeholders, and articulate recommendations clearly and persuasively. Through a combination of lectures, workshops, peer reviews, and real-world applications, students will learn to craft impactful policy papers that can inform decision-making at various levels of governance.

This course is the second part of a two-part course that imparts practical knowledge of the processes of policymaking or developing a policy paper/brief. In the first part, the students learned the initial process of identifying policy-relevant research questions through the scoping of literature and other evidence, and stakeholder consultation. In this second part of this Policy Lab course, the students will work on the identified research questions to develop a policy paper.

This course is divided into four practical modules. The first module build discussion on the scoping review and research questions and gaps identified during the first part of the Policy Lab course. In this module, students will be guided to explore and reflect upon the policy dimensions in their identified issues. The second module will focus on structuring the policy document through a writing skill workshop, the students will present their selected topics and discuss their formulation/conceptualization and finalize the structure of their policy document based on the feedback received. The third module is focused on finalizing the analysis required for discussing the selected topics and formulating actionable, measurable, and clear recommendations. The final module is dedicated to conducting a peer review workshop, where the first draft of the manuscript will be flipped among the student groups, and they will be asked to review, identify gaps including unclear phrases and recommend modifications. All these activities will be evaluated as part of the evaluation process under this course.

Course objectives

- To help students analyze and define a specific public policy issue after conducting thorough research, including literature reviews and stakeholder analysis.
- To assist students to develop critical thinking skills to evaluate evidence and identify potential policy solutions.
- To orient students to structurally organize and write a clear, concise, and persuasive policy paper.
- To provide students with a platform to enhance their skills to effectively present policy recommendations to relevant stakeholders.

Course content

Module	Topic	L	T	P
1.	**Understanding Policy Issues** • Introduction to Policy Papers: Purpose and importance of policy papers; Overview of the evidence-based policy-making process and assessment	8	0	0

	• Identifying a Policy Issue: Techniques for selecting and defining the policy problem; Engaging with current events and existing literature			
2.	**Structuring the Policy Paper** • Based on the issues identified by the students in the course "PPS 130. Policy Lab-I: Sectoral Policy Scoping", each group or individual will present their conceptual frame, discuss and structure their manuscript based on the feedback received. • Writing Skills Workshops will be conducted focusing on techniques of clear and concise writing, and for fostering persuasive communication of ideas. Students will work on their selected issues, discuss, and get feedback.	2	5	10
3.	**Analysis and Recommendations** • Evidence-Based Analysis: Evaluating data and evidence to support policy recommendations; Assessing the feasibility and potential impact of proposed policies. Students will work on their selected issues, present, and get feedback. • Developing Policy Recommendations: Formulating actionable, measurable, and clear recommendations; Discussing implementation considerations and potential challenges. Students will work on their selected issues, present, and get feedback.	4	5	10
4.	**Review and Revision** • Peer Review Workshop will be conducted. Each manuscript developed by the students will be reviewed by the fellow students (peers) and will be asked to identify the gaps. This process will be evaluated. The workshop will be engaging in constructive feedback sessions with peers. Techniques for revising and improving draft papers based on feedback will be discussed. • Finalizing the Policy Paper: Integrating feedback and finalizing the manuscript for submission and final presentation.	2	5	8
	TOTAL	**16**	**15**	**28**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test 1:** Presentations based on the Structuring of Policy Paper (15%); Analysis & Recommendation (20%)
- **Minor Test 2**: Peer Review Workshop Presentation (15%)
- **Major Test:** Submission and Presentation of Policy Paper (50%)

Learning Outcomes:

Upon completion of this course, students would be able to:

1. enhance their practical skills and methodologies essential for effective policy analysis and writing (All evaluations)
2. contribute to public policy discussions and create impactful policy documents that address pressing societal issues (All evaluations)

Pedagogical approach:

Systematic literature review; content analysis; brainstorming sessions, group, or individual presentation, etc.

Suggested readings:

- Dunn, W. N. (2018). *Public Policy Analysis: An Integrated Approach, 6th edition*. New York: Routledge. https://doi.org/10.4324/9781315181226.
- Booth, W. C., Colomb, G. G., Williams, J. M., Bizup, J., & Fitzgeral, W. T. (2016). *The Craft of Research, 4th edition*. University of Chicago Press.
- Bardach, E., & Patashnik, E. M. (2019). *A Practical Guide for Policy Analysis: The Eightfold Path to More Effective Problem Solving, 7th edition*. United Kingdom: SAGE Publications.
- Smith, C. F. (2023). *Writing Public Policy: A Practical Guide to Communicating in the Policy-Making Process, 6th edition*. Oxford: Oxford University Press.

Student responsibilities:

- At least 75% attendance will be required.
- Active classroom participation; Critical reflections during Brainstorming Sessions; Equal participation of the participants working in a group.

Course Outline prepared by: Dr. Chandan Kumar

Course reviewers

1. Dr. Sunil Pandey, Director, Circular Economy and Waste Management, The Energy and Resources Institute (TERI), New Delhi, India.
2. Dr. Prashanth N. Srinivas, Director & Health Equity Cluster Lead, Institute of Public Health, Bengaluru, India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting held on ……at TERI School of Advanced Studies, New Delhi.

Course title: Major Project-I			
Course code: PPS XXX	**No. of credits:** 20	**L-T-P**: 00-00-600	**Learning hours:** 300
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** 3rd Semester	

Course Description

This course provides students with an opportunity to gain practical experience through internships with relevant development or policy research organizations while conducting independent research for their thesis. Internships allow students to apply academic theories and concepts learned in the classroom to real-world situations, helping to solidify their understanding and connect theoretical frameworks to practical challenges. Engaging in actual projects and responsibilities within organizations emphasizes experiential learning, which is often more effective than theoretical study alone. In addition to acquiring essential professional skills, internships also provide students with opportunities to develop interpersonal skills, adaptability, teamwork, and problem-solving abilities, all of which are essential in professional environments. Working in reputed development or policy research organizations allows students to build a network of professional contacts, which can be invaluable while seeking future job opportunities or collaborative projects. Interns often have the chance to work closely with experienced professionals who can provide guidance, advice, and potential mentorship to shape their professional career.

For Public Policy students, internships provide firsthand experience with research design, data collection, and analysis, deepening their understanding of research methodologies. They often get a chance to work on ongoing influential research projects, giving students the opportunity to contribute to meaningful results that can directly impact policy decisions. Engaging in impactful projects nurtures a sense of civic responsibility and awareness of social issues, encouraging students to be active contributors to society.

This practical course is placed in two parts with a semester-long practical learning exposure in each part. They are offered in third and fourth semesters, respectively. However, each part of this 'Major Project' course is independent in terms of evaluation. After having intensive engagement with foundational and perspective-based deliberations during the first two semesters of the Programme, the students are encouraged and assisted to develop their firm interests in their area of professional work. Students are motivated to approach and choose any development or policy research organization of interest, while they are assisted by the opportunities forwarded by the Institute Placement Cell. After getting an internship opportunity by an organization, the student is expected to get acclimatized with the working environment in the organization for an initial few weeks while simultaneously exploring the suitable topic for carrying out policy-oriented research under the mentorship of an external supervisor from the host organization and an assigned supervisor from the TERI SAS. Students get a semester long period to conceptualize, work, and prepare a Major Project Thesis to be submitted to the Programme and the Department. Students are expected to strictly follow the timelines as per the Major Project Guideline provided by the Major Project Coordinator in the beginning of the third semester.

Course objectives

- To provide students with a platform to gain hands-on experience in a professional setting relevant to the student's area of study/research interest.
- To equip students with proven research skills through the completion of a thesis project.

• To assist students to foster critical thinking, analytical skills, and professional development. • To orient students to integrate practical experience with academic knowledge.				
Course content				
Module	**Topic**	**L**	**T**	**P**
1.	**Internship Preparation (Weeks 1-2)** • Week 1: Orientation and Skill Assessment o Introduction to the course structure and expectations. o Workshops on resume writing, interview preparation, and professional etiquette. o Assessment of student skills and interests to align with potential internship opportunities. • Week 2: Placement and Agreement o Assistance in securing internships with relevant organizations. o Completion of internship agreements and clarification of roles and expectations.	2	0	60
2.	**Internship Experience (Weeks 3-19)** • Practical Internship Work o Internship Commitment: Students will engage in a minimum of 30 hours per week at their designated internship organization, applying their skills and gaining industry/organizational experience. o Weekly Reflection and Monthly Reporting: Students will maintain a weekly journal/diary, documenting their experiences and reflections, which they will compile in Monthly Progress Reports to be submitted through TERI SAS Major Project Portal to their faculty advisors. o Mid-Internship Review (Week 9): Students will be asked to share a review of the internship experience with their faculty advisors, discussing challenges, learnings, and research interests related to internship work.	0	0	536
3.	**Thesis Development (Weeks 5-20)** • Week 5: Thesis Proposal Development o Meeting and discussion with Faculty Advisor for finalising research questions and relevant research methodologies o Preparation and submission of a thesis proposal outlining research questions and objectives. • Weeks 6-20: Thesis Research and Writing o Data Collection and Analysis: Students will conduct research as outlined in the approved thesis proposal, which includes collecting and analyzing data relevant to their thesis topic. o Regular Meetings with Faculty Advisor: Bi-weekly meetings to discuss progress, seek guidance, and receive feedback on thesis work.	0	0	

4.	**Thesis Presentation and Submission (Weeks 19-20)**
	• Week 19: Thesis Presentation and Reflection
	  ○ Students will present their research findings to a panel of faculty members, followed by a question-and-answer session to defend their work, and getting feedback.
	  ○ Students will reflect on the overall experience in both the internship and thesis process, discussing key learnings and how they will apply these insights to their future career.
	• Week 20: Thesis Submission
	  ○ Finalize and submit the complete thesis document after incorporating the feedback received during the presentation and adhering to institutional formatting and submission guidelines.
		0	0	

	TOTAL	**2**	**0**	**596**

Evaluation criteria:

An evaluation committee will be formed to assess the major project. The distribution of marks for the evaluation would be as per the following criteria:

- **Timeline adherence (10 marks):** Thesis Proposal (2), four progress reports (1 each), final dissertation/thesis (4).
- **Research Proposal (10 marks):** Graded based on clarity, relevance, and methodological rigor.
- **Presentation and viva (30 marks):** The presentation will be evaluated based on the content outlined as follows: (a) Background/Introduction; (b) Research Questions; (c) Objective(s); (d) Materials & methods; (e) Results and discussion; (f) Conclusion; (g) Limitations and future scope of work.
- **Thesis (50 marks):** Assessed on research quality, analysis, and presentation.

Grading criteria:

- The students scoring less than or equal to 40% (or ≤ 40%) overall marks in the evaluation would be considered unsuccessful and would be graded F (fail).
- Grading of the Major Project will be done following the absolute grading system as per the grade classification presented in Table 1:

Table 1. Major project part – grading

Marks Range (%)	Grade
> 90	A+
> 80 ≤ 90	A
> 70 ≤ 80	B+
> 60 ≤ 70	B
> 50 ≤ 60	C+
> 45 ≤ 50	C
> 40 ≤ 45	D
≤ 40	F

Research Ethics Adherence (Plagiarism):

TERI SAS has zero tolerance for plagiarism. As per UGC (Regd. no. D. L.-33004/99) dissertation/thesis or any other such documents should be free from plagiarism at the time of submission by the student. Plagiarism test shall be conducted on the draft submission of the report. The plagiarism report will be shared with the students and would be assigned to external/internal supervisors to address the plagiarism concerns. The plagiarism report and its percentage would be evaluated with a plagiarism check tool (software) and then verified by a faculty committee within the Department and would be analysed in terms of similarity sections/texts (e.g., mathematical formulations/ derivations, footnotes, etc.) in case the similarity proportion exceeds the standard limit prescribed by the University. Based on the finalized plagiarism percentage (of similarity) the marks would be deducted as given in Table 2. It would be responsibility of the student to resolve the plagiarism issue in consultation with external/internal supervisor and the thesis would deem to be fit for submission upon written consent of external/internal supervisors to Major Project Coordinator.

Table 2. Penalty imposed on the student based on plagiarism as per UGC guidelines.

Level of Plagiarism	Similarity Proportion (%)	Maximum percentage marks to be deducted from the full marks
Level 3	> 60%	Student's registration to the Programme stands cancelled
Level 2	> 40% ≤ 60%	Student repeats the Major Project next year
Level 1	> 10% ≤ 40%	The student is required to resubmit the revised Thesis within a week
Level 0	≤ 10%	No deduction of marks

Learning Outcomes:

Upon completion of this course, students would be able to:

- enhance their practical skills to delineate policy dimensions across the domains.
- augment their understanding to develop relevant policy research questions through scoping of literature and other evidence.

Pedagogical approach:

As required by the Thesis topic identified by the Student and agreed by the Supervisor.

Suggested readings:

It is a practical exercise using the knowledge gained from other taught courses and through the review process.

Relevant literature, reports, textbooks, case studies, journals, databases will be suggested to the students based on the context and requirements.

Additional Information:

1. A separate Major Project Guideline indicating timeline of different activities, and other details will be shared by the Coordinator before the start of the semester.
2. Only students meeting the CGPA criteria of 6, for second semester, as defined in Students Handbook will be allowed to take up Major Project course, failing which under no circumstance's student would be allowed to carry out Major Project. It can only be allowed in exceptional circumstances duly approved by the competent authority, where the student must have secured SGPA of 6 in the second semester.
3. Students, who need to repeat the Major Project due to exceptional circumstances, will be allowed to complete the Major Project with the appropriate approval from the competent authority only in the semester designated for the Major Project Thesis. Students should ensure that the work conducted while repeating the Major Project is not just an extension of the research from the previous Major Project, but it includes substantial contribution utilizing the allotted time period.

Supervisor:

A faculty member from TERI School of Advanced Studies (TERI SAS) or TERI will be assigned to each student who will supervise the student's major project work. Students should develop a plan of work under the guidance of the faculty Supervisor and carry out the project work at the host organisation/or at place of work in case of employed candidate. The student should identify the Supervisor from TERI SAS and discuss the proposed work with him/her. The name of the supervisor should be communicated to the Major Project Coordinator. The preference for a Supervisor should be purely based on area of the work during the Major Project. The identification of the Supervisor should be done well before the finalization of the exact topic and the thesis proposal submission to the Programme.

Student responsibilities:

- Adhering to the issued instructions and guidelines of the Major Project in entirety.
- Regular updating of the progress of work to the Mentor/Supervisor.
- Timely submission of all required documents through portal.

Course Outline prepared by: Dr. Chandan Kumar

Course Reviewers

1. Dr. Sunil Pandey, Director, Circular Economy and Waste Management, The Energy and Resources Institute (TERI), New Delhi, India.
2. Dr. Prashanth N. Srinivas, Director & Health Equity Cluster Lead, Institute of Public Health, Bengaluru, India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting held on ……at TERI School of Advanced Studies, New Delhi.

Course title: Major Project-II			
Course code: PPS XXX	**No. of credits:** 20	**L-T-P**: 00-00-600	**Learning hours:** 300
Pre-requisite course code and title (if any): Major Project - I			
Department: Department of Policy & Management Studies			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course Type: Core		**Course offered in:** 4th Semester	

Course Description

This practical course is the second internship activity followed by the first one carried out in the 3rd semester. This will also provide a semester-long practical learning exposure to the student. Students will be given the opportunity to continue the Major Project-II course after an evaluation at the end of the third semester. However, the research questions addressed in the 'Major Project - II' course should be considerably different from the previous project work. In case of other circumstances, such as unsatisfactory outcome or exposure at the previous organization, students will be advised to switch to other organizations to carry out their second Major Project work. The entire process and activities will be the same as practiced in the case of Major Project-I course in the previous semester. The student is expected to get acclimatized with the working environment in case the new organization joined for an initial few weeks while simultaneously exploring the suitable topic for carrying out policy-oriented research under the mentorship of an external supervisor from the host organization and an assigned supervisor from the TERI SAS. A Major Project Thesis is to be submitted to the Programme and the Department at the end of the fourth semester. Students are expected to strictly follow the timelines as per the Major Project Guideline provided by the Major Project Coordinator in the beginning of the fourth semester.

Course objectives

- To provide students with a platform to gain hands-on experience in a professional setting relevant to the student's area of study/research interest.
- To equip students with proven research skills through the completion of a thesis project.
- To assist students to foster critical thinking, analytical skills, and professional development.
- To orient students to integrate practical experience with academic knowledge.

Course content

Module	Topic	L	T	P
1.	**Internship Preparation (Weeks 1-2)** • Week 1: Orientation and Skill Assessment o Introduction to the course structure and expectations. o Workshops on resume writing, interview preparation, and professional etiquette. o Assessment of student skills and interests to align with potential internship opportunities. • Week 2: Placement and Agreement o Assistance in securing internships with relevant organizations. o Completion of internship agreements and clarification of roles and expectations.	2	0	60
2.	**Internship Experience (Weeks 3-19)** • Practical Internship Work	0	0	536

	○ Internship Commitment: Students will engage in a minimum of 30 hours per week at their designated internship organization, applying their skills and gaining industry/organizational experience. ○ Weekly Reflection and Monthly Reporting: Students will maintain a weekly journal/diary, documenting their experiences and reflections, which they will compile in Monthly Progress Reports to be submitted through TERI SAS Major Project Portal to their faculty advisors. ○ Mid-Internship Review (Week 9): Students will be asked to share a review of the internship experience with their faculty advisors, discussing challenges, learnings, and research interests related to internship work.			
3.	**Thesis Development (Weeks 5-20)** • Week 5: Thesis Proposal Development ○ Meeting and discussion with Faculty Advisor for finalising research questions and relevant research methodologies ○ Preparation and submission of a thesis proposal outlining research questions and objectives. • Weeks 6-20: Thesis Research and Writing ○ Data Collection and Analysis: Students will conduct research as outlined in the approved thesis proposal, which includes collecting and analyzing data relevant to their thesis topic. ○ Regular Meetings with Faculty Advisor: Bi-weekly meetings to discuss progress, seek guidance, and receive feedback on thesis work.	0	0	
4.	**Thesis Presentation and Submission (Weeks 19-20)** • Week 19: Thesis Presentation and Reflection ○ Students will present their research findings to a panel of faculty members, followed by a question-and-answer session to defend their work, and getting feedback. ○ Students will reflect on the overall experience in both the internship and thesis process, discussing key learnings and how they will apply these insights to their future career. • Week 20: Thesis Submission ○ Finalize and submit the complete thesis document after incorporating the feedback received during the presentation and adhering to institutional formatting and submission guidelines.	0	0	
	TOTAL	**2**	**0**	**596**

Evaluation criteria:

An evaluation committee will be formed to assess the major project. The distribution of marks for the evaluation would be as per the following criteria:

- **Timeline adherence (10 marks):** Thesis Proposal (2), four progress reports (1 each), final dissertation/thesis (4).

- **Research Proposal (10 marks):** Graded based on clarity, relevance, and methodological rigor.
- **Presentation and viva (30 marks):** The presentation will be evaluated based on the content outlined as follows: (a) Background/Introduction; (b) Research Questions; (c) Objective(s); (d) Materials & methods; (e) Results and discussion; (f) Conclusion; (g) Limitations and future scope of work.
- **Thesis (50 marks):** Assessed on research quality, analysis, and presentation.

Grading criteria:

- The students scoring less than or equal to 40% (or ≤ 40%) overall marks in the evaluation would be considered unsuccessful and would be graded F (fail).
- Grading of the Major Project will be done following the absolute grading system as per the grade classification presented in Table 1:

Table 1. Major project part – grading

Marks Range (%)	Grade
> 90	A+
> 80 ≤ 90	A
> 70 ≤ 80	B+
> 60 ≤ 70	B
> 50 ≤ 60	C+
> 45 ≤ 50	C
> 40 ≤ 45	D
≤ 40	F

Research Ethics Adherence (Plagiarism):

TERI SAS has zero tolerance for plagiarism. As per UGC (Regd. no. D. L.-33004/99) dissertation/thesis or any other such documents should be free from plagiarism at the time of submission by the student. Plagiarism test shall be conducted on the draft submission of the report. The plagiarism report will be shared with the students and would be assigned to external/internal supervisors to address the plagiarism concerns. The plagiarism report and its percentage would be evaluated with a plagiarism check tool (software) and then verified by a faculty committee within the Department and would be analysed in terms of similarity sections/texts (e.g., mathematical formulations/ derivations, footnotes, etc.) in case the similarity proportion exceeds the standard limit prescribed by the University. Based on the finalized plagiarism percentage (of similarity) the marks would be deducted as given in Table 2. It would be responsibility of the student to resolve the plagiarism issue in consultation with external/internal supervisor and the thesis would deem to be fit for submission upon written consent of external/internal supervisors to Major Project Coordinator.

Table 2. Penalty imposed on the student based on plagiarism as per UGC guidelines.

Level of Plagiarism	Similarity Proportion (%)	Maximum percentage marks to be deducted from the full marks
Level 3	> 60%	Student's registration to the Programme stands cancelled
Level 2	> 40% ≤ 60%	Student repeats the Major Project next year
Level 1	> 10% ≤ 40%	The student is required to resubmit the revised Thesis within a week
Level 0	≤ 10%	No deduction of marks

Learning Outcomes:

Upon completion of this course, students would be able to:

- enhance their practical skills to delineate policy dimensions across the domains.
- augment their understanding to develop relevant policy research questions through scoping of literature and other evidence.

Pedagogical approach:

As required by the Thesis topic identified by the Student and agreed by the Supervisor.

Suggested readings:

It is a practical exercise using the knowledge gained from other taught courses and through the review process.

Relevant literature, reports, textbooks, case studies, journals, databases will be suggested to the students based on the context and requirements.

Additional Information:

1. A separate Major Project Guideline indicating timeline of different activities, and other details will be shared by the Coordinator before the start of the semester.
2. Only students meeting the CGPA criteria of 6, for second semester, as defined in Students Handbook will be allowed to take up Major Project course, failing which under no circumstance's student would be allowed to carry out Major Project. It can only be allowed in exceptional circumstances duly approved by the competent authority, where the student must have secured SGPA of 6 in the second semester.
3. Students who need to repeat the Major Project due to exceptional circumstances, will be allowed to complete the Major Project with the appropriate approval from the competent authority only in the semester designated for the Major Project Thesis. Students should ensure that the work conducted while repeating the Major Project is not just an extension of the research from the previous Major Project, but it includes substantial contribution utilizing the allotted time period.

Supervisor:

A faculty member from TERI School of Advanced Studies (TERI SAS) or TERI will be assigned to each student who will supervise the student's major project work. Students should develop a plan of work under the guidance of the faculty Supervisor and carry out the project work at the host organisation/or at place of work in case of employed candidate. The student should identify the Supervisor from TERI SAS and discuss the proposed work with him/her. The name of the supervisor should be communicated to the Major Project Coordinator. The preference for a Supervisor should be purely based on area of the work during the Major Project. The identification of the Supervisor should be done well before the finalization of the exact topic and the thesis proposal submission to the Programme.

Student responsibilities:

- Adhering to the issued instructions and guidelines of the Major Project in entirety.
- Regular updating of the progress of work to the Mentor/Supervisor.
- Timely submission of all required documents through portal.

Course Outline prepared by: Dr. Chandan Kumar

Course Reviewers

1. Dr. Sunil Pandey, Director, Circular Economy and Waste Management, The Energy and Resources Institute (TERI), New Delhi, India.
2. Dr. Prashanth N. Srinivas, Director & Health Equity Cluster Lead, Institute of Public Health, Bengaluru, India.

Additional Information

This Course outline was approved in the …… Academic Council Meeting held on ……at TERI School of Advanced Studies, New Delhi.

Enclosure 15

REVISED PROGRAMME STRUCTURE OF MA-PPSD PROGRAMME

Code	Revised Programme Outline	
	Semester I	**Credit**
PPS 112	Public Policy: A Concise Exposure	3
PPS 114	Social Policies & Sustainable Development	3
PPS 176	Public Administration and Systems Management	3
PPS 115	Research Methods for Public Policy	3
PPS 116	Globalization and Changing Geopolitics: Implications for Economic & Foreign Policies	2
PPS 117	Sustainable Consumption and Production: Policies & Practices	2
PPS 118	Economics for Public Policy	2
PPS 119	International Collaborative Studio on Public Policy	1
PPS 130	Policy Lab - I: Sectoral Policy Scoping	1
	Total Credits (Semester I)	**20**
	Semester II	
PPS XXX	Sustainable Urbanization	2
PPS XXX	Water and Sustainable Development: Policies & Management	2
PPS XXX	Energy and Sustainable Development	2
PPS XXX	Digital Economy: Dividends, Disputes & Dimensions	2
PPS XXX	Infrastructure Development and Sustainability: Issues & Policy Perspectives	2
PPS XXX	Industrial Development and Sustainability: Policies, Performance, & Practices	2
PPS XXX	Climate Change and Development: Policies & Practices	2
PPS XXX	Public Policy Assessment: Methods & Measurements	2
PPS XXX	Policy Lab - II: Developing a Policy Paper	3

	Electives [Select courses from the following list to earn 2 credits]	2
	MPL 165: Competition Law and Policy	2
	MPL 134: Climate Change and Law	2
	MPL 144: Contracts Law and Management	2
	MPL 166: Urban Infrastructure Laws and Management	2
	MPL 158: Forest Law and Policy	2
	PPS 195: Communities and Conservation	2
	PPS 197: Agriculture and Rural Development	2
	Total Credits (Semester II)	**21**
	Semester III	
PPS XXX	Major Project - I	20
	Semester IV	
PPS XXX	Major Project - II	20
	Total Credits (MA - PPSD)	**81**

Rules for PhD Programme[23]

Preamble

TERI School of Advanced Studies (TERI SAS) provides a refreshing environment to achieve academic excellence. The Deemed to be University offers Ph.D. programs in a wide range of globally relevant areas of study like Natural resources management, Energy and environment, Economics, Policy studies, Management, Biotechnology, Data Science. and Social sciences etc.

Scope

This policy will be called "TERI School of Advanced Studies Ph.D. Rules-2024" and shall be applicable to Ph.D. students and Ph.D. supervisors of the deemed to be university.

A. Eligibility criteria for admission to Ph.D. programme:

1. The following are eligible to seek admission to the Ph.D. programme:

1.1. Candidates who have completed:

A 1-year/2-semester master's degree programme after a 4-year/8-semester bachelor's degree programme or a 2-year/4-semester master's degree programme after a 3-year bachelor's degree programme or qualifications declared equivalent to the master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade in a point scale wherever grading system is followed

or equivalent qualification from a foreign educational institution accredited by an assessment and accreditation agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country to assess, accredit or assure quality and standards of the educational institution.

A relaxation of 5% marks or its equivalent grade may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-Abled, Economically Weaker Section (EWS) and other categories of candidates as per the decision of the Commission from time to time.

Provided that a candidate seeking admission after a 4-year/8-semester bachelor's degree programme should have a minimum of 75% marks in aggregate or its equivalent grade on a point scale wherever the grading system is followed. A relaxation of 5% marks or its equivalent grade may be allowed for those belonging to

[23] Students taking admissions in the PhD Programme will have to sign an agreement that s/he will be abided by the rule of PhD programme of TERI SAS.

SC/ST/OBC (non-creamy layer)/Differently-Abled, Economically Weaker Section (EWS) and other categories of candidates as per the decision of the Commission from time to time.

1.2. Candidates who have completed the M.Phil. programme with at least 55% marks in aggregate or its equivalent grade in a point scale wherever grading system is followed or equivalent qualification from a foreign educational institution accredited by an assessment and accreditation agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country to assess, accredit or assure quality and standards of educational institutions, shall be eligible for admission to the Ph.D. programme. A relaxation of 5% marks or its equivalent grade may be allowed for those belonging to SC/ST/OBC (non-creamy layer)/Differently-Abled, Economically Weaker Section (EWS) and other categories of candidates as per the decision of the Commission from time to time.

1.3. Requirements for full-time sponsored candidates

1.3.1. Sponsored candidates are required to submit a sponsorship certificate from their employers on an official letter head clearly stating that for the period of his/her studies under the programme, the candidate would be treated on duty with usual salary and allowances and that he/she will be fully relieved for the full period of the study and admissible fee of the candidate will be paid by the sponsoring organization.

1.3.2. Candidates seeking admissions to Ph.D. programmes on the basis of study leave must present a proof at the time of interview of the fact that they will be/have been granted study leave for a minimum period of three years.

1.4. Requirements for the part-time candidates

1.4.1. Such Candidates are required to submit a "No Objection Certificate" at the time of interview from their employer stating clearly that the candidate is permitted to pursue studies on a part-time basis and that:

1.4.1.1. His/her official duties permit him/her to devote sufficient time for research;

1.4.1.2. The candidate shall be provided full access to the facilities as may exist in the field of research;

1.4.1.3. He/she shall be permitted to attend classes at the Deemed to be University as and when required;

1.4.2. Self-employed candidates need to provide a documentary proof of being in self-employment.

B. Admission:

2. Applications to the Ph.D. programme must be necessarily made on the Deemed to be University prescribed form. Admission details are further laid down in the Annexure I.

2.1. Admission is subject to vacancies as available in the relevant areas of specializations.

2.2. 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.

2.3. Categories of admission:

2.3.1. Full time with assistantship[1] /without assistantship

2.3.2. Full time with UGC/CSIR/DBT/another research scholarship scheme

2.3.3. Sponsored

2.3.4. Part-time

C. Duration of the programme:

1. Ph.D. programme shall be undertaken for a minimum duration of three years, including course work and for a maximum of four years, which can be extendable up to 6 years with every extension constituting for a period of 6 months (maximum of four (4) occasions), . The date of thesis submission shall be considered as the relevant benchmark for assessing the duration of Ph.D. programme. Beyond this, further extensions will be as per the criteria laid down in the 'D' Section below.
2. The women candidates and persons with disability (more than 40% disability) may be allowed a maximum possible relaxation of 2 years in the maximum duration; however, the total period for completion of a Ph.D. programme in such cases should not exceed ten (10) years[2] from the date of admission in the Ph.D. programme.
3. Female Ph.D. Scholars may be provided Maternity Leave/Child Care Leave for up to 240days in the entire duration of the Ph.D. programme

D. Extension criteria:

The maximum time limit for submission of Ph.D. thesis[3] may be extended by the Dean (Academic) based on a specific request by the Supervisor(s) concerned and duly recommended by the Student Research Committee (SRC) through Department Research Committee (DRC)/Centre Research Committee (CRC) as a special case for a period of one (1) year (on a maximum of two (2) occasions), through a process of re-registration. While recommending to the Dean (Academic), the DRC/CRC may consider one or more of the following criteria as accentuating circumstances (based on the actual evidence produced by the candidate):

3.1. Medical exigency.

3.2. Forced break due to an unforeseen employment requirement (in case of part-time candidates only).

3.3. Discontinuity in supervision (due to non-availability of Supervisor).

3.4. Change in focal area of research due to possible emergence of any new/unforeseen challenges in conducting research.

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[1] Subject to availability

[2] The request for relaxation by the candidate should reach the Supervisor prior to completion of 6 years. The Supervisor should forward the request to the Dean (Academic) through Head of the Department/Centre.

E. Conversion of Full time to Part time:

4. Full time candidate may be allowed to convert his/her registration into a Part time on the specific recommendation of the SRC to the Dean (Academic) through Head of the Department/Centre. However, such a change will be allowed only once during the entire course of study.

F. Allocation/Eligibility of Research supervisor[4]:

5. Following are the eligibility criteria to be a research supervisor/co-supervisor:
   5.1. Any regular Professor of the Deemed to be University with at least five (5) research publications in refereed journals and any regular Associate/Assistant Professor of the deemed to be university with a Ph.D. degree and at least two (2) research publications in refereed journals may be recognized as a Research Supervisor.

   5.2. Only a full-time regular faculty member of the Deemed to be University can act as a Supervisor subject to conditions laid down at Para 7.0. 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 the Deemed to be University or from other related institutions with due approval of the SRC.

   5.3. The allocation of Research Supervisor for a selected research scholar shall be decided by the DRC/CRC of the concerned Department/Centre while considering various factors which may include number of existing scholars per Research Supervisor, the available specialization amongst the Supervisors and importantly, the research interests of the scholars as indicated by them in the application form or at the time of interview.

   5.4. A Research Supervisor/Co-supervisor who is a Professor, at any given point of time, cannot guide more than Eight (8) Ph.D. scholars. An Associate Professor as a Research Supervisor can guide up to a maximum of six (6) Ph.D. scholars and an Assistant Professor as Research Supervisor can guide up to a maximum of four (4) Ph.D. scholars.

   5.5. In case of relocation of a Ph.D. woman scholar due to marriage or otherwise, the research data shall be allowed to be transferred[24] to the Deemed to be University to which the scholar intends to relocate provided all the other conditions in these regulations are followed in letter and spirit and the research work does not pertain to the project secured by the TERI SAS/faculty member from any funding agency. The scholar will however give due credit to the supervisor and TERI SAS for the part of research already done.

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[3] **Over and above to the duration mentioned in the section C.3**

[4] **Adapted from Section 6 of UGC gazette notification F. no. 14-4/2016(PS) dated 5 May 2016**

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[5] In accordance with Institutional Intellectual Property Rights policy of TERI SAS

6. Re-allocation of Research Supervisor.

6.1. (a) In case a Research Supervisor leaves or retires TERI SAS before the student clears 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 defence.

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 may be given preference for appointment as a new Supervisor.

(b) If the Supervisor leaves after the successful completion of the requirements of 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 Deemed to be University already exists, then S/he shall act as the officiating Supervisor to facilitate thesis submission.

In absence of a Co Supervisor from Deemed to be University, 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.

6.2. 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.

6.3. 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 Deemed to be University for its specific views and recommendations.

7. Admission of International students in Ph.D. programme:
   7.1. Each supervisor can guide up to two international research scholars on a supernumerary basis over and above the permitted number of Ph.D. scholars as specified in clause 5.4 above.

G. Ph.D. coursework requirements[6]:

8. The Ph.D. coursework shall be treated as a pre-requisite for Ph.D.

   8.1. In order to overcome any deficiency in the domain of fundamental training for advanced work, several courses are offered across disciplines taught at the Deemed to be University.

   8.2. The credit assigned to the Ph.D. course work shall be a minimum of 12 credits. The Student Research Committee can also recommend UGC recognized online courses as part of the credit requirements for the Ph.D. programme

   8.3. The course requirement will be prescribed by the DRC/CRC on the recommendations of the SRC. In order to fulfil the coursework requirement, a student will be required to take the following few courses:

      8.3.1. Research Methodology (Mandatory) – 3 credits
      8.3.2. Research and Publication Ethics – 2 credits (Credit)
      8.3.3. Quantitative methods – (Minimum 2 credits is required)[7]
      8.3.4. Other advanced level courses may be prescribed by SRC after considering the student's background in relation to the proposed topic of research[25]

   8.4. After completion of the prescribed coursework, including the Research Methodology and quantitative method, a combined assessment of fulfilment of the requisite credit earned and grades thereof will be carried out and finalized by the SRC. The final grades shall be communicated to Registrar of the Deemed to be University.

   8.5. A Ph.D. scholar must obtain a minimum of 65% marks or its equivalent grade in the UGC 10-point scale in the course work to be eligible to continue in the programme and submit his or her thesis.

   8.6. The Ph.D. course work must be completed within the first two semesters of joining the programme.

Note - There are no exemptions to the above provisions

[25] A list of courses will be prepared by the Department as PhD courses.

[6] Adapted from section 7 of UGC gazette notification F.no. 14-4/2016(PS) dated 5 May 2016

H. Research proposal defence:

9. A student will be permitted to appear for defending the research proposal only after he/she has completed the Ph.D. course work as decided by the SRC and defined in G.7.

   9.1. As a part of the research proposal defence, a draft research proposal must be prepared by the student in consultation with the Supervisor(s). The Supervisor will circulate the draft proposal to a panel comprising of the SRC members and other invited members, if any, and schedule the research proposal defence activity after keeping a gap of at least 10 days for their review.

   9.2. The panel may recommend/not recommend the proposal. And, in case of non-recommendation, student will be asked to repeat the research proposal defence.

   9.3. After the satisfactory defence, the student will submit his/her final research proposal and related documents to the DRC/CRC with due approval from the Supervisor. The final research proposal must be submitted to the DRC/CRC within a period of 24 months from the date of registration in the Ph.D. programme[8] and not later than that under any circumstances

10. The student's evaluation will be based on an oral presentation and the accompanying draft research proposal that should broadly include its proposed title, introduction and literature review, rationale for research (through identification of gaps etc.), research question(s)/hypotheses, objectives, /proposed methodology, expected outcomes and proposed timeline. The presentation should also list the Ph.D. courses completed, grades obtained, and any other research-related activities undertaken by the student

11. Changes in the Research Proposal approved in the research proposal defence:
    11.1. If, any major changes are suggested in the research proposal due to exceptional circumstances, as assessed by the SRC, including, but not limited to the topic, objectives and methodology, the SRC may recommend submission of a revised research proposal to be followed up by a fresh research proposal defence and same should be communicated to the DRC/CRC.

I. Attendance requirements for Ph D students:

12. The attendance requirement for Ph.D. students shall be as follows:
    12.1. A Ph.D. student, whether full-time or part-time, is expected to attend all the classes in each course, in which he/she is registered. In case his/her attendance is less than 75%, he/she will be debarred from the test/examination for the course and will be awarded an Ab Grade.

    12.2. A research scholar, after having completed the course work, must attend to his/her research work on all the working days and mark attendance except when s/he is on leave or any official work as approved by the Supervisor.

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[7] The acceptable list of quantitative methods courses under this category will be prepared by the respective Departments/Centres

[8] To avoid unnecessary delay a pre-proposal defence may be held at least 6 months prior to the deadline

J. Grant of leave to Ph.D. students:

13. The leave regulations for Ph.D. students shall be as follows:

13.1. During the course work, a full-time Ph.D. student, during his/her stay at the Deemed to be University will be entitled to a leave for 30 days, including leave on medical grounds, per academic year. However, the leave will be granted subject to the approval of Supervisor.

13.2. After completing the course work a full-time Ph.D. student during his/her stay at the Deemed to be University, will be entitled to leave for 30 days per academic year. In addition, a Ph.D. scholar who has completed his/her course work may be granted leave on medical grounds up to 10 days per academic year.

13.3. The female Ph.D. scholars are entitled to maternity leave/childcare leave and male Ph.D. scholar to paternity leave once in the entire duration of the Ph.D. programme for up to 240 days and 15 days, respectively.

K. Research committees and their functions:

14. Student Research Committee (SRC)[9]:

14.1. A Student Research Committee (SRC) shall be formed for each Ph.D. student with Supervisor as convenor.

14.2. Students Research Committee (SRC) Composition

14.2.1. Supervisor – Convenor and Co- Supervisor, if any

14.2.2. At least two faculty members from the Deemed to be University, with at least one from the Department

14.2.3. The convenor may co-opt any other external expert as an SRC member or Co-Supervisor

14.3. Following are the main roles and responsibilities of SRC:

14.3.1. To review the research proposal and finalize the topic of research under consideration;

14.3.2. To advise the research scholar to develop the study design and methodology of research and identify the course(s) that he/she may have to undertake;

14.3.3. To periodically review and assist in the progress of the research work of a research scholar;

14.3.4. To advise and monitor the progress of the doctoral scholar periodically

14.4. Ph.D. scholar shall appear before the SRC at least once in each semester so as to make a presentation of the progress of his/her work for evaluation and further guidance. The semester progress report shall be submitted by the SRC to the Dean (Academic) through DRC/CRC.

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[9] The role and function of SRC is equivalent to the Research Advisory Committee as laid out in section 8 of UGC gazette notification F.No.14-4/2016(PS) dated 5 May 2016

14.5. An 'X' grade will be awarded along with the comments received for that semester if the progress is 'satisfactory'. In case the progress of the research scholar is unsatisfactory ('U'), the SRC shall record the underlying reasons for the same and suggest corrective measures. If, the research scholar fails to implement these corrective measures, the SRC may recommend a 'U' grade along with comments. When a 'U' grade is awarded for the first time, a warning will be issued to the student. If, his/her performance does not improve even after the warning, on receiving a total of three 'U' grades or two consecutive 'U' grades, the student will be de-registered from the Ph.D. programme. On receiving a total of three 'U' grades or two consecutive 'U' grades, the student will be deregistered from the Ph.D. programme.

14.6. An Absent "ab" grade to be awarded on proper medical exigencies or medical ground supported by evidence

14.7. The progress of Ph.D. research work will be discussed in the DRC/ CRC as per the semester schedule.

14.8. The above process will continue until thesis submission.

14.9. In the event of the supervisor being unavailable for supervision, the SRC will recommend to the DRC/CRC another faculty member nomination as per the provisions given in F.6.1 and F.6.2.

15. Department/Centre Research Committee (DRC/CRC):

15.1. Department/Centre Research Committees are to be formed by each Department/Centre with the following composition and functions:

15.2. Composition

15.2.1. Head of Department/Centre – Chairperson

15.2.2. Faculty members of the Department/Centre supervising Ph.D. scholars

15.2.3. Secretary – To be nominated by Chairperson

15.3. Roles and responsibilities

15.3.1. The academic programme of all the Ph.D. students in a Department/Centre will be coordinated by the DRC/CRC as per the rules and regulations of the Deemed to be University upon recommendation of the SRC.

15.3.2. Prepare and periodically review the research plans of the Department/Centre, such that these align with the overall vision of the Deemed to be University.

15.3.3. Discuss and periodically review the research plans and objectives of each faculty member in the Department/Centre, such that they align with the overall vision of the Department/Centre/Deemed to be University.

15.3.4. Ensure/monitor functioning of SRC.

L. Evaluation and Assessment Methods, minimum standards/credits for award of the degree, etc.:

16. The procedure with respect to the above shall be as follows:

16.1. The Ph.D. scholar may submit his/her thesis at any time provided that s/he has completed the minimum period of registration and S/he has completed the course

work requirement as prescribed by the DRC/CRC on the recommendations of the SRC with a CGPA not below 6.5 and has also successfully defended his/her research proposal.

16.2. Prior to the thesis submission, the scholar shall make a presentation in the Department before the SRC, which shall also be open to all the faculty members and other research scholars of the Deemed to be University. Relevant feedback and comments obtained from them may be suitably incorporated into the draft thesis in due consultation with SRC. The minutes and the action taken report (ATR) shall be submitted to the Dean (Academic) within six months of time from the presentation.

16.3. In addition to the thesis the scholar is required to submit a synopsis document, duly approved by SRC. The synopsis document summarises the thesis, which essentially introduces the potential examiner(s) to the objectives, methodology, major findings along with an outlined structure of the thesis.

16.4. Ph.D. scholars must have a published record or a proof of acceptance for publication of at least one (1) research paper in Scopus indexed/SCI/AHCI/SSCI journals, which is a related to their Ph.D research (review paper will not be counted for this purpose) and having made two paper/poster presentations in conferences/seminars OR two (2) research papers in Scopus indexed/SCI/AHCI/SSCI journals which are related to their Ph.D. research (review paper will not be counted for this purpose) before submission of the thesis for adjudication, and produce evidence for the same in the form of presentation certificates and/or reprints.

16.5. The thesis will be scrutinized for plagiarism if any using appropriate scientific software for detection of similarity. While submitting for evaluation, the thesis shall have an undertaking from the research scholar regarding the originality of the work presented, vouching that there is no plagiarism[10] and that the work has not been submitted for the award of any other degree/diploma of the TERI SAS where the work was carried out, or to any other Institution.

16.6. The thesis shall be written in English in the specified format and shall contain a critical account of the student's research. It should be characterized by discovery of facts or a fresh approach towards the interpretation of facts and theories or a significant contribution to the knowledge of design or development, or a combination of them. It should bear evidence of the student's capacity for analysis and judgment, and his/her ability to carry out independent investigation, design, or development. No part of the thesis, or supplementary published work, shall have been submitted for the award of any other degree. Three copies of thesis in a soft cover shall have to be submitted by scholar in a prescribed format. In case of joint supervision, additional copies of the thesis are required to be submitted. Additionally, a soft copy of the thesis shall be submitted.

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[10] Excluding part of the own Ph.D. work published in journals or conference proceedings

16.7. The Ph.D. thesis submitted by the scholar shall be evaluated by an approved Board of Examiners. The supervisor(s) shall provide a list of at least eight potential examiners of international repute (at least four from India), who are not in employment of TERI SAS to the Dean (Academic). If required, Dean (Academic) may request for additional information about the potential examiners or an additional list of the potential examiners, to be forwarded to the Chairperson, Academic Council.

16.8. Subsequently, the Chairperson, Academic Council, will appoint a Board of Examiners for each student. The Board will consist of his or her research supervisor(s) (internal examiners) and at least two external examiners of whom one examiner may be from outside the country.

16.9. Each examiner will submit a detailed assessment report, preferably within two months but not exceeding three months, recommending to the Chairperson, Academic Council, one of the following courses of action:

16.9.1. That the thesis is deemed satisfactory and that the student may defend his/her thesis orally before a committee constituted for the purpose and any members of the faculty and research students who wish to be present.

16.9.2. That the student may submit a revised thesis.

16.9.2.1. In normal circumstances, s/he may submit the revised thesis within a period of one year from the date of communication in this regard from the Chairperson, Academic Council.

16.9.2.2. However, in exceptional circumstances, this period may be extended by the Chairperson, Academic Council by another one year; the total revision time, irrespective of the number of revisions allowed, will not exceed a period of two years.

16.9.3. The thesis may be out rightly rejected due to specific reasons as given in the detailed report.

16.10. In the event of any disagreement arising between the external examiners, the Chairperson, Academic Council, may, as a special case, appoint yet another external examiner, if, the merit of the case so demands. The examiner thus appointed will report independently to the Chairperson, Academic Council.

16.11. The oral defence of the thesis shall be conducted by an Oral Defence Committee consisting of the internal examiner(s) and at least one external examiner. If, for some reasons, neither of the external examiners is not available for the conduct of the oral defence, an alternative external examiner shall be appointed by the Chairperson, Academic Council. Chairperson, DRC/CRC (or his/her nominee) shall be the non-member convenor of the Oral Defence Committee.

16.12. On completion of all stages of the examination, the Convenor, Oral Defence Committee shall recommend to the Chairperson, Academic Council, along with a

report of the Oral Defence Committee duly signed by all its members, one of the following courses of action.

16.12.1. That the degree be awarded.

16.12.2. That the student should be examined further on another occasion in a manner that they shall prescribe.

16.12.3. That the degree shall not be awarded.

16.13. In case of (L.16.12.2), the Oral Defence Committee shall also provide the student a list of all the desired corrections and modifications, if any, suggested by the examiners.

16.14. The degree shall be awarded upon approval by the Board of Management, provided that:

16.14.1. The Oral Defence Committee, so recommends;

16.14.2. The student produces a 'no dues certificate' from all those concerned in the prescribed form and gets it forwarded by the supervisor; and

16.14.3. The student has submitted three hard-bound copies of the thesis, after incorporating all necessary corrections and modifications in the version submitted earlier and duly certified by the Supervisor(s), after the viva voce examination (one of the copies is to be kept at TERI SAS library.)

16.15. Candidates will be awarded Ph.D. degree with the title of thesis irrespective of the discipline or department of graduation.

16.16. Prior to the actual award of the degree, a provisional Certificate shall be issued by deemed to be university upon successful completion of L.16.14.1-L.16.14.3.

M. Award of Ph.D. degrees prior to notification of these regulations, or degrees awarded by foreign Universities:

17. These regulations are applicable for the all those students registered after notification of this regulation. Award of degrees to the candidates registered for the Ph.D. programme on or before the date of notification of these regulations, shall be governed by the earlier regulations under which initial admission has been granted.

N. Depository with INFLIBNET:

18. As mandated by UGC, the following norms shall be followed:

18.1. Following the successful completion of the evaluation process and before the announcement of the award of the Ph.D. degree, the Librarian, TERI SAS shall submit an electronic copy of the Ph.D. thesis to the INFLIBNET, for hosting the same so as to make it accessible to all the enlisted Universities/Institutions/Colleges.

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Annexure I

1. Admission will be made on the basis of a written test/National Eligibility Test (NET) score followed by an interview (as appropriate) conducted by the Deemed to be University. Candidates may however apply at any time throughout the year. Nonetheless, the applications are normally processed in two cycles for semesters commencing in July and January months each year.
2. 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 at any point given the admissions are open. For such candidates their merit score will be based on 100% weightage assigned to interview marks.

3. For the NET scored candidates, they are eligible for PhD admission in three categories.

Qualified for	**Eligible for**	
	JRF	PhD Admission
Category I (Award of JRF)	Yes	Yes
Category II (Admission to PhD)	No	Yes
Category III (Admission to PhD only)	No	Yes

a. While category I details have been spelt out above, students who qualify in Categories 2 and 3, 70% weightage will be given for test scores, 30% weightage for the interview for admission to Ph.D. program. The Ph.D. admission will be based on the combined merit of NET marks and the marks obtained in the Interview.
b. The marks obtained in the NET by the candidates in Category 2 and 3 will be valid for a period of one year for admission to Ph.D. Programs.
c. The Deemed to be University may hold entrance examination for those Ph.D. programs where NET examination in the concerned subjects/disciplines are not conducted by UGC.
d. Entrance examination for applicants who have not cleared NET in Category 1,2 and 3 but still would like to pursue the PhD program in any of the discipline (including disciplines covered under NET) could be conducted by the Deemed to be University. This will be followed by regular interview.
e. For Category 2 & 3, a minimum cut off to be set in the NET score for interview at Department level.
f. Number of seats be defined for admission in Ph.D. programmes for NET qualified candidates and non-NET qualified candidates at Department level.

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Enclosure 17

Eligibility criteria of the programmes offered at TERI SAS

M.Sc. (Biotechnology)
A Bachelor's degree in Sciences/Engineering/Technology or B. Voc. in Agriculture, Food processing and technology, Industrial Microbiology, Sericulture, Livestock production and management, Industrial aquaculture and fisheries, Greenhouse management

MSc (CSP)
A Bachelor's degree in Science/Engineering/B. Arch/Mathematics/Statistics/Data Science/ Geology/Geography/Economics/Energy/Commerce/Management/Computer or B.Voc. in relevant stream.

M.Sc. (Energy Studies and Management)
A Bachelor's degree in Science/Engineering/Energy/Economics/Mathematics/Statistics/ Geology/Geography/Commerce/Management/Computer or B.Voc in relevant stream with a minimum cumulative grade point average of 6.2 on a 10 point scale or equivalent or 55% marks in aggregate.

M.Tech (Renewable Energy Engineering and Management)
B.Tech/B.E (any branch) or B.Arch or M.Sc. (any discipline) or M.Voc. (Renewable Energy / Smart Power System / Refrigeration and Air-Conditioning) with a minimum cumulative grade point average of 6.2 on a 10 point scale or equivalent or 55% marks in aggregate.
GATE score accepted.

PG Diploma in Renewable Energy Management (PGDREM)
A Bachelor's degree in Science/Engineering/Energy/Economics/Mathematics/Statistics/ Geology/Geography/Commerce/Management/Computer or B.Voc in relevant stream with a minimum cumulative grade point average of 6.2 on a 10 point scale or equivalent or 55% marks in aggregate.

MSc (Geoinformatics)
A Bachelor's degree in Science/Engineering/B. Arch/ Economics/Mathematics/ Statistics/Geology/Geography/Bvoc in Data Science & Analytics.

M.Sc. ESRM (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.

The admission process will be based on the aggregate marks obtained in the qualifying degree, followed by interaction/counseling.

Four-year UG (FYUP) Programme in Environmental Studies (B.Sc. Honours/ Honours with Research)

A Senior Secondary School Examination (10+2) certificate in any discipline or equivalent, from a recognized Board of Education with at least 50% marks in aggregate. The admission process will be based on the aggregate marks obtained in the qualifying degree, followed by interaction/counselling CUETUG accepted

Five-year Integrated PG (FYIPP) Programme in Environmental Studies (M.Sc.)
A Senior Secondary School Examination (10+2) certificate in any discipline or equivalent, from a recognized Board of Education with at least 50% marks in aggregate. The admission process will be based on the aggregate marks obtained in the qualifying degree, followed by interaction/counselling. CUETUG accepted

Four-year UG (FYUP) Programme in Data Science (B.Sc. Honours/ Honours with Research)
A Senior Secondary School Examination (10+2) certificate in any discipline or equivalent, from a recognized Board of Education with at least 50% marks in aggregate. The admission process will be based on the aggregate marks obtained in the qualifying degree admission process will be based on the aggregate marks obtained in the qualifying degree, followed by interaction/counselling. CUETUG accepted

Five-year Integrated PG (FYIPP) Programme in Data Science (M.Sc.)
A Senior Secondary School Examination (10+2) certificate in any discipline or equivalent, from a recognized Board of Education with at least 50% marks in aggregate. The admission process will be based on the aggregate marks obtained in the qualifying degree, followed by interaction/counselling CUETUG accepted

MSc-Economics
B.A. (Hons.) / B.Sc. (Hons.) in Economics with 50% or more marks in aggregate (CGPA of 5.65).
OR
Bachelor’s 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 course.

MBA (SM)
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 with more than 2 years of relevant work experience may be exempted from requirement above depending on the discretion of the selection committee.

MA-SDP
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.

MA-PPSD
Applicants should hold a bachelor’s degree from an accredited Institution/University. Degrees in fields such as Economics, Political Science, Public Administration, Environmental Studies,

any branch of Social Sciences, or related disciplines are often preferred but not strictly necessary.
Candidates with prior professional experience in working with any research organization, Public Policy firm, Think Tanks, Govt. Departments/Ministry, Member of Parliament, Member of Legislative Assembly, Non-Govt. Organization, International Organizations, or in related fields may be given preference.
Experience through internships, volunteer programs, or fellowships in relevant sectors can also be considered valuable.

LLM
A candidate having an LL.B. (3/5 Years) / B.L. Degree from a recognised University / Institution.
Selection will be based on CLAT PG/ CUET PG Score or Personal Interaction.

BSc-Economics Programme
Senior Secondary School Leaving Certificate or Higher Secondary (12th Grade) Certificate obtained after successful completion of Grade 12 or equivalent from any discipline with Mathematics or Applied Mathematics in Grade 12.
Applicants without a background in Mathematics/Applied Mathematics in Grade 12 may be considered eligible on successfully completing a Senior Secondary (equivalent to the 10+2 level) Mathematics course(s) at the National Institute of Open Schooling (NIOS)
There is no upper age bar.

BBA
Senior Secondary School Leaving Certificate or Higher Secondary (12th Grade) Certificate obtained after successful completion of Grade 12 or equivalent from any discipline.
There is no upper age bar.