10, Institutional Area, Vasant Kunj,
New Delhi 110070

**MINUTES OF THE 49th MEETING OF ACADEMIC COUNCIL HELD ON 17th JULY 2021 AT 10:30 A.M.**

The 49th meeting of Academic Council was held on 17th July 2021 at 10:30 hours on Microsoft Team Platform.

The following were present:

Members

Professor Eklabya Sharma, Chairperson
Professor Manipadma Datta
Professor T C Kandpal
Professor Vivek Suneja
Professor Arun Kharat
Mr Manoj Chugh
Mr Rajesh Ayapilla
Professor Shaleen Singhal
Professor Arun Kansal
Professor Prateek Sharma
Professor Anandita Singh
Professor Ramakrishnan Sitaraman
Dr Shashi Bhushan Tripathi
Dr Vinay Shankar Prasad Sinha
Dr Kamna Sachdeva
Dr Sukanya Das
Dr Nandan Nawn
Dr Anu Rani Sharma
Dr Montu Bose
Dr Seema Sangita, Controller of Examination
Mr Kamal Sharma, Secretary

Special Invitees

Dr Nithiyanandam Yogeswaran
Dr Kavita Sardana
Dr Sudipta Chatterjee
Dr Abhijit Datey
Dr Chaithanya Madhurantakam

Dr Naqui Anwer could not attend the meeting.

**Item No.1:** **To confirm the minutes of the Forty Eighth Meeting of the Academic Council held on 16th July 2020**. The Registrar informed that minutes of the Forty-Eighth Meeting of the Academic Council, held on 16th July 2020, were circulated to the members and no comments have been received to date. Hence, the Council might confirm the minutes.

**TS/AC/49.1.1** The Council resolved that the minutes of the 48th Academic Council Meeting held on 16th July 2020 be confirmed.

**Item No 2: To discuss and approve the list of experts for Selection Committee for interview of faculty position**. Prof. Arun Kansal informed that the list of experts for faculty selection in various Departments was approved by the 48th Academic Council. It was suggested that the list be reviewed every six months (TS/AC/48.3.1) to check the current affiliation and designation of the experts. The list of experts was circulated to all the Departments in April 2021 and they have checked the list of experts through the websites of respective institutions. There has been no new addition/deletion of experts in the previous list. However, for some of the experts, the contact details and designations have been changed, which has been updated in the list. The corrected list is attached as per Enclosure 1 for the information of the Academic Council.

**TS/AC/49.2.1** The Academic Council resolved to approve:-

(a) The list of experts placed at **Enclosure 1**.

(b) The details of experts are to be updated by Department every six month reflecting latest affiliations.

**Item No. 3: Anomaly in the course credits and teaching weeks**.

Prof. Arun Kansal explained in detail the need for change in course credit to the Council members. The UGC had issued a notification suggesting the number of teaching weeks to be followed by a University (UGC Notification No. 271, Part III, Section 4, Sub section 14.1). A copy of the relevant page of the notification is attached as **Enclosure 2**.

According to the notification, a University that follows a 5-day per week teaching, should have 36 weeks of "Actual Teaching" in a year i.e. 18 weeks in a semester, whereas for a University following 6-day a week, the teaching should have 30 weeks of actual teaching in a year i.e. 15 weeks in a semester.

TERI SAS primarily follows 6-day teaching per week. Hence, according to the UGC notification, one credit should be equivalent to 15 hours of 'Actual Teaching'. At present, the syllabus of all courses is designed considering 1 credit equivalent to 14 hours of actual teaching.

The Academic Council is requested to approve new credit system – 1 credit equal to 15 hours of actual teaching in a semester, and two practical hours as equal to one theory hour; from the Academic Year 2021-22. All courses will be revised accordingly. Prof. Kansal informed that the revisions in the course for credit alignment shall be recommended by respective Board of Studies and will be presented to the members of the Academic Council in August 2021 for approval through circulation.

Dr Kandpal suggested that the members may be informed on how TERI SAS is planning to accommodate the additional teaching hours in the system. Dr Kansal

informed members that the same would be adjusted by decreasing the semester break period etc.

Dr Eklabya Sharma suggested that we would work out on this and would seek the concurrence of the members in the last week of August 2021 before the start of the new session.

**TS/AC/49.3.1** The Academic Council resolved to approve subject to working out finer details and sending it to the members for final approval before the start of the new session.

**Item No. 4:** **(a) Criteria for continuation of registration to subsequent semester**. The Controller of Examination presented the following proposal for revision of criteria for the promotion of students to subsequent semesters. She presented the background and rationale behind the following proposal.

**The proposal**

1. Students will be promoted to the next semester only if they have a passing grade in all the core courses of their programme.
2. Passing grades are: A+, A, B+, B, C+, C and D.
3. A student who has not secured a passing grade in a core course can continue in the subsequent semester only after converting it to a passing grade in an improvement examination or by repeating the course when it is offered next time.
    a. The student will be allowed a conditional registration in the next semester until the results of improvement examination are declared. If the student does not secure a passing grade, he or she will be deregistered, as per the rules of the improvement examination policy.
    b. In the event that the core courses have changed in the subsequent academic year due to the programme restructuring, the MPEC will decide the appropriate replacement courses.
4. A student who has a failing grade in an elective course has two options:
    a. The failing grade may be converted to a passing grade by taking an improvement examination or by repeating the course when it is offered next time.
    b. The student may be permitted to opt for a different elective to complete the credit requirement of the programme. However, the transcript will still reflect the failing grade in the original course.
5. A student will be eligible for award of degree if he or she has obtained a passing grade in all the core courses and has earned the minimum credit requirements of the programme.
6. Rules under this section shall be effective only for such students who have been admitted to a programme of study at TERI SAS after its enactment.

There was a rich discussion on both the agenda points by the Council members.

Professor Kandpal opined that the proposed modification in the policy is going to impact the academic standards of TERI SAS for award of degree. He also

pointed out that there is a need to set up some minimum criteria for continuation of registration at the end of the initial semester as it is a signal to the student about his or her inclination towards the programme.

Professor Arun Kharat pointed out that this proposal may not be in compliance with the UGC's Choice Based Credit System (CBCS) guidelines.

Mr. Manoj Chugh suggested that TERI SAS may think of awarding a certificate or diploma to students who have passed each individual course but are not eligible for the award of degree because of not meeting the degree requirements.

Professor Vivek Suneja stated that the idea of awarding degree to students with a CGPA lower than 6.0 may be considered and let the job market decide on the low CGPA shown in the transcript.

Given the wide range of opinions, it was felt that the agenda items 4a should be revised for consideration of AC.

After detailed deliberation on these points, an alternate proposal was suggested to the Council by Dr. Nandan Nawn, so that the criteria for continuation of registration should be simplified. The following criteria was proposed for continuation of registration:

| Semester | METRIC | Minimum |
|---|---|---|
| 1st to 2nd | SGPA | 4 |
| 2nd to 3rd | SGPA | 4 |
| 3rd to 4th | SGPA | 4 |
| End of 4th | CGPA | 6 |

This was agreeable to all members of the Academic Council. Professor Kandpal suggested that this may be treated as an interim measure. A revised proposal may be placed for consideration of AC in its next meeting.

**TS/AC/49.4.1(a)** The Academic Council resolved to approve the following criteria for continuation of registration:

| Semester | METRIC | Minimum |
|---|---|---|
| 1st to 2nd | SGPA | 4 |
| 2nd to 3rd | SGPA | 4 |
| 3rd to 4th | SGPA | 4 |
| End of 4th | CGPA | 6 |

It was also resolved that the degree would be awarded if the student secures a CGPA of 6 at the end of the fourth semester.

**(b) Conversion of CGPA grades into percentage:** Some of our students who had applied for Government jobs or admission to other Universities need the conversion factor being followed at TERI SAS for conversion of CGPA into percentage. At present, TERI SAS has no such formula available for the conversion of CGPA into percentage. The proposal was discussed in detail.

All members of AC agreed that this is an important issue.

Prof. Kharat advised against the percentage based system. A clarification was provided that the university will continue to follow CGPA system and this conversion certificate will be provided only to those students who require a conversion to percentage for employment or higher education opportunities.

Prof. Suneja pointed out that multiplication of CGPA by a factor of 10 is incompatible with the passing benchmark of 6 as per the CGPA based rule for the award of degree. He suggested that an alternate option of multiplication by a factor of 7 (approximately) would be an ideal choice for the mapping.

Since there was difference of opinions, it was decided that this matter would be reviewed and a revised proposal would be placed for consideration of the AC.

**TS/AC/49.4.1(b)** The Academic Council resolved that the matter would be reviewed and a revised proposal would be placed for consideration of the Academic Council in its next meeting.

**Item No. 5: Extension of maximum period for submission of Thesis**

Prof. Arun Kansal informed the members that as per the UGC notices dated 3rd December 2020 and 16th March 2021, the Academic Council may allow extension of thesis submission date by 31th December, 2021. This extension may also be granted for submission of evidence of publication and presentation in two conferences. A copy of the UGC notifications and list of doctoral scholars who may need extension is placed as Enclosure 3**.**

The members noted the matter and approved the extension sought as per UGC notifications.

**TS/AC/49.5.1** The Academic Council resolved to approve extension sought by doctoral scholars as placed at Enclosure 3.

**Item No. 6: To consider and approve closure of PG Certificate and PG Diploma programme in the Water Science and Governance programme from the AY 2021-22**

Prof. Arun Kansal informed the members that the Departmental Research Committee (DRC) of the Department of Regional Water Studies has proposed to discontinue the PG Certificate and PG diploma programme in the Water Science and Governance programme with effect from AY 2021-2022.

The Academic Council noted and approved closure of the above said courses.

**TS/AC/49.6.1** The Academic Council resolved to approve closure of PG Certificate and PG Diploma programme in the Water Science and Governance programme from the AY 2021-22.

**Item No. 7: To consider and approve closure of LLM programmes and Ph.D programme in legal studies from the AY 2021-22**

Prof Arun Kansal informed the members that the Bar Council of India has come up with guidelines for running of the LLM programme. As per the Bar Council, the LLM programme should be of two years duration with a minimum faculty strength of 10 faculty members in the Department. Prof. Kansal further stated that in case of TERI SAS, it would be difficult to comply with these stringent rules and regulations and hence it would not be feasible for us to continue with the LLM programme in future. Therefore, Prof. Kansal proposed to close the LLM and Ph.D. Programme in the Department of Legal Studies from the AY 2021.

**TS/AC/49.7.1** The Academic Council resolved to approve closure of the LLM programme and Ph.D programme in the Department of Legal Studies from the AY 2021-22.

**Item No. 8: To consider and approve new course outlines**

Prof. Arun Kansal informed the members that as per NAAC requirement, all the course outlines of various programmes are to be revised and approved by the Academic Council once in every five years. Hence, the course outlines of various programmes have been put up for the approval of the Academic Council as placed in **Enclosure 4**. He further stated that one of the reasons for the list being long is that most of the outlines were to be put up in the last Academic Council Meeting but it could not be done due to the paucity of time. He also stated that we have followed the standard procedure for revision, and each proposed course;

a. has been independently reviewed by two subject experts in the relevant field,
b. has been reviewed and recommended by their respective Board of Studies, and
c. has been discussed internally for their relevance to programme objectives and learning outcome.

He requested the respective head of the Department to present the course outlines for approval of the Academic Council.

**New Course outlines**

| Department | Programme | Course Title | Semester | Core/Elective | Enclosure No. |
|---|---|---|---|---|---|
| Policy Studies | MA (PP&SD) | Infrastructure development: Issues and | 2 | Core | 5 |

| Department | Programme | Course Title | Semester | Core/Elective | Enclosure No. |
|---|---|---|---|---|---|
| | | options | | | |
| | | Public health: approaches, issues and policy perspectives | 2 | Core | 5 |
| Energy and Environment | M.Tech (UDM) | Qualitative research methodology for urban studies | 2 | Core | 5 |
| | M.Sc (CSP) | Transport and climate change | 2 | Elective | 5 |
| | M.Sc (ESRM) | Soil Science | 2 | Elective | 5 |
| | M.Sc (ESRM) | Advanced analytical techniques for environmental applications | 2 | Core | 5 |
| | M.Sc (ESRM) | Advanced Geosciences | 2 | Elective | 5 |
| Department of Natural Resources | M.Sc (Geoinformatis) | Project Management | 2 | Core | 5 |
| Department of Business and Sustainability | MBA | Accounting and finance for sustainability | 3 | Core | 5 |
| | MBA | Project planning and management | 1 | Core | 5 |
| | MBA | Bidding system management | 1 | Core | 5 |
| | MBA | Principles and concept of sustainability | - | Core | 5 |
| | MBA | Business Communications | 1 | Core | 5 |
| | MBA | Business to business marketing | 3 | Elective | 5 |
| | MBA | Derivatives and risk management | 3 | Elective | 5 |
| | MBA | Financial intermediaries, institutions and regulations | - | Elective | 5 |
| | MBA | Security analysis and portfolio management | 3 | Elective | 5 |

| Department | Programme | Course Title | Semester | Core/Elective | Enclosure No. |
|---|---|---|---|---|---|
| | MBA | Corporate accounting and reporting | 1 | Core | 5 |
| | MBA | Managerial economics | 1 | Core | 5 |
| | MBA | International financial management | 3 | Elective | 5 |
| | MBA | Brand management | 3 | Elective | 5 |
| | MBA | Marketing management | 3 | Elective | 5 |
| | MBA | Business ethics | 1 | Core | 5 |

Members while approving the outlines suggested that since 15-week semester is to be followed, the course outlines may be altered accordingly.

**TS/AC/49.8.1** The Academic Council resolved to approve course outlines as placed in **Enclosure 4**.

**Item No. 9: To consider and approve the guidelines and course outlines of project/thesis/internships.**

Prof. Arun Kansal requested members to consider approving the proposed guidelines and course outlines of projects/thesis/internships in various programmes placed at **Enclosure 5**. He further stated that these are proposed in view of UGC guidelines and NAAC requirements. The guidelines and course outlines have been discussed internally for their relevance to the programme objectives and learning outcomes and have been recommended by their respective Board of Studies. Similar guidelines of several programmes of TERI SAS were approved in the Forty-Eighth Academic Council meeting. Presented below are the guidelines for the remaining Programmes which could not be presented in the last meeting due to the paucity of time. The concerned head of the Department was requested to present these before the Council.

| Department | Programme | Course Title | Semester | Enclosure No. |
|---|---|---|---|---|
| Energy and Environment | M.Tech (UDM) | MEU 102 – Major project – Part 1 | 3 | 6 |
| | | MEU 104 – Major project – Part 2 | 4 | 6 |
| Energy and Environment | M.Sc (ESRM) | NRE 103 – Minor project | Summer break | 6 |
| | | NRE 104 – Major project | 4 | 6 |
| Energy and Environment | M.Tech (REEM) | ENR 103 – Field visits/exposure to RE plants | 2 | 6 |
| | | ENR 108 – Summer internship | 3 | 6 |
| | | ENR 109 – Major project | 4 | 6 |

| | | | | |
|---|---|---|---|---|
| Policy Studies | M.Sc (Economics) | MPE 108 – Master thesis | 4 | 6 |
| Business and Sustainability | MBA (SM) | PPM 100 – Minor project | 3 | 6 |
| | MBA (SM) | PPM 102 – Major project | 4 | 6 |
| | MBA (IM) | BSI 102 – Minor project | 3 | 6 |
| | MBA (IM) | BSI 106 – Major project | 4 | 6 |
| Department of Natural Resources | M.Sc (Geoinformatics) | NRG 107 – minor project | 3 | 6 |
| | | NRG 104 - Major project | 4 | 6 |

With respect to the presentation given by Dr Montu Bose on behalf of the Department of Business and Sustainability, Dr Nandan Nawn suggested that it would be better to include indicative practical hours in the course. It was suggested by Prof Arun Kansal that this can be taken care of during realignment. Prof. Kandpal was of the view that LTP format for all the programmes should not be different. Prof. Manipadma Datta agreed with Prof. Kandpal's view and said the issue would be looked into for bringing uniformity.

After all the deliberations, the Chairperson concluded that we should be consistent across programmes. Colleagues across Departments can look into it and develop it further based on the suggestions given by external members.

Prof. Datta suggested that we should stick to two practical hours as equal to one theory hour and requested the HoD to amend it accordingly so that we do not have any disparity.

**TS/AC/49.9.1** The Academic Council resolved to approve the guidelines and course outlines of project/thesis/internships as placed in **Enclosure 5,** provided the suggestions are incorporated and amended accordingly.

**Item No. 10: To consider and approve outline of Ph.D. programmes**

Prof. Arun Kansal requested the members to consider approving the proposed outline of Ph.D. programme offered by various Departments as placed at **Enclosure 6**. He further submitted that these are proposed in view of UGC guidelines and NAAC requirements. They have been discussed internally for their relevance to programme objectives and learning outcome and have been recommended by their respective Board of Studies. The Ph.D. outlines of several programmes of the university were approved by Forty-Eighth Academic Council. Presented below are the outlines for the remaining Programmes. He then requested the respective head of the Department to present the outline of Ph.D. Programme.

| Department | Enclosure Number |
|---|---|
| Natural Resources | 7 |
| Business and Sustainability | 7 |
| Policy Studies | 7 |

**TS/AC/49.10.1** The Academic Council resolved to approve the programme outline of Ph.D. programme of the Department of Natural Resources, Department of Business and Sustainability and Department of Policy Studies as placed at **Enclosure 6.**

**Item No. 11: To consider and approve new programme structure of the M.Sc. (Biotechnology) Programme offered by Department of Biotechnology.**

Dr. Shashi Bhushan Tripathi presented to the members the new programme structure of the M.Sc. (Biotechnology) Programme offered by the Department of Biotechnology. He requested the Academic Council to discuss and approve the new programme structure and course outlines of M.Sc (Biotechnology) programme, which are placed at **Enclosure 7**. The proposed programme will replace the existing M.Sc (Plant Biotechnology) programme from the Academic year 2021-22. He further submitted that:

i) The rationale behind the proposed new programme was presented in the Forty-Eighth AC meeting.
ii) The new programme has been developed in consultation with various stakeholders and the analysis of their feedback is available with the department.
iii) The programme and course outline has been reviewed and recommended by the Board of Studies.
iv) The new programme has been discussed internally.

Prof. Arun Kharat suggested that there is a need to improve the course structure with respect to the two specializations proposed to be taught. The course structure and the title does not seem to match. It has to be strengthened further. Similarly, the feedback of Alumni and stakeholders should be much broader.

Prof. Kandpal wanted to know whether student lab time and classroom time has been taken into account. Prof. Vivek Suneja emphasized on the need to look into the inter-disciplinarity of the areas as recommended in the National Education Policy.

The Chairperson concluded the deliberations by stating that a lot of efforts have gone into developing this programme by the Department. Board of Studies has given its inputs and the views of other stakeholders are also taken. Therefore, we should go ahead with this programme and as the semester progresses, we may take the views of external members, specially Prof. Kharat's.

**TS/AC/49.11.1** The Academic Council resolved to approve the new programme structure of the M.Sc. (Biotechnology) Programme offered by the Department of Biotechnology as placed at **Enclosure 7**. The Department may consider incorporating inputs provided by members through further discussion with subject experts.

**Item No. 12: To consider and approve change in the structure of the M.Sc. (Economics) Programme offered by Department of Policy Studies**

Dr Kavita Sardana presented the change in the structure of the M.Sc. (Economics) as placed at **Enclosure 8** for the approval of the Academic Council. Members suggested

that it would be better to go with the thesis in the fourth semester instead of taught courses. It would help us to keep uniformity across all programmes. It was also suggested by members that the new National Education Policy is laying more stress on research based work, so it would help to continue with it. After detailed deliberation, the Council feels that the list of electives being offered in the fourth semester should be researchbased electives as emphasised in the new education policy.

After hearing all the members, the Chairperson stated that we may continue with the programme in two track programme as presented. The department also proposed to reduce the credits from 72 to 64. The members had a diverse opinion on reducing these credits from 72 to 64. The Chairperson suggested that we may run the two track programme, as suggested by the department with emphasis on research based electives for one year and monitor its progress. The Council also proposed to change the name of the programme in line with the courses being offered.

**TS/AC/49.12.1** The Academic Council resolved to approve the programme structure of the M.Sc. (Economics) offered by Department of Policy Studies as placed at **Enclosure 8** for the duration of one year and the programme will be reviewed thereafter and placed in Academic Council.

**Item No. 13: Any other item with the permission of the Chair.**

(i) Prof. Arun Kansal informed that we have almost completed the academic semester and year. We have suspended teaching for four weeks during the pandemic time during April-May, 2021. The Academic Calendar was accordingly revised and as per the revised schedule, the next academic session will start from 31 August 2021.

Prof. Kandpal suggested that the revised academic calendar should be included in the Academic Council minutes which was noted and the revised academic calendar is placed as **Enclosure 9**.

(ii) Dr Montu Bose presented the programme specific outcome for the two MBA programmes - MBA (Sustainability Management) and MBA (Infrastructure Management). He informed that it has been reviewed and recommended by the Board of Studies and wanted the approval of the Council. Dr Nandan Nawn requested Dr Montu Bose to prepare it as per the UGC learning outcome document circulated by Prof. Arun Kansal, so that it complies with the format.

**TS/AC/49.13.(ii)** The Council resolved to approve the programme specific outcome for the two MBA programmes - MBA (Sustainability Management) and MBA (Infrastructure Management) as placed in **Enclosure 10**, subjected to the language being modified as per the UGC document.

(iii) Prof. Datta informed the members that as per the UGC Regulations, the Academic Council is required to co-opt three persons who are not teachers. One of the seats for co-opted members has been vacated by Ms Ranu Kayastha Bhogal, Director, Policy Research and Campaigns, Oxfam India. Ms Bhogal was inducted into the Academic Council on 10th October 2019 and she resigned on 7th July 2021.

The Chairperson, Academic Council has proposed the name of Mr Rahul Mittal, Director, Sonalika Group to be a part of the Academic Council as a co-opted member to enhance and expand TERI SAS' association with industry and corporate world. He further stated that under the guidance of Mr Rahul Mittal, Sonalika Group has become the highest exporter of tractors from India; with strong presence in more than 120 countries. Mr Mittal's strong adherence to dedication inspires him to bring liveliness and creativity into the work culture, going hand in hand with the existing company ethos. Mr Mittal has been the key driver for the brand to be recognized from various awards including the global agriculture leadership award as well as innovation leadership award.

The Chairperson, while welcoming Mr Rahul Mittal as a co-opted member, thanked Ms Ranu Kayastha Bhogal for her contributions to the Academic Council.

**TS/AC/49.13.(iii)** The Council resolved to approve the name of Mr Rahul Mittal as a co-opted member of the Academic Council for a period of two years w.e.f. 17th July 2021

There being no other items for discussion, the meeting was adjourned with a vote of thanks to the Chair at 15;25 hours.

Sd/
Kamal Sharma
Registrar (Acting)

Enclosures:-

| | |
|---|---|
| Enclosure 1 | List of experts for Selection Committee |
| Enclosure 2 | Anomaly in the course credits and teaching weeks |
| Enclosure 3 | Copy of UGC notification for extension and the list of doctoral scholars |
| Enclosure 4 | New course outlines |
| Enclosure 5 | Guidelines and course outlines of project/thesis/internships |
| Enclosure 6 | Outlines of Ph.D programmes |
| Enclosure 7 | New programme structure of the M.Sc. (Biotechnology) Programme offered by Department of Biotechnology |
| Enclosure 8 | **C**hange in the structure of the M.Sc. (Economics) Programme offered by Department of Policy Studies |
| Enclosure 9 | Revised academic calendar |
| Enclosure 10 | Programme specific outcome of MBA Programme |

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

Printed Copy: Registrar Office

**Enclosure 1**

**List of experts for Selection Committees**

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

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| 4. | Dr. Nisha Mendiratta | Associate Head / Scientist G | Climate Change | Department of Science & Technology | Technology Bhavan, New Mehrauli Road, New Delhi - 110016 | nisha67@nic.in | 011-26590497 |
| 5. | Prof. S. C. Mullick | Former Professor | Energy and Environment, Solar Energy, Applied Heat Transfer and Energy Conservation | Centre for Energy Studies, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi - 110016 | subhash_cmullick@yahoo.com | 9717502835 |
| 6. | Prof. T. C. Kandpal | Professor | Energy and Environment, Solar Energy, Heat Transfer, Energy Policy | Centre for Energy Studies, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Haus Khas, New Delhi - 110016 | tarak@ces.iitd.ac.in | 011-26591262 |
| 7. | Prof. S. G. Deshmukh | Professor | Energy and Environment, Mechanical Engineering | Mechanical Engineering Department, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | deshmukh@mech.iitd.ac.in | 011-26591056 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| 8. | Prof. K. K. Pant | Professor and Head | Energy and Environment, Chemical Engineering, Biomass energy. | Department of Chemical Engineering, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | dr.kkpant@gmail.com; kkpant@chemical.iitd.ac.in | 011-2659 6172/2659 6177 |
| 9. | Prof. Ratan Mohan | Former Professor | Energy and Environment, Chemical Engineering | Department of Chemical Engineering, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | ratan@chemical.iitd.ac.in | 011 2659 1033 |
| 10. | Prof. Sukumar Mishra | Professor | Energy and Environment, Power System Engineering, Renewable Energy. | Department of Electrical Engineering, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | sukumar@ee.iitd.ac.in | 011-2659-1074 |
| 11. | Prof. G. Bhuvaneshwari | Professor | Energy and Environment, Power Electronics, | Department of Electrical Engineering, Indian | Indian Institute of Technology Delhi, Hauz Khas, New Delhi | bhuvan@ee.iitd.ac.in | 011- 2659 1092 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | Electrical Machines and Drives | Institute of Technology, Delhi | 110 016 | | |
| 12. | Prof. P. R. Bijwe | Professor | Energy and Environment, Power Systems Analysis and Optimization, | Department of Electrical Engineering, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | prbijwe@ee.iitd.ac.in | 011- 2659 1046 |
| 13. | Prof. Vamsi Krishna Komarala | Professor | Energy and Environment, Renewable Energy | Centre for Energy Studies, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | vamsi@ces.iitd.ac.in | 011-26591255 |
| 14. | Prof. K. A. Subramanian | Professor | Energy and Environment, Study on performance, combustion, emission characteristics of automotive Internal | Centre for Energy Studies, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | subra@ces.iitd.ac.in | 011-26591247 |

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

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| 18. | Dr. Anwar Shahzad Siddiqui | Professor | Energy and Environment Power Systems Analysis Power Systems Simulation Power | Department of Electrical Engineering & Technology, Jamia Millia Islamia | Jamia Millia Islamia, New Delhi-110025 | assiddiqui@jmi.ac.in ; anshsi@yahoo.co.in | 011-26981717, 9990505825 |
| 19. | Prof. Majid Jamil | Professor | Energy and Environment, Electrical Power Systems, Power Systems Protection, Renewable Energy Sources | Department of Electrical Engineering & Technology, Jamia Millia Islamia | Faculty of Engineering & Technology, Jamia Millia Islamia, New Delhi - 110025 | mjamil@jmi.ac.in; majidjamil@hotmail.com | 9313462108 |
| 20. | Dr. Naveen Kumar | Professor | Energy and Environment, Internal Combustion Engines, Alternative fuels with special emphasis on | Department of Mechanical Engineering, Delhi Technological University | Delhi Technological University, Shahbad Daulatpur, Main Bawana Road, Delhi – 110042 | naveenkumar@dce.ac.in; naveenkumardce@gmail.com | 9891963530 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | biofuels | | | | |
| 21. | Prof. Subhasis Maji | Professor | Energy and Environment, Fluid Mechanics Thermodynamics, | Indira Gandhi National Open University | School of Engineering and Technology, Indira Gandhi National Open University Maidan Garhi, New Delhi – 110068 | subhasis@ignou.ac.in | 011-29534808, 29572926 |
| 22. | Prof. Rakhi Sharma | Associate Professor | Energy and Environment , Renewable energy technology | Indira Gandhi National Open University | School of Engineering and Technology, Indira Gandhi National Open University, Maidan Garhi, New Delhi - 110068 | rakhisharma@ignou.ac.in; rakhis_ignou@rediffmail.com | 011-29572916, 29532863; 9868548535 |
| 23. | Prof. Saumyen Guha | Professor | Hydraulics and Water Resources Engineering | Department of Civil Engineering, Indian Institute of Technology Kanpur | Indian Institute of Technology Kanpur, Kanpur - 208016 | sguha@iitk.ac.in | 0512-259-7917 |
| 24. | Prof. Sachchida Nand Tripathi | Professor & Head | Environmental Engineering, Aerosol Science and | Department of Civil Engineering, Indian Institute of | Indian Institute of Technology Kanpur, | snt@iitk.ac.in;sachchida.tripathi@gm | 0512-259-7845 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | Technology, Air Quality Monitoring, | Technology Kanpur | Kanpur – 208016 | ail.com | |
| 25. | Prof. A.K. Nema | Professor | Environmental Engineering, Environmental Management, Environmental Impact Assessment | Department of Civil Engineering, Indian Institute of Technology Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi - 110016 | aknema@civil.iitd.ac.in | 011-2659 1241 |
| 26. | Prof. R. B. Singh | Professor and Head | Environment and Disaster Management, Urban Environment, Remote Sensing & GIS, Climate Change | Department of Geography, Delhi School of Economics | Delhi School of Economics, University of Delhi, Delhi-110 007 | geographydse2012@gmail.com, rbsgeo@hotmail.com | 011-27666491, 27667725 |
| 27. | Prof. C. K. Varshney | Emeritus Professor | Environmental Science | former Dean and Professor of Ecology, JNU | 88, Vaishali, Pitampura, Delhi – 110 034 | ckvarshney@hotmail.com | 011- 42455366 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| 28. | Dr. C. R. Babu | Professor Emeritus | Environmental Science, Taxonomy and Ecology, Systematics | Taxonomy and Ecology, Systematics, Genetics,<br>Conservation and Sustainable Utilization of<br>Biodiversity, Ecosystem Dynamics and Function | CEMDE, Department of Environmental Studies, University of Delhi, Delhi – 110007 | crb26@hotmail.com, crbabu26@gmail.com | 011-27666237; 9810586709 |
| 29. | Prof. V. K. Jain | Vice-Chancellor | Atmospheric Sciences | Tezpur | Tezpur University, Tezpur - 784028, Assam | vc@tezu.ernet.in | 91-3712-267003 |
| 30. | Dr. Pramod Kumar Aggarwal | Regional Program Leader | Environmental Science | CGIAR Research Program on Climate Change Agriculture & Food Security | CGIAR Research Program on Climate Change Agriculture & Food Security, BISA, CIMMYT India Office, NASC Complex, DPS | p.k.aggarwal@cgiar.org | 011- 25842940 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | | | Marg, New Delhi 110012; E-13/12, Vasant Vihar, New Delhi 110057 | | |
| 31. | Dr. Saumitra Mukherjee | Professor | Geology, Remote sensing, Space Sciences & GIS applications in Environmental Geosciences | | School of Environmental Sciences, Jawaharlal Nehru University, New Delhi - 110067 | saumitra@mail.jnu.ac.in; saumitramukherjee3@gmail.com; dr.saumitramukherjee@usa.net | 011-26704312, 9313908512 |
| 32. | Prof. Dr. P.S.N. Rao | Head of the Department, Professor of Housing and Director | Urban Development | School of Planning and Architecture | School of Planning and Architecture, 4-Block-B, Indraprastha Estate, New Delhi - 110002 | drpsnrao@hotmail.com; hodhousing@spa.ac.in | 011 - 2370 2375, 2370 2376 |
| 33. | Prof. Shrawan Kumar Acharya | Professor | Urban and Regional Planning; Urban Governance; Poverty, Climate Change, Disaster | Centre for the Study of Regional Development, Jawaharlal Nehru University | Centre for the Study of Regional Development, School of Social Sciences, Jawaharlal Nehru | skacharya@mail.jnu.ac.in; shrawan.acharya@gmail.com | 011-26704090 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | and Urban Vulnerabilities | | University, New Delhi - 110067 | | |
| 34. | Prof. Geetam Tiwari | Professor | Transport Planning and policy, Traffic Safety, Public Transport and NMV Planning | Department of Civil Engineering, Indian Institute of Technology Delhi | Transportation Engineering Laboratories, Department of Civil Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | geetamt@civil.iitd.ac.in | +91 11 2659 6265, 91 11 2659 6402 |
| 35. | Prof. Hina Zia | Professor | Urban Development | Faculty of Architecture and Ekistics, Jamia Millia Islamia | Department of Architecture, Faculty of Architecture and Ekistics, Jamia Nagar New Delhi-110025 | hzia@jmi.ac.in | 011-26981717, 26984617 |
| 36. | Dr. Om Prakash Mathur | Senior Fellow | Urban Development | Institute of Social Sciences | Institute of Social Sciences<br>8, Nelson Mandela | opmathur@issin.org; om_mathur@yahoo.com | 011-43158800, 43158801 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | | | Road, Vasant Kunj<br>New Delhi-110070 | | |
| 37. | Prof. Milap Punia | Professor | Geographic information science and spatial analysis; with applications in Regional Development, urban studies, spatial planning, | Centre for the Study of Regional Development, Jawaharlal Nehru University | Centre for the Study of Regional Development, School of Social Sciences, Jawaharlal Nehru University, New Delhi - 110067 | punia@mail.jnu.ac.in; milap.jnu@gmail.com | 011-26704196 |
| 38. | Prof. Anu Kapur | Professor | Urban Development, Geography in India and Geography of India | Delhi School of Economics, University of Delhi | Department of Geography, Delhi School of Economics, University of Delhi Delhi-110007 | anu_iias@yahoo.com | 11-27666491, 9871453503 |
| 39. | Prof. Manju Mohan | Professor & Head | Impacts of Urbanization on Weather, Climate and Air Pollution/ | Centre for Atmospheric Sciences, Indian Institute of | Indian Institute of Technology Delhi, Hauz Khas, New Delhi – 110016 | mmohan6@hotmail.com, mmanju@cas.iitd.ernet.in, mmohan66@gmail | 11-26591313/ 26591301 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | Air Quality Measurements and Modeling for Regulatory Applications | Technology Delhi | | .com | |
| 40. | Prof. Sangeeta Kohli | Professor | Heat Transfer, Fluid Mechanics, Renewable Energy Technology | Mechanical Engineering Department, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi - 110 016 | skohli@mech.iitd.ac.in | 011-2659 1243 |
| 41. | Prof. Ambuj Sagar | Professor | Energy and Environment, Energy Policy | Humanities & Social Sciences, Indian Institute of Technology, Delhi | Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110 016 | asagar@hss.iitd.ac.in | 011-2659 7135 |
| 42. | Prof. S. K. Singh | Professor & Dean (AA) | Environmental Engineering, Solid waste processing, Wastewater treatment designs | Delhi Technological University | Department of Civil and Environmental Engineering, Delhi Technological University, Bawana Road, New Delhi- | sksinghdce@gmail.com, sksingh@dce.ac.in | 011-27871061 |

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | | | 110042 | | |
| 43. | Dr. Anubha Kaushik | Professor | Environmental pollution, Bioremediation, Bioenergy, Ecosystems approach and EIA | Guru Gobind Singh Indraprastha University | University School of Environment Management, Guru Gobind Singh Indraprastha University, Sector - 16C, Dwarka, New Delhi - 110078 | aks.es.10@gmail.com | 011-25302170, 9654947305 |
| 44. | Prof. Dinesh Mohan | Professor | Environmental/Analytical/Aquatic/Surface Chemistry, Remediation and Encapsulation of Priority Pollutants from water | School of Environmental Sciences, Jawaharlal Nehru University | School of Environmental Sciences, Jawaharlal Nehru University, New Delhi – 110067 | dmohan@mail.jnu.ac.in, dm_1967@hotmail.com | 011-26704616, 09717196214 |
| 45. | Dr. Mukesh Sharma | Professor | Environmental Engineering, Air Quality Modelling and | Department of Civil Engineering, Indian Institute of Technology Kanpur | Indian Institute of Technology Kanpur, Kanpur – 208016 | mukesh@iitk.ac.in | 0512-2597759 |

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

| Department of Energy and Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Phone/Mobile No |
| | | | | management | Planning and Architecture, New Delhi<br><br>4-Block-B, Indraprastha Estate, New Delhi 110002 | | |
| 49. | Prof Bhim Singh | Professor | | Electrical Engineering Department, Indian Institute of Technology, New Delhi | Electrical Engineering Department, Indian Institute of Technology, Hauz Khas, New Delhi-110016 | bsingh@ee.iitd.ac.in | 011-26591071<br><br>9811502125 |

| Department of Business and Sustainability | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sl. No** | **Name** | **Designation (Professor/Equivalent designation)** | **Specialisation** | **Affiliation** | **Full Address** | **Email id** | **Mobile No** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Prof. Madhu Vij | Professor | Finance | FMS, University of Delhi | FMS, University of Delhi | madhufms@gmail.com | 9810828835 |
| 2 | Prof. Vijay Kaul | Department of Finance and Business Economics, Professor | Marketing | University of Delhi South Campus | Arts Faculty Building, University of Delhi,<br>South Campus Benito Juarez Marg<br>Dhaula Kuan, New Delhi - 110 021 | kaulvijay@yahoo.com | 9810715407 |
| 3 | Prof N. Ravichandran | Professor | Management | Dean, Jamia Hamdard University | Dean, Jamia Hamdard University | ravi@jamiahamdard.ac.in | 9718491102, 8800460620 |
| 4 | Prof. Vivek Suneja | Professor | Strategy | FMS, University of Delhi | FMS, University of Delhi | suneja_v@yahoo.com | 01127666382 |
| 5 | Prof. Asif Zameer | Professor | Marketing | Fore School of Management | Fore School of Management | asifzameer@yahoo.com | 9871053303 |
| 6 | Prof Devi Singh | Former Director | | IIM Lucknow | 841 Nava Sansad Vihar, Opp, Hotel Taj Vivanta, Sector 22, Plot 4, Dwarka, Delhi-110077 | dsingh@iiml.ac.in | 9818623000 |
| 7 | Prof B Banerjee | Former Dean | Finance & Accounting | Faculty of Commerce & Management, University of | C 10, Sandhead Apartments, 164/78, Lake Gardens, Kolkata- | bhabatosh.commerce@gmail.com | 9432350127 |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | 110016 | | |
| 13 | Prof. Yamini Gupt | Department of Finance and Business Economics, Professor & Joint Dean (International Relations) | Economics | University of Delhi (South Campus) | Arts Faculty Building, University of Delhi,<br>South Campus Benito Juarez Marg<br>Dhaula Kuan, New Delhi - 110 021 | ygupt@yahoo.com | 7011065805 |
| 14 | Prof. Ananya Ghosh Dastidar | Department of Finance and Business Economics, Professor | Economics | University of Delhi (South Campus) | Arts Faculty Building, University of Delhi,<br>South Campus Benito Juarez Marg<br>Dhaula Kuan, New Delhi - 110 021 | agdastidar@gmail.com; agdastidar@south.du.ac.in | 9818259172 |
| 15 | Prof. Umakant Dash | Director & Professor | Economics | Institute of Rural Management, Anand | Post Box No. 60, Anand 388001, Gujarat. India. | umakant@irma.ac.in; dash.umakant@gmail.com | 9791148921/9444915676 |

| **Centre for Post Graduate Legal Studies** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivale | Specialisation | Affiliation | Full Address | Email id | Mobile No |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | nt designation) | | | | | |
| 1 | Prof. Manoj Kumar Sinha, | Director/Vice Chancellor | International Law/Human Rights Law/Human Rights Law/Environmental Law | The Indian Law Institute<br>New Delhi | Bhagwandass Road, New Delhi-01 | manoj_kumarsinha@yahoo.com | 9433602546 |
| 2 | Prof B S Chimni | Former Professor , JNU<br>Professor Emeritus, OP Jindal Global Law School | International Law | OP Jindal Global Law School, Sonipat, Haryana | O.P. Jindal Global University Sonipat, Narela Road Near Jagdishpur village Sonipat, Haryana-131001, NCR of Delhi, India | bschimni@hotmail.com | 9871622809/011-26704349 |
| 3 | Prof Kamala Sankaran | Professor | Constitutional Law, Law and Development | Faculty of Law, University of Delhi | University of Delhi, Chhatra Marg, Delhi | kamala_sankaran@hotmail.com | 9810512637 |
| 4 | Prof. M P Singh | Professor Emiritus, Faculty of Law, University of Delhi | Constitutional Law/Jurisprudence | Faculty of Law, University of Delhi | Sector-14, Dwarka, New Delhi-110078 | mpjitholi@gmail.com | 9711921492/28034991 |
| 6 | Mr. Raghavendra GR | Joint Secretary | Intellectual Property Law/ Judicial Reforms | Department of Justice, Government of India | Shastri Bhawan, New Delhi-01 | raghavender.gra@nic.in | 9811415790 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7 | Prof. VG Hegde, | Professor, JNU | International Law | Centre for International Legal Studies, JNU | New Mehrauli Road, New Delhi 110067 | vghegde@mail.jnu.ac.in , vghegde@gmail.com | 9312712476 |
| 8 | Prof. GS Bajpai | Professor | Research Methods | Professor, National Law University Delhi | Sector-14, Dwarka, New Delhi-110078 | gs.bajpai@nludelhi.ac.in | 9718225340 |
| 9 | Dr. Anirudha Rajput | Member, International Law Commission | International Law | Member, International Law Commission | International Law Commission, Geneva | adrajput@gmail.com | 9810704531 |
| 10 | Dr. Amar Pal Singh | Professor and Dean | Environmental Law | University School of Law and Legal Studies | Sector - 16C, Dwarka, New Delhi – 110078 | amarpalsingh@ipu.ac.in | 8860303226 |
| 11 | Dr. Kanwal D.P.Singh | Professor and former Dean | Environmental Law, Research Methods | University School of Law and Legal Studies | Sector - 16C, Dwarka, New Delhi – 110078 | kdps@ipu.ac.in | 9910003228 |
| 13 | Prof. Nuzhat Parveen Khan | Professor and Dean | Environmental Law, Research Methods | School of Law | Plot Nos 8-11, TechZone 2, Greater Noida, Uttar Pradesh 201310 | nuzhat.khan@bennett.edu.in; nuzhat.law@gmail.com | 9910603938 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14 | Prof VK Ahuja | Professor, Faculty of Law / Joint Director, Delhi School of Public Policy and Governance | IPR, Human Rights | Faculty of Law/ Delhi School of Public Policy and Governance, University of Delhi | University of Delhi, Chatra Marg, Delhi | vkahuja2002@yahoo.co.in | 9868482282 |
| 15 | Prof. Raman Mittal | Professor | IPR, Constitutional Law | Faculty of Law, DU | University of Delhi, Chatra Marg, Delhi | mittalraman@gmail.com | 9650476202 |
| 16 | Prof. Srikrishna Deva Rao | Vice Chancellor and Professor of Law | criminal law, juvenile justice, human rights and clinical legal education | National Law University Delhi | Sector-14, Dwarka, New Delhi-110078 | vc@nludelhi.ac.in | 9871504622/9437564623 |
| 17 | Prof.Bharat H. Desai | Professor, | International Law; International Environmental Law; International Humanitarian Law; International Criminal Law; International Dispute Settlement | Centre for International Legal Studies, Jawaharlal Nehru University | New Mehrauli Road, New Delhi 110067 | desai@mail.jnu.ac.in, desai@jnu.ac.in | 9990352162 |

**Department of Policy Studies**

| S.No | Name | Designation (Professor/Equivalent designation) | Specialization | Affiliation | Full Address | Email id | Mobile No |
|---|---|---|---|---|---|---|---|
| 1. | Prof. Indira Rajaraman | Former Reserve Bank Chair Professor/NIPFP | Economics (Public Finance) | Reserve Bank Chair Professor/NIPFP | B-2 /2395, Greenglade Apartments Vasant Kunj. New Delhi-110070 | indira_raja@yahoo.com | Mobile: 9818938846 |
| 2. | Prof Shubashish Gangopadhyay | Dean, Founder and Research Director of the IDF | Economics (Public Finance) | India Development Foundation/ Indian School of Public Policy | 4101, DLF, Phase IV Gurgaon 122 015, Haryana, India | sg@idfresearch.org | Off – 0124-4381691<br>M - 9910991221 |
| 3. | Prof. Surender Kumar | Professor | Economics (Environmental Economics) | Delhi School of Economics | Department of Economics, Delhi University New Delhi- 110 007 | surenderkumarbansal@hotmail.com, skumar@econdse.org | 9871283064 |
| 4. | Dr B.N. Goldar | Former Professor on Projects | Economics (General) | Institute of Economic Growth | Delhi University Enclave New Delhi – 110007 | b_goldar77@yahoo.com; bng@iegindia.org | 9811443161 |
| 5. | Prof. Ashwini Deshpande | Professor and (Founding) Director, Centre for Economic Data and Analyis (CEDA), Ashoka University | Gender/Economics | Department of Economics, Ashoka University | Plot No. 2, Rajiv Gandhi Education City, National Capital Region P.O.Rai, Sonepat Haryana-131029 | ashwini.deshpande@ashoka.edu.in | 130-2300000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6. | Prof. T.C.A. Anant | Member, UPSC | Economics (Indian Economy) | UPSC | UPSC Bhavan, Shahjahan Rd, UPSC, Man Singh Road Area, New Delhi-110069 | tca.anant@nic.in; tca.anant@gmail.com | 011-23742150; 9717118585 |
| 7. | Prof. Bharat Ramaswamy | Dean, Academic Affairs,<br>Professor of Economics | Economics | Ashoka University | Plot No 2, Rajiv Gandhi Education City, Sonepat, Haryana- 131029 | isid.bharat@gmail.com; bharat.ramaswami@ashoka.edu.in | 9811340848 |
| 8. | Dr. Krishnendu Ghosh Dastidar | Professor | Environmental Economics | Jawaharlal Nehru University | Centre for Economic Studies and Planning School of Social Sciences JNU, New Delhi – 110067 | krishnendu.dastidar@gmail.com, kgd0302@mail.jnu.ac.in, kgd12@yahoo.com | 011-26704448 |
| 9. | Prof M N Murty | Adjunct Professor | Environmental Economics | Amrita Center for Economics & Governance (ACEG), Amritapuri | 72, Sakshara Aptts. Block A-3, Paschim Vihar, Delhi 110 063 | mn.murty71@gmail.com | 011-25275873, Mobile: 9891288806 |
| 10. | Prof Tulsi Patel | Professor | Sociology | Delhi University | B-5/318, Ekta Garden-9, Patparganj, Delhi – 110 092 | sociology_dse@yahoo.com | 011-22727687 |
| 11. | Prof N. Jayaram | Director of the Institute for Social and | Research Methodology & Sociology | Institute for Social and | 87, 10th Cross, RBI Layout | njayaram2@rediffmail.com | Tel: Mob:<br>Email: |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Economic Change, Bangalore | | Economic Change | JP Nagar 7th Phase<br>BENGALURU – 560078 | | +91-80-65653332<br>+91-9535766565 |
| 12. | Prof. Avanish Kumar | Professor, Public Policy & Governance | Anthropology | Management Development Institute | 13-D, Vijay Mandal Enclave, Near Azad Apartment, Near Essex Farm and IIT Delhi, New Delhi - 110016 | avanish@mdi.ac.in | 9871687668 |
| 13. | Prof Meeta Mehra | Chairperson and Professor of Economics | Macroeconomics, International Trade,Climate Change Economics, Environmental Economics, Energy and Resource Economics, | Centre for International Trade and Development, Jawaharlal Nehru University | Centre for International Trade and Development (CITD), Room No. 209, School of International Studies (SIS) II, JNU, New Delhi- 110067 | meetakm@mail.jnu.ac.in; meetakm@gmail.com; meetakm@jnu.ac.in | 011-26704353 (Office), 9811660905 (Mobile) |
| 14. | Prof Prabhat Patnaik | Professor Emeritus | Macroeconomics and Political economy | Centre for Economic Studies and Planning, Jawaharlal Nehru University | JNU,<br>New Delhi-110 067 | prabhatptnk@yahoo.co.in | 0124-2350 544 (R) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 15. | Prof Biswajit Dhar | Professor | Trade and development issues; International finance; Intellectual property rights; Trade and environment; Agriculture | Centre for Economic Studies and Planning, Jawaharlal Nehru University | Centre/School/Special Centre: School of Social Sciences<br>Room No: 336<br>JNU, New Delhi-110 067 | biswajit@mail.jnu.ac.in, bisjit@gmail.com | 011-26704462 |
| 16. | Mr Nitin Desai | Distinguished Fellow, Earth Science and Climate Change | Economics/Public Policy | TERI | 5th Floor, B-63, Defence Colony, New Delhi-110024 | nitin.desai@teri.res.in | 9871386586 |
| 17. | Prof Aditya Bhattacharya | Professor | Economics | Delhi School of Economics | University of Delhi<br>New Delhi- 110007 | aditya@econdse.org | 011-27008112, 27008129 |
| 18. | Prof JV Meenakshi | Professor | Agricultural Economics, Health Economics | Delhi School of Economics, | University of Delhi<br>New Delhi- 110007 | meena@econdse.org | 011-27008127 |
| 19. | Prof Abhijit Sen | Professor (Retd.) | Monetary Economics, International Finance and Open Economy Macroeconomics | Centre for Economic Studies and Planning, Jawaharlal Nehru University | G-1255 Chittaranjan Park<br>New Delhi - 110019 | abhijitsenjnu@gmail.com | 011-26272749 (R)<br>9818260887 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20. | Prof Pulin Nayak | Visiting Professor | Public Economics, Economic Theory | Ashoka University | Plot No. 2, Rajiv Gandhi Education City, National Capital Region P.O.Rai, Sonepat Haryana-131029 | pulin.nayak@ashoka.edu.in, pulin.nayak@gmail.com | 130-2300000 |
| 21. | Prof Rohini Somanathan | Professor | Economic Development, Political Economy, Public Economics | Delhi School of Economics | Room no 202, University of Delhi New Delhi- 110007 | rohini@econdse.org | 011-27008147 |
| 22. | Prof E Somanathan | Professor, Economics and Planning Unit, Indian Statistical Institute | Environment and development | Indian Statistical Institute | 7 Shaheed Jeet Singh Marg, New Delhi 110016 | som@isid.ac.in | 011-4149 3939 |
| 23. | Prof Arup Mitra | Professor & Dean | Development economics | South Asian University | Faculty of Economics (FE), Akbar Bhawan, Room No. 231, Chankyapuri, New Delhi- 110021 | arupmitra@sau.int | 9818948470 Phone: 011-27783468 |
| 24. | Prof Bina Agarwal | Professor of Development Economics and Environment | Gender inequality, environment and development; land, property and livelihoods; and agriculture and food security | GDI, School of Environment, Education and Development, University of Manchester University of | 13 Nizamuddin East, First floor (R), New Delhi 110013, India | bina.india@gmail.com; bina.agarwal@manchester.ac.uk | (off) 011-27666364 ext 258. (home) 011-24350077 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Manchester) | | | |
| 25. | Prof Sanjay Srivastava | Professor (on leave) | Urbanism, urban cultures and technologies of planning; gender and globalization; Social theory | Institute of Economic Growth | Institute of Economic Growth,<br>Delhi University Enclave,<br>New Delhi - 110007 | sanjaysri@iegindia.org | 011-27666364/6367, 27667101/7288/7365/7424 |
| 26. | Prof Satish Deshpande | Professor, Sociology | Caste and Class Inequalities, Contemporary Social Theory, Politics and History of the Social Sciences and South-South Interactions | Delhi School of Economics, Delhi University | A I/6, Maurice Nagar, Delhi University,<br>New Delhi- 110007 | sdeshpande@sociology.du.ac.in; sdeshpande7@gmail.com | 011-27667858 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 27. | Prof Amita Baviskar | Professor & Head of the Department of Environmental Studies | Citizenship, war and counterinsurgency in South Asia, indigenous identity and politics in India, the sociology of law and inequality; Environmental Studies and Sociology & Anthropology | Ashoka University | Plot No. 2, Rajiv Gandhi Education City, National Capital Region<br><br>P.O. Rai, Sonepat, Haryana 131029, India. | amita.baviskar@gmail.com; amita.baviskar@ashoka.edu.in | 011-2766-7101 extn. 256 (office) and 9811874547 (mobile) |
| 28. | Dr. Shalini Singh | Director | Public Health | National Institute of Cancer Prevention and Research | National Institute of Cancer Prevention & Research (NICPR)<br><br>Indian Council of Medical Research (ICMR), Dept. of Health Research<br><br>Ministry of Health & Family Welfare, Govt. of India,<br><br>I-7, Sector – 39, Noida, Uttar Pradesh – 201301 | shalinisingh.icmr@gmail.com; director.nicpr@icmr.gov.in | 011-26589438/120-02578837 |

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

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 39. | Prof. JBG Tilak | Professor | Economics (Education) | Council for Social Development | Sangha Rachna<br>53, Lodi Estate<br>New Delhi – 110003 | jtilak@csdindia.org ; jtilak2017@gmail.com | 98686 46919 |
| 40. | Prof. Neera Chandhoke | Professor | Political Science | Delhi University | Social Science Building, University of Delhi, New Delhi 110007 | neera.chandhoke@gmail.com | 9811191919 |
| 41. | Prof. Rajni Palriwala | Professor | Sociology | Delhi University | Department of Sociology, University of Delhi, New Delhi 110007 | rajnip@gmail.com; rpalriwala@sociology.du.ac.in | 011 27667858 |
| 42. | Prof. Neera Agnimitra | Professor | Social Work (Community Practice; Ecology and Social Work; Rural and Urban Community Development; Gender Studies) | Delhi University | Department of Social Work, Delhi University 3, University Road, Delhi-110007 | neeraagnimitra@gmail.com | 9810460055 |
| 43. | Prof. Rima Dada | Professor | Anatomy (Health) | All India Institute of Medical Sciences | Ansari Nagar,<br>New Delhi - 110029 | rima_dada@rediffmail.com | 011-26588500; 9811783318 |
| 44. | Prof. Vatsla Dadhwal | Professor | Gynecology (Health) | All India Institute of Medical | Ansari Nagar, | vatslad@hotmail.com | 011-26588500; |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Sciences | New Delhi - 110029 | | 9811015979 |
| 45. | Prof. Soumendra Mohan Patnaik | Professor | Anthropology | University of Delhi | Department of Anthropology, University of Delhi, New Delhi - 110007 | smp_du@yahoo.com | 9891333637 |
| 46. | Prof. PC Joshi | Professor | Anthropology | University of Delhi | Room No. 22 Department of Anthropology University of Delhi, New Delhi – 110007 | pcjoshi@anthro.du.ac.in | 9871222692 (mob) 011-27667329 (Office) |
| 47. | Prof. Pamela Singla | Professor | Social Work (Gender studies/Social Development; Social Policy) | University of Delhi | 23/4 Cavalry Lines Delhi University Campus Delhi-110007 | pamelasingla@gmail.com | 011-27667147 (Office) 9811328666 |
| 48. | Prof Asmita Kabra | Professor | Economics/Human Ecology | School of Human Ecology, Ambedkar University | 2711, Lothian Rd, Chabi Ganj, Kashmere Gate, New Delhi, Delhi 110006 | asmita@aud.ac.in | |
| 49. | Prof. Sanghamitra Sheel Acharya | Professor | Social Medicine and Community Health | Centre of Social Medicine and Community Health, JNU | Centre of Social Medicine and Community Health, School of Social Sciences | sanghamitra@mail.jnu.ac.in; sanghmitra.acharya@gmail.com | 9810547096 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | JNU, New Delhi- 110067 | | |
| 50. | Prof Sangeeta Bansal | Professor | Environmental Economics | Centre for International Trade and Development, Jawaharlal Nehru University | 211, Centre for International Trade and Development, School of International Studies-II, Jawaharlal Nehru University, New Delhi-110067 | sangeeta.bansal7@gmail.com | 011-26704357 |
| 51. | Prof. Ritu Priya Mehrotra | Professor | Social Medicine and Community Health | Centre of Social Medicine and Community Health, JNU | Centre of Social Medicine and Community Health,<br>School of Social Sciences, JNU. New Delhi-110067 | ritupriya@mail.jnu.ac.in; ritu_priya_jnu@yahoo.com | Off. 011-26704615<br>Residence: 011-26742752<br>Mobile: 9313350186 |
| 52. | Prof Seeta Prabhu | Visting Professor and Senior Advisor, Human Development and SDGs | Planning and Development | Tata Institute of Social Sciences | TISS Mumbai Campus, V.N. Purav Marg, Deonar, Mumbai<br>400088 | seetaprabhu@gmail.com | Off. +91-22-2552 5000 |
| 53. | Prof Aparna Sawhney | Professor | Economics | Centre for International Trade & | Room no. 109, SIS-II, School of International Studies II (New Building) | asawhney@mail.jnu.ac.in; aparnasawhney@y | Phone: 011-26704389/26704339 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Development, JNU | Jawaharlal Nehru University<br>New Delhi 110067, INDIA | ahoo.com | |
| 54. | Prof Ramprasad Sengupta | Emeritus Professor | Economics | Jawahar Lal Nehru University | 601, Tower 8, Upohar Luxury Complex, New Garia, Kolkata 700094, India | rps0302@gmail.com | +91 98718 40681 |
| 55. | Prof Vikram Dayal | Professor & Course Director of the IES Training and the Head of the IES Section | Economics | Institute of Economic Growth | Institute of Economic Growth, University Enclave, University of Delhi (North Campus),<br>Delhi 110 007 | vikday@iegindia.org | +91-11-27666364/6367, 27667101/7288/7365/7424 |

| **Department of Regional Water Studies** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialization | Affiliation | Full Address | Email id | Mobile No |
| 1. | Prof Garg N. K. | Professor | Water Sector Expert | Department of Civil Engineering,<br>Indian Institute of | Indian Institute of Technology Delhi<br>Hauz Khas, | nkgarg@civil.iitd.ac.in | 011 - 2659 1210 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Technology Delhi | New Delhi - 11 00 16 | | |
| 2. | Prof Chahar B.R. | Professor | Water Sector Expert | Department of Civil Engineering,<br>Indian Institute of Technology Delhi | Indian Institute of Technology Delhi<br>Hauz Khas,<br>New Delhi - 11 00 16 | chahar@civil.iitd.ac.in; | 011 - 2659 1187 |
| 3. | Prof Kaushal D. R. | Professor | Water Sector Expert | Department of Civil Engineering,<br>Indian Institute of Technology Delhi | Indian Institute of Technology Delhi<br>Hauz Khas,<br>New Delhi - 11 00 16 | kaushal@civil.iitd.ac.in; | 011 - 26591216 |
| 4. | Prof S. K. Singh | Professor & Dean (AA) | Water Sector Expert | Department of Civil and Environmental Engineering,<br>Delhi Technological University | Delhi Technological University<br>(formerly Delhi College of Engineering)<br>Bawana Road ,<br>Delhi-42 | sksinghdce@gmail.com; | 011 - 27871061 |
| 5. | Prof V. K. Minocha | Professor | Water Sector Expert | Department of Civil and Environmental Engineering,<br>Delhi Technological | Delhi Technological University<br>(formerly Delhi College of Engineering)<br>Bawana Road , Delhi- | vkminocha@dce.ac.in; | 011-27871018 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | University | 42 | | |
| 6. | Prof Sirajuddin Ahmed | Professor | Water Sector Expert | Department of Civil Engineering,<br>Jamia Millia Islamia | Jamia Millia Islamia,<br>Jamia Nagar,<br>New Delhi-110025 | suahmed@jmi.ac.in; | 011-6843941 |
| 7. | Prof Shamshad Ahmad | Professor & Head | Water Sector Expert | Department of Civil Engineering,<br>Jamia Millia Islamia | Jamia Millia Islamia,<br>Jamia Nagar,<br>New Delhi-110025 | sahmad8@jmi.ac.in; | 011 - 2698 5227 |
| 8. | Prof Quamrul Hassan | Professor | Water Sector Expert | Department of Civil Engineering,<br>Jamia Millia Islamia | Jamia Millia Islamia,<br>Jamia Nagar,<br>New Delhi-110025 | qhassan@jmi.ac.in; | 9868856198 |
| 9. | Prof Mohammed Sharif | Professor | Water Sector Expert | Department of Civil Engineering,<br>Jamia Millia Islamia | Jamia Millia Islamia,<br>Jamia Nagar,<br>New Delhi-110025 | msharif@jmi.ac.in; | 9810116472 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10. | Prof Vishal Narain | Professor & Chairperson - FPM & EFPM | Water Sector Expert | Management Development Institute | Management Development Institute<br>Mehrauli Road<br>Sukhrali,<br>Gurgaon - 122 007 | vishalnarain@mdi.ac.in; | 124-5013050 |

| **Department of Natural Resources** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Mobile No |
| 1 | Prof. CK Varshney | Professor Emeritus (JNU) and Distinguished Adjunct Professor (AIT, Bangkok) | Environmental Science, Ecology, Wetlands, EIA | School of Environmental Sciences, JNU | 88, Vaishali, Pitampura, Delhi 110034 | ckvarshney@hotmail.com | 9818547904 |
| 2 | Prof. K.G. Saxena | Professor | Ecology, Natural Resource Management and Sustainable Development | School of Environmental Sciences | Jawaharlal Nehru University, New Delhi-110067 | kgsaxena@mail.jnu.ac.in kgsaxena@gmail.com | 9971461199 |
| 3 | Prof. KS Rao | Professor & Head | Ecosystem analysis; Adaptation to | Department of | University of Delhi, | srkottapalli@botany.du.ac.in,srkottap | 9313294607 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | climate change; Ecosystem redevelopment; Agroforestry; Land use/cover dynamics; Reserve people conflict mitigation, Sustainable rural development models/approaches. | Botany | Delhi - 110007 | alli@yahoo.com | |
| 4 | Prof. Nilanchal Patel | Professor | Remote sensing, GIS, Geoinformatics applications | Department of Remote Sensing | Birla Institute of Technology Mesra, (A Deemed University) Ranchi, Jharkhand, PIN: 835215 | npatel@bitmesra.ac.in | 9431100357 |
| 5 | Prof. V.K.Sehgal | Principal Scientist | Remote sensing for drought monitoring, crop management, Drone applications in agriculture | Division of Agricultural Physics | Indian Institute of Agricultural Research Pusa Road, New Delhi – 110012 | vksehgal@gmail.com<br>sehgal@iari.res.in | 9899034144 |
| 6 | Prof. MS Nathawat | Professor | Remote Sensing and GIS, Desertification, Natural Resources | I School of Sciences (SOS) | Room no.2,Block 15, Section J School of Science Indira Gandhi National | msnathawat@ignou.ac.in | 7678596317, 9868289803 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | Management, Physical Geography,<br><br>Regional & Urban Planning, Climate Change and Disaster Management | IGNOU | Open University Maidan Garhi New Delhi-110068 | | |
| 7 | Dr. PLN Raju | Director | Geoinformatics | NESAC | North-East Space Applications Centre (NESAC), Umiam - 793103, RI Bhoi district, Meghalaya | director@nesac.gov.in | 9436160902 |
| 8 | Prof.Kusum Arunachalam | Professor | Forest Ecology & Biodiversity, Conservation, Climate Resilient Ecosystems, Traditional Knowledge | Department of Environment and Natural Resources | School of Environment & Natural Resources, Doon University, Dehra Dun 248001. | kusumdoon@gmail.com | 9411113894 |
| 9 | Dr. V.M. Chowdary | Scientist/Engineer SG | GIS, Remote sensing, water resource management | Department of Space | Regional Remote Sensing Centre (RRSC) - North<br>Indian Space Research Organisation | chowdary_isro@yahoo.com | 9434754217 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | Dept. of Space, Govt. Of India<br>Antariksh Bhavan,<br>Plot No.7, Planning Area Center, Beside IOCL Office,<br>Sadiq Nagar, New Delhi 110 049 | | |

| **Department of Biotechnology** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Ser No | Name | Designation (Professor/Equivalent designation) | Specialisation | Affiliation | Full Address | Email id | Mobile No |
| 1 | Dr K R Koundal | Professor and Emeritus Scientist | Plant Molecular Biology, Biotechnology, Isolation & cloning of plant genes | National Research Centre on Plant Biotechnology<br>Indian Agricultural Research institute | National Research Centre on Plant Biotechnology, Indian Agricultural Research institute, Pusa Campus, New Delhi 110 012 | kirparamkoundal@gmail.com. | Phone : 011-25841787 Ext 244 |
| 2 | Dr. A. K. Singh | Director (Additional | Genetics and Plant Breeding | Indian Agricultural Research Institute | Indian Agricultural Research Institute, Pusa, New Delhi- | director@iari.res.in | 91-11-25842367 |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Dean, Faculty of Science | | | New Delhi 110062 | | 608 8874 |
| 8 | Dr Renu Swarup | Secretary, DBT | Genetics and Plant Engineering | Department of Biotechnology | Department of Biotechnology<br>Block 2, 7th Floor C G O Complex, Lodhi Road New Delhi 110 003 | swarup@dbt.nic.in | Phone: 91-11-24360064<br>24362950.<br>24362881.<br>24360747 |
| 9 | Dr. Niranjan Chakraborty | FNA, FNASc, FNAAS Professor of Eminence | Plant Molecular Biology | NIPGR | NIPGR, Aruna Asaf Ali Marg, New Delhi, Delhi 110067 | nchakraborty@nipgr.ac.in, nchakraborty@hotmail.com | 91-11-26735178<br>91-11-26742658 |
| 10 | Dr Paramjit Khurana | Head & Professor<br>DPMB | Plant Biotechnology and Genomics | Department of Plant Molecular Biology<br>South Campus | Department of Plant Molecular Biology<br>South Campus<br>New Delhi - 110021 | param@genomeindia.org; paramjitkhurana@hotmail.com | Mobile: 9711006512 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11 | Prof N. Raghuram | Professor and Former Dean | Functional Genomics & molecular biology | School of biotechnology, GGS IP University, | School of biotechnology, GGS IP University, Secor 16C, Dwarka New Delhi-110075 | raghuram98@hotmail.com | Phone (Office): 91-11-25302308<br>Mobile: 9891252943 |
| 12 | Dr. Debasisa Mohanty | Staff Scientist, NII | Bioinformatics & Computational Biophysics; Prediction of structure and function of proteins; In silico analysis of genomes; Computer simulation of biomolecular systems | NII | National Institute of Immunology<br>Aruna Asaf Ali Marg,<br>New Delhi - 110067,<br>India | deb@nii.res.in | 91-11-26717121 |
| 13 | Professor Sheela Shrivastava | Professor | Microbiology, Molecular Biology | Department of Genetics, University of Delhi South Campus, New Delhi-110 021 | Department of Genetics, University of Delhi South Campus, New Delhi-110 021 | srivastava_sheela@yahoo.com | 9899208715 |
| 14 | Professor Samudrala Gourinath | Professor | Structural Biology, Protein chemistry | School of Life Sciences, Jawaharlal Nehru | School of Life Sciences, Jawaharlal Nehru University, New | sgourinath@mail.jnu.ac.in | 011-26704513 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | University, New Delhi | Delhi 110067 | | |
| 15 | Professor Rup Lal | Professor and NASI Senior Scientist Platinum Jubilee Fellow | Microbiology, Molecular Biology | The Energy and Resources Institute (TERI), Lodhi Road, New Delhi | The Energy and Resources Institute (TERI), Lodhi Road, New Delhi-110003 | ruplal@gmail.com | 9810785766 |

**Enclosure 2**

## Anomaly in the course credits and teaching weeks

**14.0 Teaching Days**

**14.1** The Universities/Colleges must have at least 180 teaching, i.e., there should be a minimum of 30 weeks of actual teaching in a 6-day week. Of the remaining period, 12 weeks may be devoted to admission and examination activities, and non-instructional days for co-curricular, sports, college day, etc., 8 weeks for vacations and 2 weeks may be attributed to various public holidays. If the University adopts a 5 day week pattern, then the number of weeks should be increased correspondingly to ensure the equivalent of 30 weeks of actual teaching, with a 6-day week.

The above provision is summarised as follows:

| | **Number of weeks : 6-days a week pattern** | | **Number of weeks : 5-days a week pattern** | |
|---|---|---|---|---|
| **Categorisation** | **University** | **College** | **University** | **College** |
| **Teaching and Learning Process** | 30 (180 days) weeks | 30 (180 days)weeks | 36 (180 days) weeks | 36 (180 days) weeks |
| **Admissions, Examinations, and preparation for Examination** | 12 | 10 | 8 | 8 |
| **Vacations** | 8 | 10 | 6 | 6 |
| **Public Holidays (to increase and adjust teaching days accordingly)** | 2 | 2 | 2 | 2 |
| **Total** | 52 | 52 | 52 | 52 |

**14.2** In-lieu of the curtailment of vacation by 2 weeks, the university teachers may be credited with $1/3^{rd}$ of the period of their earned leave. However, colleges may have an option of a total vacation of 10 weeks in a year and no earned leave except when required to work during the vacations for which, as in the case of University teachers, $1/3^{rd}$ of the period shall be credited as Earned Leave.

**Enclosure 3**

## Copy of UGC notification for extension and the list of doctoral scholars

ज्ञान-विज्ञान विमुक्तये

प्रो. रजनीश जैन
सचिव
**Prof. Rajnish Jain**
**Secretary**

सत्यमेव जयते

विश्वविद्यालय अनुदान आयोग
**University Grants Commission**
(शिक्षा मंत्रालय, भारत सरकार)
(Ministry of Education, Govt. of India)
बहादुरशाह जफ़र मार्ग, नई दिल्ली-110002
Bahadur Shah Zafar Marg, New Delhi-110002
Ph :. 011-23236288/23239337
Fax : 011-2323 8858
E-mail : secy.ugc@nic.in

No.F.1-10/2020(CPP-II)

3rd December, 2020

**PUBLIC NOTICE**

**Extension of date for submission of thesis for terminal M.Phil/Ph.D students**

The University Grants Commission has issued **Guidelines on Examination and Academic Calendar for the Universities in view of COVID-19 Pandemic and subsequent Lockdown** on 29th April, 2020. As per these Guidelines, extension of six months was conveyed for M.Phil/Ph.D students who were to submit their Dissertation/Thesis by 30th June, 2020.

Due to COVID-19 Pandemic, the universities have remained closed for the past several months. Therefore, the students have not been able to conduct their research/experiments in the university laboratories nor they were able to access library services that are critical for completion of thesis.

In view of the above and in the larger interest of the research scholars, a further extension of six months for terminal M.Phil/Ph.D students, who were supposed to submit their thesis by 31st December, 2020, may be granted by the universities i.e. till 30th June, 2021. Extension of six months, as mentioned above, may also be granted for submitting evidence of publication and presentation in two conferences. However, the tenure of fellowship of M.Phil/Ph.D will be the same (5 years).

(RAJNISH JAIN)

ज्ञान-विज्ञान विमुक्तये

प्रो. रजनीश जैन
सचिव
Prof. Rajnish Jain
Secretary

सत्यमेव जयते

विश्वविद्यालय अनुदान आयोग
University Grants Commission
(शिक्षा मंत्रालय, भारत सरकार)
(Ministry of Education, Govt. of India)
बहादुरशाह जफ़र मार्ग, नई दिल्ली-110002
Bahadur Shah Zafar Marg, New Delhi-110002
Ph :. 011-23236288/23239337
Fax : 011-2323 8858
E-mail : secy.ugc@nic.in

**F.No. 1-10/2020(CPP-II)** **16th March, 2021**

## PUBLIC NOTICE

## Extension of date for submission of theses for terminal M.Phil/Phd. Students

In continuation to UGC Public Notice dated 3rd December, 2020 on the above mentioned subject, and keeping in view the larger interest of the research scholars, a further extension of six months beyond 30.06.2021, i.e., till 31st December 2021, for submission of thesis by M.Phil/Ph.D students may be granted by the Universities. Extension of six months, as mentioned above, may also be granted for submitting evidence of publication and presentation in two conferences. However, tenure of fellowship will remain upto five years only.

**(Rajnish Jain)**

**List of Students**

| S. No. | Name of the Student | Roll No. | Department | Due date for Thesis submission |
|---|---|---|---|---|
| 1 | Sonia Grover | 1226RNB | Department of Natural Resources | 30-Jun-21 |
| 2 | Nidhi Gautam | 1236RPB | Department of Business and Sustainability | 30-Jun-21 |
| 3 | Pradeep Vashisht | 1307RNA | Department of Natural Resources | 30-Jun-21 |
| 4 | Swati Singh | 1312RNA | Department of Natural Resources | 30-Jun-21 |
| 5 | Varsha Srivastava | 1336REB | Department of Energy and Environment | 30-Jun-21 |
| 6 | Md Ziauddin | 1337RPB | Department of Energy and Environment | 30-Jun-21 |
| 7 | Sahaj Kaur | 1406RNA | Department of Natural Resources | 30-Jun-21 |
| 8 | Sangeeta Agasty | 1410RSA | Department of Regional Water Studies from Department of Business and Sustainability on 30 July 2020 | 30-Jun-21 |
| 9 | Dharmesh Kumar Singh | 1415RNA | Department of Natural Resources | 30-Jun-21 |
| 10 | Lokesh Chandra Dube | 1416RNA | Department of Natural Resources | 17-Jul-21 |
| 11 | N K Ram | 1418REA | Department of Energy and Environment | 30-Jun-21 |
| 12 | Vivek Kumar Singh | 1422RBA | Department of Biotechnology | 30-Jun-21 |
| 13 | Anjulata Singh | 1432 RBB | Department of Biotechnology | 04-Jul-21 |
| 14 | I V Rao | 1436 RSB | Department of Energy and Environment | 19 Jun 2021 |
| 15 | Akanksha Balha | 1502RNA | Department of Energy and Environment | 20 Jul 2021 |

| S. No. | Name of the Student | Roll No. | Department | Due date for Thesis submission |
|---|---|---|---|---|
| 16 | Charu Bhanot | 1505RNA | Department of Natural Resources | 20 Jul 2021 |
| 17 | Tanya Sharma | 1515RNA | Department of Energy and Environment | 20 Jul 2021 |
| 18 | Kamlesh Yadav | 1517REA | Department of Energy and Environment | 20 Jul 2021 |
| 19 | Renu | 1519REA | Department of Energy and Environment | 20 Jul 2021 |
| 20 | Lalit Sharma | 1522RPA | Department of Energy and Environment | 20 Jul 2021 |
| 21 | Rishika Singh | 1526RPA | Centre for Post Graduate Legal Studies | 20 Jul 2021 |
| 22 | Yogesh Tyagi | 1527RPA | Department of Energy and Environment | 20 Jul 2021 |
| 23 | Gurdeep Kaur | 1528RBA | Department of Biotechnology | 20 Jul 2021 |
| 24 | Swati Patel | 1530RBA | Department of Biotechnology | 20 Jul 2021 |
| 25 | Himanshu Arora | 1533RSA | Department of Energy and Environment | 20 Jul 2021 |
| 26 | Arun Pratap Golaya | 1535RNB | Department of Natural Resources | 27 Aug 2021 |
| 27 | Ashmeet Kaur | 1540RPB | Department of Policy Studies | 17 Sep 2021 |
| 28 | Snigdha Goel | 1610REA | Department of Regional Water Studies | 22 Jul 2021 |
| 29 | Amit Pandey | 1700524RSP | Department of Policy Studies | 30 Oct 2021 |

**Enclosure 4**

**New course outlines**

| | | | |
|---|---|---|---|
| **Course title: Infrastructure Development: Issues and Options** | | | |
| **Course code:** | **No. of credits:** 2 | **L-T-P:** 22-6-0 | **Learning hours:** 28 |
| **Department:** Policy Studies | | | |
| **Course coordinator:** | | **Course instructor:** | |
| **Contact details:** | | | |
| **Course Type:** Core | | **Course offered in:** Semester 2 | |
| **Pre-requisite course code and title (if any):** None | | | |

**Course Description**

The Course is designed to familiarise the students with the issues and challenges of developing infrastructure in India. The course, *inter alia*, includes a critical analysis of the development of four vital infrastructure sectors namely transport, energy, telecommunication and water. Infrastructure sector considered a prerequisite to achieve social and economic development faces several challenges like scarcity of public funds, land and other resources, environmental issues, governance, and regulatory issues etc. The innovative measures adopted to overcome current difficulties will be discussed through case studies.

**Course objectives**

- Review the existing status of infrastructure as a whole, and the extant polices relating to infrastructure development in India and other developing countries
- Identify the inadequacies in different infrastructure sectors and the policy changes required to facilitate rapid infrastructure development.
- Discuss new methods employed in addressing issues particularly relating to sustainability and regulatory practices
- Discuss the role of public private participation in financing of infrastructure.

**Course content**

| | Topic | L | T | P |
|---|---|---|---|---|
| **1** | **Infrastructure Development: Emerging issues**<br>• Definition of infrastructure<br>• The inter-relationship between the infrastructure and economic and social development.<br>• Typical problems in infrastructure development such as designing appropriate projects, funding the projects, identifying and obtaining the human resources required for implementing the project efficiently, then ensuring the delivery of infrastructure services in a cost-effective manner.<br>• The importance of appropriate public policy and governmental involvement in infrastructural development.<br>• Role of central, state and local governments for infrastructure development.<br>• The role of private investment (foreign and domestic) in the development of infrastructure.<br>• International experience in development of major infrastructure. | 6 | 2 | |
| **2** | **Funding of Infrastructure** | 6 | 2 | |

| | | | | |
|---|---|---|---|---|
| | • Funding of infrastructure<br>• Public Private Participation<br>• Establishment of specific companies (SPVs) to develop and implement projects.<br>• Development of debt markets.<br>• Role of multilateral and bilateral agencies in infrastructure growth in developing countries | | | |
| **3** | **Regulation of Infrastructure services.**<br><br>• The need for independent regulation of infrastructure to ensure equity, quality, cost effective pricing, a level playing field for investors and consumer satisfaction.<br>• The evolution of independent regulation in India.<br>• The framework of independent regulation in different sectors in India and the variation of important legal provisions relating to the scope of regulation and the independence of the regulators.<br>• The impact of regulation on performance of the utilities. | 4 | 2 | |
| **4** | **Infrastructure and Sustainability**<br><br>• Sustainability issues in infrastructure development<br>• Land, forest and other environmental concerns<br>• Green growth, judicious use of natural resources<br>• Low carbon technologies in transport and energy<br>• Incorporation of SDGs in infrastructure policies | 4 | | |
| | **Total** | **22** | **6** | |

**Evaluation Criteria:**

The evaluation will be done based on individual and group assignments and a major examination:

- **Test-1:** *Individual Assignment (40%)*

These assignments are designed to assess students' understanding, evaluating, and writing based on individual research pertaining to public policy perspectives on a wide range of infrastructure sectors better understand critical issues and policy alternatives to sustainable infrastructure development

- **Test-2**: *Group Project Work (20%)*

Group projects help students better learn course concepts and applications, develop and engage in cooperative processes to tackle real world problems affecting sustainability. The learning outcome include higher-level reasoning skills, increased willingness to take on and accomplishing more difficult tasks. Furthermore, these benefits extend beyond the classroom as the practices and skills are put into practice for the community, career, and personal aspects of their lives.

- **Test-3**- *Major Examination (40%)*

There will be a final examination at the end of the semester covering the whole syllabus and contents discussed under each module. Course instructor has the freedom to draft the questions based on contemporary practical issues on sustainability law and governance and its relevance in the various infrastructure sectors.

**Learning outcomes**

The expected learning outcome is enhanced critical and informed understanding of infrastructure development in India and other developing countries. At the end of the course, the participants

would be able to

- Critically reflect on the challenges in the development of sustainable infrastructure (Evaluation: Tests 1, 2&3)
- Achieve a level of well-informed professional so that he contributes to the delivery of infrastructure development and management (Evaluation: Tests 1, 2 &3)

**Pedagogical approach**

Instructions will be facilitated through lectures, interactive sessions based on cases studies and critical readings. The sessions will be based on relevant policy perspectives where lectures will be followed by case study-based discussions and group presentations by the participants.

**Materials:**

**Required text:**

**Main readings:**

**Compulsory:**

1. Piyush Joshi, (2003). Law relating to Infrastructure Projects (Second edition) LexiNexus Butterworths India New Delhi (Module 1)
2. Delmon, Jeffrey. (2011) Public Private Partnership projects in Infrastructure: An essential guide for policy makers, Cambridge University Press (Module 2)
3. Mehta, Pradeep S, (2009). Developing infrastructure through an ideal regulatory framework, CUTS Institute for regulation and Competition (Module 3)
4. Fay, Marianne and Toman, Michael (2010). Infrastructure and Sustainable development, World Bank (Module 4)

**Suggested:**

5. Shilling, John D (2007). The Nexus between Infrastructure and Environment, Evaluation brief World Bank
6. Hawkesworth, Ian (2015), Towards Framework for the governance of Infrastructure, OECD

**Case Studies:** Will be selected based on the professional background of the students and relevance of the case studies for them.

**Websites:** Ministry of Finance, Department of Economic Affairs; Niti Aayog; World Bank

**Journals:** The Economic and Political Weekly, The Economist

**Other readings:** Policy Papers of Government of India and other relevant reports published from time to time

**Additional information (if any):** None

**Student responsibilities:**

1. Active participation in the processes of Learning
2. Critical reflections for discourse creation
3. Punctuality (according to the Course criterion)

**Course reviewers**

1. Mr. S. Sundar, Distinguished Fellow Emeritus, TERI, New Delhi and former Secretary Transport, Government of India.
2. Dr Ashwani Kumar, PhD, Chief Operations Manager, Northern Railway, Baroda House, New Delhi

| **Course title: Public Health: approaches, issues and policy perspectives** | | | |
|---|---|---|---|
| **Course code:** | **No. of credits: 2** | **L-T-P: 24-04-00** | **Learning hours: 28** |
| **Pre-requisite course code and title (if any):** None | | | |
| **Department/Centre:** Department of Policy Studies | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type**: Core | | **Course offered in**: Semester 2 | |

**Course description**

This course is designed to provide the candidate a basic understanding of fundamental concepts, approaches and policy issues in the area of public health. Ensuring good health and wellbeing of human population is considered as the cornerstone of development. The public health initiatives affect people every day in every part of the world. It addresses broad issues that can affect the health and well-being of individuals, families, communities, populations, and societies—both now, and for generations to come. This course aims to adorn students with enriched comprehension on the public health related issues, with special reference to India, as well as evidence-based health planning and policymaking.

**Learning objectives:**

- To orient the students on the fundamentals of public health.
- To provide the students a fair understanding on the contemporary key public health challenges in India and recent policy efforts to address those challenges.
- To help students develop an understanding on the organization of and reforms in health care systems, public health planning and policymaking.

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | **Public Health: Key Concepts, Approaches, Frameworks and Measures**<br>This module aims to orient the candidates on the basic concepts, objectives, evolution, core principles and activities of public health, along with the political economy of health. A political economy analysis shows how political, social, and economic factors are entwined at societal, community, and household levels to produce health or ill health in individuals. Major discussions in this module include:<br>▪ Public Health: Definition, Role, Core Principles and Activities<br>▪ Evolution of Public Health<br>▪ Political Economy of Health (and Development) : Approaches to understanding Health and Disease; Global Health Framework<br>▪ Empirical Public Health: Usage and limitations of Population Health Data; Commonly used Health Indicators<br>▪ Health Equity and Societal Determinants of Health | 8 | | |
| 2. | **Public Health Issues in India**<br>This module would discuss the trends and patterns of key health indicators relevant from the perspective of Sustainable Development Goal (SDG) -3 in Indian context. In addition, the respective public health programmes and interventions addressing those issues will be discussed. Specific points of discussion will include:<br>▪ Recent trends and patterns of key public health challenges in India<br>▪ Importance of social determinants of health in India's context and its | 8 | 2 | |

| | | | | |
|---|---|---|---|---|
| | policy relevance<br>▪ Major Contemporary Health Schemes and Programmes as case studies (subject to change as per the Government's focus/priority): for example – National Health Mission, Integrated Child Development Services (ICDS) Scheme, *Janani Suraksha Yojana* and its modified/allied schemes or programmes, *Ayushman Bharat* Scheme, POSHAN *Abhiyaan*, etc. | | | |
| 3. | **Policy Perspectives**<br>This module would discuss the prerequisites for comprehending evidence-based public health planning and policymaking; and would specifically focus on the following:<br>▪ Understanding and Organizing Health Care Systems: Principles of Health Care Systems; Health Care System Archetypes; Primary Health Care, its renewal, and the turn to Universal Health Coverage; Approaches to improving the Performance of Health Systems<br>▪ Health Policy and Planning: Policy Cycle – Assessment of Population Health, Assessment of Potential Interventions, Policy Choices, Policy Implementation, Policy Evaluation | 8 | 2 | |
| | | **24** | **4** | |

**Evaluation criteria:**

**Test-1:** Critical Review of Literature (35%);

a. Task: Develop a small piece (Review Paper) based on a critical appraisal of literature on any topic listed in the syllabus or in consultation with the Course-Coordinator.

b. Structure of the assignment: A detailed guideline on the structure of the review paper will be provided by the Course-Coordinator.

c. Indicators of assessment: selection of appropriate literature (weightage: 5%); clear and concise summaries (weightage: 30%); critique based on student's own assessment or based on literature (weightage: 40%); effective introduction and conclusion (weightage: 10%); well-structured essay with no grammatical errors (weightage: 10%); and appropriate format of citations and references (weightage: 5%).

**Test-2:** Group Presentation and Discussion (25%);

a. Task: Prepare a group of 2-3 students (subject to change based on the total number of students in the course); select any topic based on contemporary public health or health policy issues in India in consultation with the Course-Coordinator; conceptualize, develop, present and discuss the selected issue in group.

b. Structure of the presentation: Outline of the issue/topic; relevance of the issue in the current scenario; adequate background of the issue with relevant facts and figures; existing challenges and opportunities supported by evidences, logical arguments and experiences; way forward.

c. Indicators of assessment: selection of the contemporary issue (weightage: 10%); conceptualization, outlining and division of sections among the group members (weightage: 10%); content of the presentation (weightage: 40%); effective introduction and conclusion (weightage: 10%); well-conceptualized presentation slides (weightage: 10%); and responses to the questions raised by the audience (weightage: 20%).

**Test-3:** Written Test (40%); after the completion of the full syllabus, the final written test will be conducted. The structure of the major/final test will follow both short- and long-answer type questions.

**Learning outcomes**

After completing this course, the candidates would be able to:

1. understand the fundamental concepts, approaches, framework and key measures related to population health. (Evaluation: All components)
2. comprehend the patterns of key population health indicators, transitions there in and respective policy efforts made by the Indian Government. (Evaluation: All components)
3. understand the process of developing evidence-based public health planning and nuances of policymaking. (Evaluation: All components)

**Pedagogical approach**

Discussions on core concepts, approaches, measures, and health scenarios will be mainly facilitated through lectures and interactive sessions. Assignments and exercises will follow the discussions and would mainly be focused on developing the health profile and policy issues with special reference to India. Group presentation being an integral part of the curriculum would also enrich the participative learning process.

**Suggested Readings**

**Module 1:**

- Sen A (1999). Health in Development. *Bulletin of the World Health Organization*, 77(8): 619-623.
- Evans DB (2009). 'Health and Development: an Economic Perspective'. In Gatti A and Boggio A (Eds.) *Health and Development: Toward a Matrix Approach*. New York: Palgrave Macmillan.
- Bhalwar RV, Vaidya R, Tilak R, Gupta R, Kunte R (Eds.) (2009). *Textbook of Public Health and Community Medicine*. Pune: Department of Community Medicine, AFMC, in collaboration with WHO, India Office, New Delhi.
    - Chapter -1: Introduction, Definitions & General Concepts in Public Health & Community Medicine, by *RajVir Bhalwar, Mandeep Singh, J. Jayaram*
    - Chapter -2: History of Public Health, by *Leo S. Vaz*
- Birn AE, Pillay Y, Holtz TH (2017). *Textbook of Global Health*. New York: Oxford University Press.
    - Chapter -3: Political Economy of Health and Development
    - Chapter -7: Health Equity and The Societal Determinants of Health
- Skolnik R (2021). *Global Health 101*, Fourth Edition. Burlington, MA: Jones & Bartlett Learning.
    - Chapter -1: The Principles and Goals of Global Health
    - Chapter -2: Health Determinants, Measurements, and the Status of Health Globally
    - Chapter -3: The Global Burden of Disease
    - Chapter -6: An Introduction to Health Systems
- Jacobsen KH (2014). *Introduction to Global Health,* Second Edition. Burlington, MA: Jones & Bartlett Learning.
    - Chapter -1: Global Health and Health Transition
    - Chapter -2: Measuring the Global Burden of Disease
- Smith S, Sinclair D, Raine R, Reeves B (2005). *Health Care Evaluation*. Berkshire: Open University Press.
    - Chapter -1: Introduction to Health and Health care
    - Chapter -3: Measuring Disease
    - Chapter -4: Measuring Health Status and Health-related Quality of Life
- McCracken K, Phillips DR (2012). *Global Health: An introduction to current and future*

*trends*. New York: Routledge.
    - Chapter -1: Global Health: An Introduction
    - Chapter -2: Measuring Population Health and Disease
    - Chapter -3: The Determinants of Population Health
- WHO (2010). A Conceptual Framework for Action on the Social Determinant of Health. Social Determinants of Health Discussion Paper 2. Debates, Policy & Practice, Case Studies. Geneva: World Health Organization (WHO).

**Module 2:**

- Balarajan Y, Selvaraj S, Subramanian SV (2011). Health care and equity in India. *The Lancet*, *377*(9764), 505-515.
- Fan VY, Mahal A (2011). Learning and getting better: rigorous evaluation of health policy in India. *The National Medical Journal of India*, *24*(6), 325-327.
- Nandi A, Ashok A, Laxminarayan R (2013). The socioeconomic and institutional determinants of participation in India's health insurance scheme for the poor. *PloS one*, *8*(6), e66296.
- National Health Policy 2017, Ministry of Health and Family Welfare, Govt. of India, 2017.
- Patel V, Parikh R, Nandraj S, Balasubramaniam P, Narayan K, Paul VK, Kumar AS, Chatterjee M, Reddy KS (2015). Assuring health coverage for all in India. *The Lancet, 386*(10011), 2422-2435.
- Rao KD, Ramani S, Hazarika I, George S (2013). When do vertical programmes strengthen health systems? A comparative assessment of disease-specific interventions in India. *Health policy and planning*, *29*(4), 495-505.

**Module 3:**

- Birn AE, Pillay Y, Holtz TH (2017). *Textbook of Global Health*. New York: Oxford University Press.
    - Chapter -4: Global Health Actors and Activities
    - Chapter -11: Understanding and Organizing Health Care Systems
    - Chapter -13: Building Healthy Societies
- Brown GW, Yamey G, Wamala S (Eds.) (2014). *The Handbook of Global Health Policy*. West Sussex: John Wiley & Sons, Ltd.
    - Chapter -1: Understanding Global Health Policy by *Ruairí Brugha, Carlos Bruen, Viroj Tangcharoensathien*
    - Chapter -3: Contemporary Global Health Governance: Origins, Functions, and Challenges by *Rajaie Batniji, Francisco Songane*
- Goldsteen RL, Goldsteen K, Dwelle TL (2015). *Introduction to Public Health: Promises and Practices*, Second Edition. New York: Springer Publishing Company, LLC.
    - Chapter -6: Public Health System Performance
- McCracken K, Phillips DR (2012). *Global Health: An introduction to current and future trends*. New York: Routledge.
    - Chapter -8: Health Systems, Finance and Planning
- Skolnik R (2021). *Global Health 101*, Fourth Edition. Burlington, MA: Jones & Bartlett Learning.
    - Chapter -6: An Introduction to Health Systems
- Smith S, Sinclair D, Raine R, Reeves B (2005). *Health Care Evaluation*. Berkshire: Open University Press.
- Spasoff RA (1999). *Epidemiologic Methods for Health Policy*. New York: Oxford University Press.

**Additional information:** None

**Student responsibilities**

- Active participation in the processes of Learning
- Critical reflections for discourse creation
- Punctuality (according to the Course criterion)

**Course reviewers**

1. **Dr. Mira Johri**, Professor, Department of Health Management, Evaluation and Policy, School of Public Health, University of Montreal, Canada.
2. **Dr. Manoj Alagarajan,** Assistant Professor, International Institute for Population Sciences, Mumbai.

| | | | |
|---|---|---|---|
| **Course title: Qualitative research methodology for urban studies** | | | |
| **Course code:** | **No. of credits:** 2 | **L-T-P:** 18-6-8 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** none | | | |
| **Department:** Department of Energy and Environment | | | |
| **Course coordinator:** | | **Course instructor:** | |
| **Contact details:** | | | |
| **Course type:** Core | | **Course offered in:** Second Semester | |

**Course description:**

This course is designed to introduce students to the process of research as an academic activity, and methods used in undertaking it in the domain of urban studies. The focus of this course is on Qualitative Methods to complement learning of quantitative techniques taught in the first semester. This course is designed to equip students of urban development management with knowledge and skills required to develop, plan, and carry out research work both as a standalone activity and/or as a part of course and work-related assignments. Thus, this course will help towards developing comprehensive understanding of qualitative methods employed in empirical research involving a systematic collection of data, analysis, interpretation, and writing. Entire course delivery will be dependent on selection of an urban space; by the class or groups of students and a documentation of its functions and users/inhabitants. All tutorials and practical exercises will be structured around the chosen urban space/area/neighbourhood. The course will also sensitise students towards research ethics.

**Course objectives:**

- To develop research appreciation among students by introducing them to the process of conducting research
- To train students in using tools for qualitative data collection and employing appropriate techniques for undertaking qualitative analysis in the domain of urban studies.
- To enable students to apply these skills for preparing research outputs like research proposal, papers, and dissertation.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1 | **Introduction to Qualitative Research**<br>• Types of research, their distinctions and complementarity – quantitative, qualitative, mixed methods<br>• Epistemological foundations of qualitative research<br>• Significance of qualitative research in urban studies<br>• Ethical considerations in research | 2 | | |
| 2 | **Qualitative Research Process**<br>• Identifying and defining a research problem<br>• Developing research objectives and questions<br>• Conducting review of literature<br>• Selection of an urban space/area/neighbourhood<br>• Sources of data and choice of methods for data collection<br>• Scope and limitations of research<br>• Expected outcomes of research | 8 | 2 | |
| 3 | **Methods and Tools of Qualitative Data Collection and Generation** | 4 | 2 | 8 |

| | | | | |
|---|---|---|---|---|
| | • Sourcing of secondary urban sector data from Census of India; Gazetteers, Statistical Handbooks; Reports etc.<br>• Primary data collection and generation through:<br>  • Field work/survey of an urban space/area/neighbourhood – Observation, Transect Walk for mapping on-ground features, resource mapping, stakeholder mapping, photo-documentation, ethnography and participant observation.<br>  • Open-ended questionnaire<br>  • Interviews and narratives<br>  • Focus Group Discussions (FGDs) | | | |
| **4** | **Content Analysis, Presentation and Writing**<br>• Steps in categorization of qualitative data for analysis<br>• Analysing and interpreting data, texts, documents for abstraction of meaningful results<br>• Presentation of results<br>• Research writing | 4 | 2 | |
| | **Total** | **18** | **6** | **8** |

**Evaluation criteria:**

The evaluation is based on application of learning from Modules 2, 3 and 4 comprising three distinct components, *viz*. tutorial based exercises; field work-based assignments and a final output - draft research proposal based on overall learning from the course (all Modules).

**Type and Weightage (%)**

All are written submissions:

Test 1: 20%, Written Assignment, Identification of thematic, defining a research problem, research objectives, and research questions, Evaluation linked to learning from Module 1&2.

Test 2: 30%, Written Assignment and Presentation; Review of literature, devising research methodology and presentation of collected qualitative data. Evaluation linked to learning from Module 2&3.

Test 3: 50%, Written Report (5000 words); A Research Proposal including Introduction, review of literature, research methodology, expected outcomes and references in about 5000 words. Evaluation linked to all modules.

**Learning outcomes:**

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

1. Develop research temperament to identify, formulate and solve research problems (Evaluation criterion 1 and 2)
2. Advance their understanding about qualitative research methods and their application in urban studies (All evaluation criterion)
3. Gain competence in designing an urban research study using qualitative techniques of data collection and generation (Evaluation criterion 2 and 3)
4. Become proficient in use of mixed methods for better outcomes in complex situations. In addition,

they would be able to produce academically rigorous Dissertations as part of Major Project internships and other research outputs like proposals, papers, reports (Evaluation criteria 3)

**Pedagogical approach:**

The course is delivered through a mix of lectures and discussions. A significant component of learning is derived from practical sessions including tutorials (preparation of checklists, open-ended questionnaires, role play, group exercises) and field work conducted on a chosen urban space/area/neighbourhood. This entails active student participation, thereby enhancing their competencies.

Practical exercises: Identification of a suitable urban space which could be a residential neighbourhood, commercial artery, cultural spaces, public spaces and conducting field work for data collection and generation using different methods (Module 3)

Tutorial 1: Identifying research problems, designing research questions and objectives (Module 2)

Tutorial 2: Preparing checklist of questions for conducting interviews, discussions and FGDs (Module 3)

**Materials:**


1. Bryman, Alan (2012): Social Research Methods, Oxford University Press, New Delhi
2. Coffey, Amanda (1996) Making Sense of Qualitative Data: Complementary Research Strategies, Sage Publications, California
3. Corbetta, P. (2003): Social Research, Theory, Methods and Techniques, Sage Publications, New Delhi
4. Cresswell, J.W. (2014): Research Design: Qualitative, Quantitative and Mixed Method Approach, Sage Publications, New Delhi
5. Czaja, R. and Blair, J. (2005): Designing Surveys: A Guide to Decisions and Procedures, Pine Forge, Thousand Oaks
6. Denzin, Norman K. and Lincoln, Yovonna S. Eds. (2011): The Sage Handbook of Qualitative Research, Sage Publications, Los Angeles, Chapters 4, 5, 17, 29, 32, 33
7. Flick, Uwe Ed. (2014): The Sage Handbook of Qualitative Data Analysis, Sage Publications, New Delhi
8. Groves, RM., et.al. (2009): Survey Methodology, John Wiley & Sons, Hoboken
9. Guthrie, Gerard (2010): Basic Research Methods: An Entry to Social Science Research, Sage Publications, New Delhi
10. Hammett, Daniel (2015): Research and Fieldwork in Development, Routledge, London
11. Kothari, C.R. (2004): Research Methodology, Methods and Techniques, New Age International Private Limited Publishers, New Delhi
12. Misra, R.P. (1988): Research Methodology: A Handbook, Concept Publishing Company, New Delhi
13. Patton, Michael Quinn (1990): Qualitative Evaluation and Research Methods, Sage Publications, California, Chapters 5, 6, 7, 8
14. Sarantakos, S. (1998): Social Research, Macmillan Press, London
15. Silverman, D. (2006): Interpreting Qualitative Data: Methods for Analyzing Talk, Text and Interaction, Sage Publications, London
16. Srivastava, Vinay Kumar Ed. (2005): Methodology and Fieldwork (Oxford in India Readings in Sociology and Social Anthropology), Oxford University Press, New Delhi
17. Walliman, N. (2011): Research Methods: The Basics, Routledge, London

18. Yin, Robert K. (2009): Case Study Research: Design and Methods, Sage Publications, London

Please note: For data related to population of India, refer to the Census of India data sets available at http://censusindia.gov.in/

**Additional information (if any):NA**

**Student responsibilities:**
Attendance, feedback, discipline: as per TERI SAS rules.

**Course Reviewers:**

Professor Ravinder Kaur, Department of Geography (CAS), Panjab University, Chandigarh

Dr Nira Ramachandran, Independent Researcher and formerly ICSSR Senior Fellow, Institute of Economic Growth, New Delhi

| | | | |
|---|---|---|---|
| **Course title:** Transport and Climate Change | | | |
| **Course code:** | **No. of credits:** 3 | **L-T-P:** 28-14-0 | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** Basic statistics | | | |
| **Department**: Energy and Environment | | | |
| **Course coordinator**: | **Course instructor**: | | |
| **Contact details**: | | | |
| **Course type**: Elective | **Course offered in**: Semester 2 | | |

**Course description:**

Transport sector alone contributes to 22% - 25% of the overall $CO_2$ emissions globally and same percentage of energy is consumed by the sector. Although in India, transport's sector consumption of energy and contribution to $CO_2$ emissions per capita is low, however the same has been rising with rising income and urbanization. This has accentuated the need to meet the travel demands using energy efficient modes of transport. Technological improvements along with policy frameworks can help in minimizing the impact of transport sector on environment in India and globally. Climate change and its impact on weather and sudden disastrous events have also been increasing over years. This is not only increasing the vulnerability of infrastructure but also of population. There is a need to understand the linkages between transport and climate change to enable identification and implementation of mitigation and adaptation strategies. This will help in achieving sustainable development and minimizing the risk associated with climate change to the environment, infrastructure and society. The course aims to equip the students with the relevant methods, tools and techniques along with acumen on understanding the linkage between transport and environment. It will discuss and provide hands-on learning of environmental impact models specifically relevant in transport sector. The course will provide students with case-studies from India and other developed and developing countries to understand the strategy and policies relevant to minimize the negative impact of transport on environment and vice-versa.

**Course Objectives:**

1. To understand the impact of transport on climate change and vice-versa
2. To develop skills in modelling impact of transport on environment and climate change
3. To gain perspective and develop acumen on integrating climate change with transport policies and strategies
4. To learn vulnerability assessment techniques and methods

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | **Transport and climate change: need for low carbon mobilities and adaptation**<br>• Transport and mobility: current trend and threats<br>• Transport and its impact on energy, environment and climate change<br>• Climate change events and its impact on transport: a global perspective | 6 | 0 | 0 |
| 2. | **Modelling impact of transport on environment**<br>• Energy consumption parameters<br>• Modeling impact of transport on emissions<br>• Line source dispersion models<br>• Measuring impact on land consumption and waste generation | 6 | 4 | |
| 3. | **Strategies to mitigate impact of transport on environment**<br>• Mitigation strategies (infrastructure, behaviour and technology - avoid, shift and improve paradigm recent examples in debate-telecommuting, share ride services, electric mobility and integrated land use transport planning) | 6 | 6 | |

| | | | | |
|---|---|---|---|---|
| | • Low carbon fuels, clean vehicle technology and emission factors<br>• Regulatory frameworks and policies for mitigating impact (examples include - vehicle scrapping and polluters pay principal) | | | |
| 4. | **Adapting transport to climate change**<br>• Risk assessment of climate change events on transport system performance-behaviour, road safety, accessibility, mobility and infrastructure integrity<br>• Vulnerable infrastructure and dependent population<br>• Adaptation strategies (examples can include - infrastructure design, demand management, routing and space and urban form management) | 8 | 6 | |
| | | **28** | **14** | |

**Evaluation Criteria:**

Assignments: 20% [Module 1 and Module 2] – The assignment will be based on literature review to be conducted by students. The aim is to expose them to the linkage between transport and climate change, need for mitigation and adaptation policy and the application of models to measure impact of transport on environment in varied geographical context.

Project work: 40% [Module 3 and Module 4] – Life size projects involving evaluation of impacts on environment and impact of climate change on transport infrastructure and behavior leading to designing integrated strategies addressing transport, environment and climate change will be done. The students will formulate the methodology for analysis and conduct the analysis using the introduced tools to identify the issues, challenges and set of recommendations to minimize the impact of transport on environment, climate change and vice-versa.

Test 3: 40% [all modules] - Written test

**Learning outcomes**

On successfully completing this course the students will be able to:

- Assess the impacts of transport on climate change
- Assess the impacts of climate change on transport infrastructure and population vulnerability.
- Examine and appraise transport plans and strategies for impacts on and/or of climate change

**Pedagogical approach**:

The course will be delivered through classroom teaching, research-based discussions, case-study discussions of both successful and unsuccessful practices and tutorials.

**Module wise reading list**

- **Module 1**
  - Hensher, D.A. and Button, K.J., 2003. *Handbook of Transport and the environment (Volume 4)*. United Kingdom: Elsevier.
  - Hickman, R. and Banister, D., 2014. *Transport, climate change and the city*. Routledge.
  - Dhar, S. and Shukla, P.R., 2015. Low carbon scenarios for transport in India: Co-benefits analysis. *Energy Policy*, *81*, pp.186-198.
  - *EIA reports and IPCC reports*
- **Module 2**
  - Yeh, S., Mishra, G.S., Fulton, L., Kyle, P., McCollum, D.L., Miller, J., Cazzola, P. and Teter, J., 2017. Detailed assessment of global transport-energy models' structures and projections. *Transportation Research Part D: Transport and Environment*, *55*, pp.294-309.
  - Schipper, L., Leather, J. and Fabian, H., 2009. Transport and carbon dioxide emissions: forecasts, options analysis, and evaluation.
- **Module 3**
  - Wright, L. and Fulton, L., 2005. Climate change mitigation and transport in developing nations. *Transport Reviews*, *25*(6), pp.691-717.

- Salter, R., Newman, P. and Dhar, S., 2011. Technologies for climate change mitigation-transport sector.
- Miller, J. and Franco, V., 2016. Impact of improved regulation of real-world NOX emissions from diesel passenger cars in the EU, 2015− 2030. *Washington DC: International Council on Clean Transportation*.

http://www.theicct.org/sites/default/files/publications/ICCT_real-world-NOX-RDE-2015-2030_dec2016.pdf

- Faiz, A., Weaver, C.S. and Walsh, M.P., 1996. *Air pollution from motor vehicles: standards and technologies for controlling emissions*. World Bank Publications.

https://www.un.org/esa/gite/iandm/faizpaper.pdf

- Folkson, R. ed., 2014. *Alternative fuels and advanced vehicle technologies for improved environmental performance: towards zero carbon transportation*. Elsevier.

- **Module 4**
  - EEA, E., 2014. Adaptation of transport to climate change in Europe: Challenges and options across transport modes and stakeholders.
  - Eisenack, K., Stecker, R., Reckien, D. and Hoffmann, E., 2012. Adaptation to climate change in the transport sector: a review of actions and actors. *Mitigation and Adaptation Strategies for Global Change*, *17*(5), pp.451-469.

**Some case studies for discussion**

- London transportation plan
- Transport infrastructure design-Japan
- Adaptation plan-Melbourne
- Adaptation plan-France
- Mitigation and adaptation plans-Singapore
- Latin America and its experience

**Journals to be referred-**

- Transportation Research Part A
- Transportation Research Part D
- Journal of Transport geography
- Transport Policy
- Urban Climate
- Climate Policy
- Mitigation and Adaptation Strategies for Global Change

**Course Reviewed by**

- Dr Sudhir Chella Rajan, Professor, Indo-German Centre for Sustainability, Indian Institute of Technology Madras.
- Dr Hermann Knoflacher, Professor, Vienna University of Technology.
- Dr Oliver Lah, Research Unit Head, Mobility and International Cooperation, Wuppertal Institute for Climate, Environment and Energy.
- Dr Subash Dhar, Senior Researcher, Department of Technology, Management and Economics, UNEP DTU Partnership, Technical University of Denmark – DTU.

**Course title:** Soil Science

| | | | |
|---|---|---|---|
| **Course code:** NRE 130 | **No. of credits:** 3 | **L-T-P:** 25-12-10 | **Learning hours:** 42 |

**Pre-requisite course code and title (if any):**

**Department:** Energy and Environment

| | |
|---|---|
| **Course coordinator:** | **Course instructor:** |
| **Contact details:** | |
| **Course type**: Elective | **Course offered in:** Semester 2 |

**Course Description**

The course will help students to understand soil's physical attributes, biological composition, and chemical makeup. This knowledge will help them to solve range of soil management issues. The course will equip students to conservationist to replenish degraded ecosystem.

**Course objective**

- To provide skillsets related to monitoring the properties of soil
- Imparting knowledge related to agriculture management techniques and conservation of natural resources

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | Soil physical and chemical properties: soil formation and distribution; mobility of nutrient and trace elements during soil genesis; paedogenic evolution and inherent soil nutrient cycle benefits, which enhances its sink and source role | 5 | 4 | |
| 2. | **Soil biology and biochemistry:** fundamental biological and biochemical features and processes occurring in soil systems | 5 | 4 | |
| 3. | Soil erosion and conservation: soil erosion and effects of modern agriculture on soil geochemistry, introduction to different conservation and soil remediation practices and reflection on forest ecosystems | 10 | | |
| 4. | Soil pollution: Interactions between industrial effluents and soils; soil contamination with radionuclides. | 5 | 4 | |
| **5** | **Practical's:**<br>➢ Determination of soil colour by Munsell soil colour chart in field<br>➢ Determination of bulk density (clod coating method) and particle density by pyconometer method and porosity of soil<br>➢ Determination of soil texture by feel method and sieve analysis<br>➢ Determination of soil texture by Bouyoucos hydrometer method<br>➢ Determination of infiltration rate of soil by double ring infiltrometer<br>➢ Determination of pH, conductivity and anion/cation exchange capacity of soil<br>➢ Study of soil map | | | **10** |
| | | **25** | **12** | **10** |

**Evaluation criteria**

All written submissions:

**Test 1: 30%, Written examination**, to assess understanding of soil properties, and processes of soil systems. Evaluation is linked to Module 1&2.

**Test 2: 30%, Written Assignment and Presentation**; to increasing understanding of the latest

research in the fields of soil erosion and conservation and impact of soil pollution due to contamination. Evaluation linked to learning from Module 3&4.
**Test 3: 50%, Practical submissions and viva,** soil samples to be evaluated from nearby ecosystems including forests, urban watersheds and agriculture fields. Evaluation linked to module 5

**Learning outcomes**
On successfully completing this course the students will be able to:
- Examine physico-chemical, mineralogical and biological properties of various types of soil
- Assess impact on soil nutrient cycle due to soil erosion and soil pollution and soil remediation techniques and conservation practices
- Assess soil health, to reflect on soil's contribution to its sink and source role and compare with soils which support forest ecosystems and natural vegetation

**Pedagogical approach**
Classroom lectures, tutorials and practical

Materials & Required text
**Fundamentals of Soil Science, 8ed by Henry D Foth, John Wiley**
Fundamentals of Soil Science by Indian Society of Soil Science (ISSS)
Tan, K.H., 2009. *Environmental soil science*. CRC Press.
Rowell, D.L., 2014. *Soil science: Methods & applications*. Routledge.

**Journals**
Soil biology and biochemistry
Soil research
Journal of Soil and Water Conservation
Indian Journal of Soil Conservation
Soil biology and biochemistry
Soil research
Catena
Sedimentology
Journal of sedimentary research

**Additional information (if any)**

**Student responsibilities**
Meeting deadlines for assignment submissions, attending regular classes

**Course Reviewers:**
1. Dr. Anshumali, Associate Professor, Indian School of Mines, Department of Environmental Science and Engineering, Indian Institute of Technology (ISM) Dhanbad
2. Dr. Abhay Kumar Singh, Sr. Principal Scientist, Central Institute of Mining and Fuel Research, Dhanbad

**Course title:** Advanced Analytical Techniques for Environmental Applications

| **Course code:** | **No. of credits:** 3 | **L-T-P:** 28-06-16 | **Learning hours:** 50 |
|---|---|---|---|

**Pre-requisite course code and title (if any):** Environmental monitoring laboratory (NRE 138)

**Department:** Energy and Environment

| **Course coordinator:** | **Course instructor:** |
|---|---|

**Contact details:**

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

**Course Description**

This course is to provide understanding of various analytical techniques and instrumental methods that students come across during their course work and research undertakings. This course begins with basic introduction of analytical technique and related terminologies. This course introduces analytical techniques along with working principal, common instrumentation and possible applications. This course will be beneficial to various fields including, environmental science, chemical science, material science and life science.

**Course objective**

- The objective of this course is to provide advanced skillsets of analytical techniques pertinent to environment and climate domain
- To provide scientific understanding of instrumentation, operation, interpretation of data and its applications

**Course content**

| **Module** | **Topic** | **L** | **T** | **P** |
|---|---|---|---|---|
| 1. | Spectroscopy Techniques- Electromagnetic spectrum. Quantisation of energy, Electronic, vibrational and rotational transition. Jablonski diagram, Qualitative and quantitative analysis, Beer-Lambert's law and limitations.<br>UV-Visible spectroscopy- Principals, instrumentation, sampling and application, Fluorescence Spectroscopy, IR/Raman Spectroscopy. | 5 | 0 | 4 |
| 2. | **Atomic Spectrometry-**<br>**Atomic Absorption Spectrometry/Atomic Emission Spectroscopy-Principal, Instrumentation, sampling and application, Hydride generation technique, Flame Photometry, MP-AES, ICP-OES** | 4 | 1 | 4 |
| 3. | Chromatographic Techniques- Classification of chromatographic techniques, principles and theory of chromatography.<br>Liquid Chromatography-HPLC, Instrumentation, solvent delivery system, isocratic and gradient elution, reversed phase and normal phase chromatography, Ion Chromatography and application.<br>Gas Chromatography- Instrumentation, carrier gas, packed and capillary columns, different detectors and applications.<br>Introduction to hyphenated techniques. | 5 | 1 | 2 |
| 4. | X-Ray techniques-<br>Solids, crystal, Bravais lattice, miller indices, X-rays production, X- ray diffraction, Bragg's law, PXRD.<br>X-ray fluorescence-principle, instrumentation and application. | 5 | 2 | 0 |
| **5.** | Electroanalytical Methods-<br>Redox process, electrode and electrode potentials, electrochemical cells, Potentiometry, Conductometry.<br>Polarography-Principle, half wave potential, Ilkovic equation and application. | 5 | 2 | 0 |
| **6.** | Thermal Analysis Techniques-Heat, heat capacity, thermal conductivity<br>Working principle, instrumentation and application of Thermogravimetric Analysis, Differential Scanning Calorimetry and Differential Thermal Analysis. | 4 | 0 | 6 |
| | | **28** | **6** | **16** |

**Evaluation criteria**

Test 1: 30 % (module 1and 2)-this will be open book exam where problem-based questions will be asked based on techniques taught in module 1 and 2
Test 2: 30% (module 1, 2, 3 and 4)-close book tests with focused on applications of techniques in environmental domain
Test 3: 40% (module 5 and 6)- close book tests with focused on applications of techniques in environmental domain

**Learning outcomes**

- To be able to handle appropriate instrumental methods for analysis. (Test 1, 2 and 3)
- Familiarity with working principals, tools and techniques of analytical techniques. (Test 1, 2 and 3)
- To understand the strengths, limitations and creative use of techniques for problem-solving. (Test 1 and 3)

**Pedagogical approach**

Classroom lectures, tutorials, demonstration of analytical techniques and Practical training/hand on training. Case studies based on peer reviewed research articles.

**Employability:**

Academic, NGO and industrial research organization.

**Materials**

Required text

Suggested readings

- Keith A. Smith and Malcolm S. Cresse, "Soil and Environmental Analysis Modern Instrumental Techniques", Third Edition 2004, Marcel Dekker, Inc.
- Manahan, Stanley E. "Environmental Chemistry" Seventh Edition, Boca Raton: CRC Press LLC, 2000
- D. Harvey, "Modern analytical chemistry" (McGraw-Hill, Boston, 2000)
- Clair Sawyer, Perry McCarty and Gene Parkin, "Chemistry for Environmental Engineering and Science" 5th Edition, McGraw-Hill Higher Education.
- G. H. Jeffery J. Bassett J. Mendham R C. Denney "Vogel's Textbook of Quantitative Chemical Analysis" Fifth Edition, 1989, Longman.
- G. Svehla "Vogel's Qualitative Inorganic Analysis" Seventh Edition, Longman.
- Paul Gabbott "Principles and Applications of Thermal Analysis" Wiley-Blackwell, 2007.
- P. J. Haines "Principles of Thermal Analysis and Calorimetry" RSC Paperbacks 2003.

Websites

- https://nptel.ac.in/

Journals

- Environmental Science & Technology - ACS Publications
- Environmental Chemistry Letters
- Peer reviewed Science and Technology Journals

**Advanced Reading Material**

Will be provided by instructor if require.

**Additional information (if any)**

Please keep in mind that this course, require hands on experience to strengthen the concepts; however, this course provides supplemental material in order to communicate this information.

**Student responsibilities**

1. Class attendance.
2. Study of course materials as specified by the instructor.
3. Regular submission of given class assignments.

**Course Reviewers:**

| | | | |
|---|---|---|---|
| **Course title:** Advanced Geosciences | | | |
| **Course code:** NRE | **No. of credits:** 3 | **L-T-P: 34-08-0** | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any): Environmental Geosciences** | | | |
| **Department:** Department of Energy and Environment | | | |
| **Course coordinator:** | | **Course instructor:** | |
| **Contact details:** | | | |
| **Course type**: Elective | | **Course offered in:** Semester 2 | |

**Course Description**

Contemporary geology driven environmental issues such as geological episodic events, geogenic pollution, depletion of natural resources and global climate change are intrinsically linked with the various components of the Earth's systems and its processes. Thus, for effective management of the environment and its resources, knowledge on the Earth's physical functioning and its inter-linkages with the various developmental aspects are essential.

This course will provide the students with a advance understanding of the key processes of the Earth's system and its linkages with natural disasters and anthropogenic interferences. Different aspect of earth's processes and natural resources will be discussed in the context of environmental challenges.

The course will provide the necessary knowledge and skillsets to the students for analyzing the trends in Earth's environment and the causative agents.

**Course objectives**

- This course will provide a detailed understanding of the key processes of the Earth's system related to the developments and current environmental challenges.
- It will enable them to understand the effects of anthropogenic interferences on Earth's functioning, and its impact on geological/geomorphological changes.

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | **Introduction**<br>Earth structure; Geologic Time Scale; Dynamics of Geological Processes; | 4 | | |
| 2. | **Earth processes (interior and surface)**<br>**Tectonic Geomorphology - geomorphic indicators of tectonic activity and paleoseismicity**<br>**Mass movement – classification; Hillslope evolution and stabilization**<br>Floodplains – channel and flood plain evolution; **Streams - processes of transport, depositional features, drainage patterns**<br>Coastal zones and processes – nature of coastline (emergent and submergent coastlines), coastal erosion and stabilization<br>Deserts and desertification, **wind action (erosional and transport processes), semiarid regions - features and processes**<br>**Glaciers – classification and dynamics, erosional features and deposits**<br>**Weathering – mechanical, chemical and biological weathering, weathering of silicate minerals** | 12 | 4 | |
| 3. | **Natural Resources**<br>Groundwater – hydrogeology, storage and mobility, withdrawal and its consequences, aquifer characteristics, aquifer types, porosity, permeability<br>Surface water – **reser**voirs, processes, management<br>Soil – **high temperature geochemistry, genesis, classification, degradation**, soil survey and land use planning,<br>Issues related to over-exploitation and pollution, geogenic contaminants. | 6 | | |
| 4. | **Mineral resources**<br>Metal and non-metal mineral deposits, Hydrocarbons and Radioactive mineral | 4 | | |

| | | | | |
|---|---|---|---|---|
| | deposits for energy; Global mineral supplies; Ore deposits in India, National mineral policy. | | | |
| 5. | **Field and Laboratory Methods in Environmental Geoscience** Interpretation of geologic maps; Geophysical logging and interpretation; Data mining and data analysis/interpretation in geosciences; Map reading, Geological cross-section preparation, Use of Brunton compass to read the attitude and dip of the geological formation. Hand specimens of rocks and minerals. | 8 | 4 | |
| | **Total** | **34** | **8** | **0** |

**Evaluation criteria**

**Test 1: Written Test** [at the end of module 1 and 2. The enhanced understanding of earth's interior and how does it control of impact the surface processes will be evaluated. How these internal processes shape the earth's exterior would be expected to be learnt] **20%**

**Test 2: Written Test** [at the end of module 3,4 and part of module 5. The students learn about the components which how earth system components drive or control the earth processes specifically in terms of resources such as soil, water, mineral. The subsurface information collection through different techniques would also provide insights on data collection and its interpretation] **20%**

**Test 3: Written Test** [at the end of entire syllabus, module 1-5. Integrating all the knowledge gathered about surface and sub-surface processes to understand interdependence of geological processes in shaping the earth**] 40%**

**Assignment: 20%** [Case study based on holistic understanding of earth surface and subsurface processes. The students would be required to submit case studies by integrating the knowledge gained through the course and identify major geological processes that shape the earth system. **20%**

**Learning outcomes**

- The student will have enhanced understanding of earth's interior and surface processes (Test 1)
- Understand the earth's geological processes, mineral formations and infer the subsurface information using field techniques (Test 2)
- Overall in-depth understanding techniques to gather geological information and to apply knowledge in understanding processes that shape the earth. (Test 3 and assignment)

**Pedagogical approach**

Pedagogical approach consists of classroom teaching enriched with theories, frameworks, and methods combined with hands on exercises on application of tools and techniques, discussion of case studies, presentation of case studies by students.

**Materials**

Required text


1. H. Chamley (2003). Geosciences, Environment and Man. Elsevier Science.
2. C. Montgomery (2020) Environmental Geology. McGraw-Hill Education
3. E.A. Keller (2012) Introduction to Environmental Geology. Pearson Education.
4. K.S. Valdiya (2013). Environmental Geology: Ecology, Resource and Hazard Management. Tata McGraw-Hill Education
5. B.R. Frost and C.D. Frost (2019). Essentials of Igneous and Metamorphic Petrology, Cambridge University Press.
6. S. Boggs Jr. (2012) Principles of Sedimentology and Stratigraphy. Pearson Education.
7. J.I. Drever (1997) The Geochemistry of Natural Waters: Surface and Groundwater Environments. Prentice-Hall Publishers
8. K.M. Hiscock and V.F. Bense (2014) Hydrogeology: Principles and Practice. Wiley-Blackwell.
9. N. Lu and J.W. Godt (2013) Hillslope Hydrology and Stability. Cambridge University Press.
10. R.J. Huggett (2017). Fundamentals of Geomorphology. Taylor & Francis.
11. D.L. Turcotte and G. Schubert (2014). Geodynamics. Cambridge University Press.
12. R.S. Anderson and S.P. Anderson (2010) Geomorphology: The Mechanics and Chemistry of Landscapes. Cambridge University Press.
13. Edwards R. and Atkinson K. (1986); Ore Deposit Geology, and its Influence on Mineral Exploration.

Chapman and Hall.
14. M.L. Jenson and A.M. Bateman (2013), Economic Mineral deposits. John Wiley
15. S. Marshak and G. Mitra (2017). Basic Methods of Structural Geology. Pearson Education.
16. A.L. Coe (Ed.) (2010) Geological Field Techniques. Wiley-Blackwell.

Suggested readings

Case studies

- Schiappa, T.A. and Smith, L., 2019. Field experiences in geosciences: A case study from a multidisciplinary geology and geography course. Journal of Geoscience Education, 67(2), pp.100-113.
- Dolphin, G., Dutchak, A., Karchewski, B. and Cooper, J., 2019. Virtual field experiences in introductory geology: Addressing a capacity problem but finding a pedagogical one. Journal of Geoscience Education, 67(2), pp.114-130.
- Gilley, B., Atchison, C., Feig, A. and Stokes, A., 2015. Impact of inclusive field trips. Nature Geoscience, 8(8), pp.579-580.
- Hallar, A.G., McCubbin, I.B., Hallar, B., Levine, R., Stockwell, W.R., Lopez, J.P. and Wright, J.M., 2010. Science in the mountains: A unique research experience to enhance diversity in the geosciences. Journal of Geoscience Education, 58(2), pp.95-100.

Journals

- Nature Geoscience
- Journal of Structural Geology
- Geoscience Frontiers
- Geosciences Journal, Springer

**Advanced Reading Material**

**Additional information (if any)**

**Student responsibilities**

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

**Course reviewers:**

Dr. Jayant Kumar Tripathi, Professor, School of Environmental Science, Jawaharlal Nehru University, New Delhi

Dr. Umesh Kumar Singh, Professor, Department of Environmental Science, School of Earth, Biological and Environmental Sciences, Central University of South Bihar, Bihar

Dr. Saumitra Mukherjee, Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi

| **Course title: Project Management** | | | |
|---|---|---|---|
| **Course code:** NRG 103 | **No. of credits:** 3 | **L-T-P:** 28-14-0 | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Natural Resources | | | |
| **Course coordinator:** | **Course instructor:** | | |
| **Contact details:** | | | |
| **Course type**: Core | **Course offered in:** Semester 2 | | |

**Course Description**

The objective of this course is to make the students familiar with the entire life cycle of projects; Planning, Execution and Operation. This would help students prepare themselves for working in various projects right from conceptualization to delivery. It would help optimize usage of country's resources on various projects.

This course guides students through fundamental project management concepts and behavioral skills needed to successfully launch, lead, and realize benefits from projects in profit and nonprofit organizations. Successful project managers skillfully manage their resources, schedules, risks, and scope to produce a desired outcome. In this course, students explore project management with a practical, hands-on approach through lectures and class exercises. Special attention is given to explain the concepts based on the past experiences of the instructor. It emphasizes that project management is a professional discipline with its own tools, body of knowledge, and skills.

**Course objectives**

- Understand project management design, development, and deployment
- Use project management tools, techniques, and skills
- Employ strategies to address the ubiquitous issue of resistance to change
- Align critical resources for effective project implementation
- Understand the implications, challenges, and opportunities of organizational dynamics in project management
- Identify and use key performance metrics for project success
- Understand how to manage project cost, quality, and delivery
- Engage and lead effective project management teams in your organization
- Impart project management knowledge, tools, and processes to your colleagues
- Recognize and mitigate the early seeds of failure in the project life cycle

**Course content**

| SNo | Topic | L | T | P |
|---|---|---|---|---|
| 1. | Introduction to Project Management<br>(Definition, Need/Benefits, achieve business objective, role of Project Manager, project Life Cycle, Integrative approach, process group)<br>Introduction to body of knowledge , PMBOK | 2 | | |
| 2. | Creating a Project Proposal<br>(Establishing Objectives, scoping the boundaries, priorities strategic development, WBS/PBS, responsibility, communication plan) | 2 | 2 | |
| 3. | Estimation in Project Proposal<br>(Basic, Time, Cost, Resource, Techniques, Guidelines) | 2 | | |
| 4. | Developing Project Plan | 2 | 2 | |

| | | | | |
|---|---|---|---|---|
| | (Evaluating and Constructing network, Schedule, Criticality, Gantt Charts, Techniques) | | | |
| 5. | Project Proposal Evaluation<br>(Reading, evaluating feasibility–resource, time, cost, idea, quality) | 2 | | |
| 6. | Project Resource Management<br>(Overview and types of resource, Resource constraints & scheduling, Allocation methods, resource vis-à-vis other activities of project planning) | 2 | | |
| 7. | Preparation for presentation<br>(Designing small write-ups–introduction, literature review, materials, methods, results, discussion, summary, conclusions) | 2 | 2 | |
| 8. | Presentation skills development<br>(Presenting in a formal meeting with–data, figures, graphs, tables, contents etc.) | 2 | | |
| 9. | Attending presentation and meetings<br>(Expressing freethinking, opinions, judgments (written and oral) and analyses; Formulation of questions; Responding comments and critique given by other) | 2 | 2 | |
| 10. | Risk Management<br>(Concept, process, PERT, Contingency planning, funds, time, unexpected changes in control and management) | 2 | | |
| 11. | Time Management<br>(Rationale, Options, Time compression techniques, mapping and managing project cost and time, trade-offs) | 2 | 2 | |
| 12. | Project Monitoring and Controlling<br>(Monitoring process (time, cost, resource), control processes, earned value cost/schedule system, variance analysis, CBA and other techniques) | 2 | 2 | |
| 13. | Project Closure<br>(Quality assurance, auditing (resources, time, cost), submission, auditing, closure) | 2 | | |
| 14. | Group discussions | 2 | 2 | |
| | **Total** | **28** | **14** | |

**Evaluation criteria**

- Test 1: 25% [Module 1 -6]
- Class Exercise: 15% [Practical live examples solved in class) (Based on knowledge given in Module 1 – 13]
  Identification of a project live or hypothetical and carry out PM related SOP's , time schedule development , cost management plan , HR , procurement and close out stages [Based on knowledge given in Module 1 – 13].
  Question / answer sessions on the same project
- Presentation: 20% Topic based presentation submitting the hard as well soft copy, Towards the end of the semester [based on knowledge gained in modules 1 – 13]
- Test 2: 40% [Module 1 – 13]

**Learning outcomes**

Manage the scope, cost, timing, and quality of the project, at all times focused on project success as

defined by project stakeholders

Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.

**Pedagogical approach**

**Materials**


1. Prasanna Chandra (2011). Projects: Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill
2. Lewis, James (2002). Fundamentals of Project Management, 2nd ed., American Management Association. ISBN 0-8144-7132-3.
3. Project Management Institute (2003). A Guide to the Project Management Body of Knowledge (PMBOK), 3rd ed., Project Management Institute. ISBN 1-930699-45-X.
4. Berkun, Scott (2005). Art of Project Management. Cambridge, MA: O'Reilly Media. ISBN 0-596-00786-8.
5. Comninos D &, Frigenti E (2002). The Practice of Project Management - a guide to the business-focused approach. Kogan Page. ISBN 0-7494-3694-8
6. Finnerty (2012). Project Financing, John Wiely and Sons
7. Meredith, Jack R. and Mantel, Samuel J. (2002). Project Management: A Managerial approach, 5th ed., Wiley. ISBN 0-471-07323-7.


**Journals**

1. Project Management Journal
1. International Journal of Project Management

Case Studies

**Additional information (if any)**

**Student responsibilities**

Attendance, feedback, discipline, guest faculty etc.

**Course reviewers:**

1. Sh. RiteshViz , Founder VLE Consultant LLP

2. Sh. K Mal, retd. Principle Chief Engineer, Indian Railway

## Department of Business & Sustainability
## 49th Academic Council Meeting

| Programme | Course Code | Course Title | Semester | Credit | Type | Enclosure # |
|---|---|---|---|---|---|---|
| MBA (Sustainability Management) | MPP 163 | Principles and Concepts of Sustainability | 1 | 2 | Core | 5 |
| | PPM 101 | Business communications | 1 | 3 | Core | 5 |
| | PPM 128 | Corporate Accounting and Reporting | 1 | 3 | Core | 5 |
| | PPM 148 | Managerial Economics | 1 | 3 | Core | 5 |
| | PPM 196 | Marketing Management | 1 | 3 | Core | 5 |
| | PPM 157 | Business Ethics | 1 | 2 | Core | 5 |
| | BSI 125 | Accounting and Finance for Sustainability | 3 | 3 | Core | 5 |
| | PPM 109 | Business to Business Marketing | 3 | 2 | Elective | 5 |
| | PPM 123 | Derivatives and Risk Management | 3 | 2 | Elective | 5 |
| | PPM 125 | Financial Intermediaries, Institutions and Regulations | 3 | 2 | Elective | 5 |
| | PPM 126 | Security Analysis & Portfolio Management | 3 | 2 | Elective | 5 |
| | PPM 191 | International Financial Management | 3 | 2 | Elective | 5 |
| | PPM 195 | Brand Management | 3 | 2 | Elective | 5 |

| Programme | Course Code | Course Title | Semester | Credit | Type | Enclosure # |
|---|---|---|---|---|---|---|
| MBA (IM) | BSI 156 | Project Planning and Management | 2 | 2 | Core | 5 |
| | BSI 181 | Bidding System Management | 2 | 1 | Core | 5 |

| | | | |
|---|---|---|---|
| **Course title:** Accounting and Finance for Sustainability | | | |
| **Course code: BSI 125** | **No. of credits:** 3 | **L-T-P distribution:** 33-09-00 | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator (s):** | | **Course instructor (s):** | |
| **Contact details:** | | | |
| **Course type** | **Core** | **Course offered in:** Semester III | |

**Course Description**

The course intends to expose the learners to the emerging world of sustainability-centered accounting and finance. The field is emerging. There are many challenges to standardize the practices. Different experiments and research are on. So, it's a felt need of importance that the budding managers develop a clear perspective to actively contribute to the evolving process of newer paradigm.

**Course Objectives**

In the context of the above course description, the objectives are to:

- Have an in-depth understanding of economic concepts and principles in climate and sustainable finance;
- Expose learners to the emerging challenges of sustainable and ESG finance and develop the right kind of attitude to address them;
- Sensitise learners on the glaring funding gaps in global climate and sustainable finance and the efficacy of market-based instruments to generate finance;
- Eexplain the role of different actors in climate and sustainable finance, including central banks, financial supervisory authorities, national and multilateral development banks, corporate banks, and institutional investors;
- Understand and analyze the potential risks and opportunities of environmental trends for financial markets, with a particular emphasis on climate risks;
- Explain the range of financial policy instruments and initiatives and their potential with regard to integrating climate change and sustainability into financial policy and supervisory frameworks

Course content

PART I

| **Module** | Topic | **L** | **T** | **P** |
|---|---|---|---|---|
| 1. | Introduction:<br>a. Changing paradigm of corporate finance and accounting;<br>b. Integrating sustainability into business;<br>c. Triple Bottom Line (TBL)and its relationship with Finance and Accounting;<br>d. Emerging Challenges and opportunities. | 2 | 0 | 0 |
| PART II | | | | |
| 2. | Measuring sustainability: the macro level indicators:<br>a. Green national accounting;<br>b. Genuine savings;<br>c. System of Environmental-Economic Accounting (SEEA). | 3 | 1 | 0 |
| 3. | Measuring sustainability: the firm level indicators<br>o Green/Environmental Profit & Loss Account<br>o Green/Environmental Balance Sheet. | 2 | 1 | 0 |

| | | | | |
|---|---|---|---|---|
| 4. | Life Cycle Cost Analysis (LCA) and Full Cost Accounting (FCA)<br>a. Acquisition costs versus Life Cycle costs<br>b. Measurement techniques. | 2 | 1 | 0 |
| 5. | Activity Based Cost Management (ABCM):<br>a. Activity identification<br>b. Cost Centers vs. Cost Drivers;<br>c. Activity Based Cost Measurement (ABCM). | 1 | 1 | 0 |
| 6. | Integrated Reporting<br>a. Economic and environmental reporting;<br>b. Integrating process;<br>c. Sustainable Reporting Standards | 3 | 0 | 0 |
| 7. | Firm level performance analysis<br>a. Financial vs. Non-Financial: Integration<br>b. Challenges to developing appropriate benchmarks;<br>c. Case studies. | 1 | 2 | |
| **PART III** | | | | |
| 8. | Sustainability issues: Impact on Business and Economy<br>a. Sizing climate economy<br>b. Sustainability: Economic, Environmental and Social Factors (EES)<br>c. Value creation and EES variables<br>d. Sustainable value added (SVA): Measurement & Estimation<br>e. Environmental liabilities: Identification and Reduction | 3 | 1 | 0 |
| 9. | Responsible Investments:<br>a. Responsible Investment Principles aside fined by the UN(UNPRI);<br>b. Approaches and forms;<br>c. Stockholders' value max vs. stakeholders' value max;<br>d. Stakeholders' activism;<br>e. Valuation approaches.<br>f. Concept of shared value and value chain analysis;<br>g. Behavioral aspects. | 3 | 1 | 0 |
| 10. | Sustainability Risk Management<br>a. Risks and return relationship p: the changing scenario;<br>b. Capital budgeting decisions and sustainability risks;<br>c. Risk Management approaches<br>d. Developing proper risk reporting mechanism | 2 | 1 | |
| 11. | Hedging Sustainability risks<br>a. Hedging sustainability risks through market instruments;<br>b. Weather derivatives;<br>c. Energy derivatives. | 2 | 0 | 0 |
| 12 | Investment market and sustainability factors:<br>a. Sustainable portfolios;<br>b. Role of fund managers;<br>c. Investment bankers and sustainability issues. | 2 | **0** | **0** |

| | | | | |
|---|---|---|---|---|
| 13 | Market Indices and Sustainability Issues<br>d. Basis and Construction mechanisms of such indices;<br>e. Major green marketing dices in the world;<br>f. Indian position and a global comparison. | 2 | **0** | **0** |
| 14 | Financing sustainability<br>g. Kyoto Protocol and CDM;<br>h. Carbon Financing;<br>i. Carbon credit and emission trading;<br>j. Other market based instruments-green bonds, social impact bonds and the like.<br>k. Historic Climate (Green) Deal (22.04.2016 at UN) | 3 | **0** | **0** |
| **PART IV** | | | | |
| 15 | Policy and Regulatory issues<br>l. An overview of the policy issues in India and the globe;<br>m. Role of an appropriate regulatory framework;<br>n. G20 and global growth through Green Finance. | 2 | 0 | 0 |

**Evaluation criteria**

- Test 1: Assignment/Presentation 20%
- Test 2: Term paper based on preparing a case study 20%
- Test 3: Written 30%
- Test 4: Written 30%

**Learning Outcomes**

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

- Comprehend the critical issues involved in accounting for sustainability and sustainable development (Modules #1 and #2).
- Innovate and use the tools and techniques for developing an accounting framework for sustainability factors in the organization. (Modules #3, #4 and #5).
- Develop a functional framework for reporting and disclosing sustainability activities. (Module #6).
- Acquire skills for firm level performance analysis. (Module #7)
- Develop a complete understanding of sustainable financing market systems, the tools and instruments used for financing sustainable development. (Module #8)
- Have an in-depth knowledge on the challenges pertaining to sustainable and ESG financing and the role of several stakeholders including central banks, financial supervisory authorities, national and multilateral development banks, corporate banks, and institutional investors to fund sustainable development efforts. (Modules #9. #10)
- Develop a thorough understanding on the nature of risks associated with sustainable financing and some of the accounting tools to address such risks. (Module #11, #12)
- Have a thorough understanding of the international conventions of climate sensitive investments (Module # 13, #14).
- Develop a fair understanding of the policy perspectives of responsible investment and finance. (Module #15)

**Pedagogical approach**

The course will be delivered through lectures and discussion of case studies, research papers and articles.

**Course Materials**

**Books**

1. Unerman, J, Bebington, J and O'Dwyer, B. Sustainable Accounting and Accountability, Routledge, London and New York, 2010.
2. Wells, G. Sustainable Business: theory and practice of business under sustainability, Elgar, Cheltenham, UK,2013.
3. Cherneva, Iveta (ed.). The Business Case for Sustainable Finance, Routledge, London and New York, 2012.
4. Bhattacharya, RN (ed.). Environmental Economics-an Indian Perspective, OUP, New Delhi, 2001.

**Occasional materials and hand-outs as delivered by the faculty member**.

**Reports and Other References**

1. UNEP. Fiduciary Responsibility: Legal and practical's pacts f integrating environmental, social and governance issues into institutional investment. USA. 2009.
2. MSCI. Understanding MSCI ESG Indexes: Methodologies, facts and figures. UK 2019.
3. Climate Bonds Initiative. ASEAN Green Financial Instruments Guide. Thailand. 2019
4. Climate Bonds Initiative. Bonds and Climate Change the State of The Market. USA. 2018.
5. Reports by Consulting Organizations such as KPMG, PwC, Deloitte, E&Y etc.

**Web sources**

Sustainable stock exchange initiative. https://sseinitiative.org/
S&P BSE Greenex. https://www.asiaindex.co.in/indices/equity/sp-bse-greenex
S&P BSE Carbonex.https://www.asiaindex.co.in/indices/equity/sp-bse-carbonex
National Stock Exchange. https://www1.nseindia.com/products/content/equities/indices/thematic_indices.htm
World Federation of Exchanges. https://www.world-exchanges.org/
Shifting and Mobilizing Finance for Sustainability. fhttps://www.wri.org/our-work/topics/finance

**Additional information (if any):**

**Student responsibilities:** This is more an open-ended course. The students are required to focus on research-based learning.

**Prepared by**: Prof. Manipadma Datta

**Reviewers**:
Prof. Madhu Vij, FMS, DU
Prof. B. Banerjee, CU.

| | | | |
|---|---|---|---|
| **Course title:** Project Planning and Management | | | |
| **Course code: BSI 156** | **No. of credits:** 2 | **L-T-P distribution:** 20-08-0 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator (s):** | | **Course instructor (s):** | |
| **Contact details:** | | | |
| **Course type** | Core | **Course offered in:** Semester 1 | |

**Course description**

The objective of this course is to make the students familiar with the entire life cycle of projects, Planning, Execution and Operation. This would help students prepare themselves for the working in various projects right from conceptualization to delivery. It would help optimize usage of country's resources on various projects, especially in infrastructure domain.

This course guides students through fundamental project management concepts and behavioral skills needed to success-fully launch, lead, and realize benefits from projects in profit and nonprofit organizations. Successful project managers skillfully manage their resources, schedules, risks, and scope to produce a desired outcome. In this course, students explore project management with a practical, hands-on approach through lectures and class exercises. Special attention is given to explain the concepts based on the past experiences of the instructor.

It emphasizes that project management is a professional discipline with its own tools, body of knowledge, and skills.

**Course objectives**

- Understand project management design, development, and deployment
- Use project management tools, techniques, and skills
- Employ strategies to address the ubiquitous issue of resistance to change
- Align critical resources for effective project implementation
- Understand the implications, challenges, and opportunities of organizational dynamics in project management
- Identify and use key performance metrics for project success
- Understand how to manage project cost, quality, and delivery
- Engage and lead effective project management teams in your organization
- Impart project management knowledge, tools, and processes to your colleagues
- Recognize and mitigate the early seeds of failure in the project life cycle

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | **Introduction**: Definition of projects, Concept of Project Life Cycle: Application in real life, Need for Planning | 2 | 0 | 0 |
| 2. | **Planning Stage**: Planning needs of different projects, Objectives, Idea generation to fulfill these objectives, Scoping the boundaries, | 2 | 0 | 0 |
| 3. | **Stakeholder Management**: Project owners, regulators, executors, line-managers, suppliers, financers/lenders, users and Project Affected People, Role of each stake holder and interactions amongst them; Contracts and their importance for such interactions. | 3 | 3 | 0 |
| 4. | Work Breakdown Structure, Project costing, and budgeting, scheduling, selection of stakeholders, structuring, assigning and managing them to plan for smooth execution of projects. | 2 | 0 | 0 |
| 5. | **Execution Stage**: Sequencing activities and mobilizing relevant stakeholders, Project management consultants, Bringing all the stakeholders together, contracting and awarding work packages. Resource management | 2 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| 6. | Execution and control–Network techniques, CPM v/s PERT, Project performance appraisal, Monitoring and controlling; Variance Analysis; Earned Value Analysis including schedule project and corrective actions. Time over-run issues and associated penalties/rewards | 3 | 3 | 0 |
| 7. | Cost, Quality and Dispute Control mechanism, Arbitration and legal recourse, Quality management system, Activity based costing etc. Cost over-run and necessary control mechanism | 2 | 2 | 0 |
| 8. | **Operation Stage**: Project completion audit. Objectives: targeted v/s achieved.<br>Learning for future projects. | 2 | 0 | 0 |
| 9. | Application of technology enablers i.e. ERP, use of project planning, management and evaluation software's | 2 | 0 | 0 |
| | **Total** | **20** | **8** | **0** |

**Evaluation criteria**

- Test 1: Written Test 25%
- Test 2: Class exercise 15% (Practical live examples solved in class)
  Identification of a project live or hypothetical and carry out PM related SOP's, time schedule development, cost management plan, HR, procurement and close out stages.
  Question / answer sessions on the same project
- Test 3: Presentation 20% (Topic based presentation submitting the hard as well soft copy)
- Test 4: Written test 40%

**Learning Outcome**

**After the course, the students will be able to**

- Develop, plan, implement and monitor projects.
- Handle the group dynamics that remain crucial for a successful project implementation.
- Management effectively the techno-legal factors involved in projects.
- Develop skills to work for goal congruence with reference to overall organizational key objectives.

**Pedagogical approach**

The course will be delivered through lectures and discussion of case studies, research papers and articles.

**Materials**

**Suggested readings:**


1. Prasanna Chandra (2011). Projects: Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill
2. Lewis, James (2002). Fundamentals of Project Management, 2nd ed., American Management Association. ISBN 0-8144-7132-3.
3. Project Management Institute (2003). A Guide to the Project Management Body of Knowledge (PMBOK), 3rd ed., Project Management Institute. ISBN 1-930699-45-X.
4. Berkun, Scott (2005). Art of Project Management. Cambridge, MA: O'Reilly Media. ISBN 0-596-00786-8.
5. Comninos D &, Frigenti E (2002). The Practice of Project Management - a guide to the business-focused approach. Kogan Page. ISBN 0-7494-3694-8
6. Finnerty (2012). Project Financing, John Wiely and Sons
7. Meredith, Jack R. and Mantel, Samuel J. (2002). Project Management: A Managerial Approach, 5th ed., Wiley. ISBN 0-471-07323-7.


Journals


1. Project Management Journal
2. International Journal of Project Management


**Additional information (if any)**

**Student responsibilities**

Attendance, feedback, discipline etc.

**Prepared by:**

Mr. Subodh Jain & Montu Bose

**Course reviewers:**

1. Sh. Ritesh Viz, Founder VLE Consultant LLP

2. Sh. K Mal, Retd Principle Chief Engineer, Indian Railway

| | | | |
|---|---|---|---|
| **Course title:** Bidding System Management | | | |
| **Course code:** **BSI 181** | **No. of credits:** 1 | **L-T-P distribution:** 14-0-0 | **Learning hours:** 14 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator (s):** | | **Course instructor (s):** | |
| **Contact details:** | | | |
| **Course type** | Core | **Course offered in:** Semester 2 | |

**Course description**

The course is divided into eight modules. Planning for infrastructure projects is a multi-stage process and bidding is an important as well as a challenging stage in this process. This course is designed to apprise students of the complete bidding management system. The course would help them to understand various aspects of bidding management including legislative and regulatory framework for procuring projects, planning for inviting bids, standard bidding, documentation as well as evaluation and final acceptance.

**Course objectives**

- To help students learn the procedures as well as practices of bidding process for infrastructure projects.
- To make the students understand institutional and legislative framework for bidding management in the Indian context.
- To ensure that the students become aware of and capable of handling problems encountered in bidding management.
- To make the bid plan, document and carry out post tender activities
- To carry out successful negotiations
- To know international standards like FIDIC etc.

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | **Module 1: Need for a robust bidding system** Infrastructure projects in India: sources of finance, parliamentary control; International infrastructure projects: mechanisms, procedures, principles Legislative and institutional framework in Indian context for procuring infrastructure projects; transparency in public procurement | 2 | 0 | 0 |
| 2. | **Module 2: Infrastructure projects– packets of uncertainties** Factors contributing to high uncertainty: large scope, myriad of stakeholders resulting in social and geographical dislocations of populations, long lead/gestation, negative surprises including natural disasters; Government rules, procedures and legislative framework for dealing with the same; | 1 | 0 | 0 |
| 3. | **Module3: Planning for inviting bids (key driver for on –time project implementation)** Planning from drawing board to commissioning: land acquisition, mining, forest, environmental clearances, scanning the market for possible companies with relevant experience, skills and resources for the work/project; differences between state level and union level of bidding. | 1 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| 4. | **Module 4: Standard bidding documents and some essential ingredients** International best practices; International Federation of Consulting Engineers (FIDIC); Introduction to drawing standard bidding documents; eligibility requirements; qualifying criteria; preparation of bidding document; definitions and interpretations; scope of project; obligations of contractors; obligations of authority; representations and warranties of contractor and authority; performance security; right of way; design and construction of project–design and drawings; utilities / roads/trees and new utilities; quality assurance, monitoring and supervision; completion certificate; change of scope; defect liability; financial covenants– contract price, advance payment; form of bank guarantee; stage payment, procedure for estimating payment for works, payment for damages, final payment certificate; price variation clauses; change of law; General Conditions of Contract; special Conditions of Contract; mechanism for resolution of disputes; legal vetting of draft contract documents etc. | 2 | 0 | 0 |
| 5. | **Module 5: Invitation of Expressions of Interest** Advertising - expression of interest and publishing draft bid documents for interested bidders; joint site visits, geological and other technical data visage technical date, meteorological specifics, flood date etc; Prebid conference, interacting with bidders and addressing of their concerns / anxieties. Due consideration of points raised and issue of suitable amendments /corrigenda. Empirical price variation clauses, etc. | 2 | 0 | 0 |
| 6. | **Module 6: Invitation of bids** Notice inviting tenders/bids in newspapers, websites, emails; sufficient time to bidders; Earnest money- amount &forms in which accepted; Opening of tenders- Public opening; Tender Opening Committee; Attendance of persons attending bid opening, Single packet vs double packet systems. | 2 | 0 | 0 |
| 7. | **Module 7: Evaluation of bids – technical bids and price bids** Nominations of Bid / Tender Evaluation Committee; Members to declare conflict of interests - if any; Free and fair evaluation; Verification of credentials of bidders; Non-material nonconformities and material nonconformities; List of qualified bids; Opening of 2nd packet - price bid; Advance notice to bidders; Date, time, venue; Public opening of bids by nominated bid opening committee; Evaluation of lowest bid by bid evaluation committee; Discussions of Reasonableness of rates; selection of L1 bid; Selection of lowest bid; non L1 acceptance criteria. | 2 | 0 | 0 |
| 8. | **Module 8: Acceptance of bid– signing of contract agreement** Letter of acceptance (LOA); Contract agreement; Signing of contract-formats, Mobilization and other Advances; Publishing on internet; Right to Information Act. | 2 | 0 | 0 |
| | **Total** | **14** | **0** | **0** |

**Evaluation Criterion**
Test 1: Quizzes /Assignments – 40%
Test 2: Written 60%

**Learning Outcome**

**After the course, the students will learn to**

- Develop expertise to select proper choice criteria for selecting right vendors.
- Acquire the skills for proper price discovery.
- Ability to efficiently manage the bidding system and customize it for the organization.

| |
|---|
| **Pedagogical approach**<br>A combination of class-room interactions and assignments with special emphasis on case studies and real-life examples. |
| **Materials**<br>1. Lister Lee. FastTrack Bid Management – The bid manager's handbook. Biz Guru Ltd; 2nd Updated edition. 2010.<br>**2.** Nickson D. The Bid Manager's Handbook. Routledge; 1st edition. 2016. |
| **Additional information (if any)** |
| **Student responsibilities**<br>Attendance, feedback, discipline, guest faculty etc. |

**Prepared by**: Mr. Subodh Jain & Montu Bose

**Course reviewers:**

1. Sh. Ritesh Viz , Founder , VLE Consultant LLP
2. Sh . K Mal , Retd Principal Chief Engineer , Indian Railway

**Course title:** Principles and Concepts of Sustainability

| **Course code:** MPP 163 | **No. of credits:** 2 | **L-T-P distribution: 20-08-00** | **Learning hours:** 28 |
|---|---|---|---|

**Pre-requisite course code and title (if any):**

**Department:** Department of Business & Sustainability

| **Course coordinator(s):** | **Course instructor(s):** |
|---|---|
| **Contact details:** | |
| **Course type:** Core | **Course offered in: Semester I** |

**Course description**

The economic development and globalization have increased the production and consumption of the economics of the world over time. However, various economic and production and/or consumption activities are adversely impacting the environment and the society. Naturally, several questions are arising against the business community and its role in environmental sustainability and duties for the society.

Given the environmental and sustainability related challenges and issues faced by the business and the economies, understanding the concept of sustainability and practicing the concepts in real life is primarily important for every firm, organizations and communities. In addition to the basic understanding of the issues, employee with the ability to critically analyse different aspects of sustainability in production and consumption and the relation between sustainability and development is critically important. This course would try to discuss and sensitize students for various sustainability issues in business.

**Course objectives**

1. To build an inter-disciplinary perspective on business sustainability.
2. To enable students to discuss the concept of sustainability and be able to see how it translates into realities of organizations and communities.
3. To empower students to critically analyse different, often competing, definitions of sustainability driven by perspectives and interests of societal stakeholders.
4. It will help students understand the different challenges to sustainability, the role of business in addressing these challenges.

**Course contents**

| **Module** | **Topic** | **L** | **T** | **P** |
|---|---|---|---|---|
| **1** | **Sustainable development – evolution, approaches, interpretations**<br>The students are requested to prepare and conduct two debate on the importance of environmental/social aspects of SD and on probabilities of various world scenarios | 3 | 1 | 0 |
| **2** | **What drives business – issues and trends**<br>What drives business; Social Role; Philanthropy; Corporate Social Responsibility; Creating Shared Values; Triple bottom line; Critical review of Bottom of the Pyramid concept | 2 | 1 | 0 |
| **3** | **Is the business of business, is business?**<br>Through the group discussion and presentation, the students are requested to explore various forms of "corporations of the future". They will also work with analysis of a case of sustainable enterprise. | 4 | 1 | 0 |
| **4** | **Business (corporate) sustainability**<br>The students are introduced to analyze a case relevant for understanding of stakeholder engagement and communication (Disney case) | 3 | 1 | 0 |
| **5** | **Sustainable Production and Consumption**<br>In addition to the discussion, the students will work with the study case of Rio Tinto focusing on the company's strategy in biodiversity and ecosystem serve | 4 | 2 | 0 |

| | | | | |
|---|---|---|---|---|
| **6** | **Corporate Social Responsibility**<br>The students will be requested to organize a debate on the role of CSR in the progress towards SD | 2 | 1 | 0 |
| 7 | **Pro-poor development**<br>the students will work with developing principles of business engagement with poor communities | 2 | 1 | 0 |
| | **Total** | 20 | 8 | 0 |

**Evaluation Criterion:**

Test 1: Group Presentation - 50 %
Test 2: Individual Presentation on a given topic - 20 %
Test 3: Individual Assignment - Essay / Reaction Paper in 1000 words - 30%

**Learning Outcome:**

On successful completion of the course, the students would be able to -

- Understand and internalize the concept of sustainability and to ensure the concept pervades through the layers of organization.
- Critically analyze different, often competing, definitions of sustainability driven by perspectives and interests of societal stakeholders.
- Become familiar with the sustainability visions and practices relevant for the business community at the level of companies, supply chain, communities.

**References:**

Dresner S. (2002) The Principles of Sustainability, Earthscan, London.
Robertson M. (2017) Sustainability Principles and Practice, Routledge, London & NY.
Materials:
Vanegas JA (2003) Road Map & Principles for Built Environment Sustainability, Environmental Science & Technology, Vol.37(23), pp. 5363-72.
Lindsey TC. (2011) Sustainable Principles: Common Values for Achieving Sustainability, Journal of Cleaner Production, Vol.19(5), pp. 561-65.

**Additional Information:**

**Student Responsibility:**

**Prepared by:** Dr. Zanaida Fadeeva & Montu Bose

**Course Reviewers:**

Dr. Mala N. Reddy, IIM Kozhikode (Visiting Faculty) & former faculty of TERI SAS
Dr. Santosh Pandey, Cofounder, Nihilent Technologies

| | | | |
|---|---|---|---|
| **Course Title: Business communication** | | | |
| **Course code: PPM 101** | **No. of credits:** 3 | **L-T-P distribution: 42-00-00** | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business & Sustainability | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type:** Core | | **Course offered: Semester I** | |

**Course description**

The ability to communicate is an essential skill. This course introduces the fundamental principles of business communication and provides the opportunity to distinguish between business communication and personal/social communication.

It prepares students to communicate effectively in a trans-national, globalized business environment. It introduces students to the basic formats and principles of business communication as well as strategies and abilities to adapt to different circumstances in business situations.

It covers communication structures briefly and introduces students to the ever more important area of cross-cultural communication. The course is designed to impart a basic understanding of written business communication, including letters, reports, presentations and email and valuable insights into listening and non -verbal communication.

Every skill gained from this course will aid the learners in developing complete confidence to communicate professionally with different audiences.

**Course objectives**

The course is *not* intended to teach the basics of the English language and assumes that students will have a good understanding of the English language.

The course aims to:

* Enable students to develop new perspectives and equip themselves to meet the demands of a fast-changing world where technology and globalization and other forces have dramatically changed the practice of business communication in recent years
* Enhance proficiency and competencies in verbal and non- verbal communication skills with a holistic long-term perspective
* Guide the participants to manage cross cultural communication
* Develop technical communication skills
* Address contemporary skills, issues and concepts
* Familiarize the students with the major digital media formats available for business messages
* Develop the ability to write press releases and understand how PR bridges the gap between an organization and its clients

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | **Module 1: Business Communication principles**<br>(a) The Communication Mode<br>(b) The elements of good written communication, including spelling check and grammar<br>(c) Purpose, audience, organization, tone and their role in communication.<br>**Class exercises** | 3 | | |
| **2** | **Module 2: Order of content**<br>(a) "Pyramid" organization of Material<br>(b) Clarity and conciseness<br>(c) Action statements<br>**Class exercises** | 3 | | |
| **3** | **Module 3: Introduction to Managerial Communication; Communication Models**<br>(a) Leadership communication<br>(b) Emotional intelligence and cultural literacy<br>(c) Cross cultural skills<br>**Self - evaluation and analysis** | 3 | | |

| | | | | |
|---|---|---|---|---|
| **4** | **Module 4: Interpersonal communication; Body Language; Persuasion**<br>(a) Interpersonal skills<br>(b) Positive ethos<br>**Self - evaluation and analysis** | 3 | | |
| **5** | **Module 5: Organizational Managerial Communication**<br>(a) Structured and unstructured communication<br>(b) High structure communication<br>(c) Low structure communication<br>**Case study** | 3 | | |
| **6** | **Module 6: Communication and Cultural Context – Communication in High and Low Cultural Contexts**<br>(a) High and Low context cultures<br>(b) The importance of understanding cross cultural business Communication<br>**Case study** | 3 | | |
| **7** | **Module 7: Managing cross cultural communications**<br>(a) Language, value systems, perceptions, philosophies<br>(b) Time and space<br>(c) Fate and personal responsibility<br>(d) Face and Face - Saving<br>(e) Non - verbal communication<br>**Case study** | 3 | | |
| **8** | **Module 8: Technical Communication I – Writing Effective Business Proposals, Business Letters and Memos**<br>(a) Clarity<br>(b) Conciseness<br>(c) Etiquette<br>**Class exercises** | 3 | | |
| **9** | **Module 9: Technical Communication II – Planning and producing Effective Business Reports**<br>(a) Context<br>(b) Structure<br>(c) Audience<br>**Class exercises and quiz** | 3 | | |
| **10** | **Module 10: Technical Communication III – Creating Written Presentations**<br>(a) PowerPoint and other tools<br>(b) Colour – relation to topic – relation to audience – Human factors<br>(c) Appropriate text and fonts<br>(d) Effective use of images – when and when not to use images<br>**Quiz and individual presentations** | 3 | | |
| **11** | **Module 11: Technical Communication IV – Making Effective Oral Presentations**<br>(a) Public speaking<br>(b) Clarity<br>(c) Voice control<br>(d) Eye contact<br>(e) Use of humor<br>**Quiz and individual short speeches** | 3 | | |

| | | | | |
|---|---|---|---|---|
| **12** | **Module 12: The Media and other tools of communication**<br>(a) Role of Media<br>(b) Making effective use of the media<br>(c) Public relations<br>(d) The War - book<br>**Class exercises** | 3 | | |
| **13** | **Module 13: E- Communication**<br>(a) New modes of communication<br>(b) E mail etiquette<br>(c) When chat is an appropriate tool for communication<br>(d) Blogs and other modes of self – expression as tools of business communication<br>**Quiz and class exercises** | 3 | | |
| **14** | **Module 14: Negotiation - A Communication focus**<br>(a) Listening Skills – the importance of being a good listener<br>(b) Building rapport<br>(c) Facilitation<br>(d) Consensus building<br>**Self - evaluation and quiz** | 3 | | |
| | **Total** | 42 | 0 | 0 |

**Evaluation Criteria**

The evaluation process will be as follows:

Test 1 20% (Examination on Modules 1,2,3)

Test II 30% (Examination on Modules 4,5,6,7)

Test III 50% (Examination on full course)

**Learning outcomes**

**After the course, the students will be able to**

1. Communicate with more clarity that would facilitate the organizational work process.

2. Break the barriers and help in the process of earning greater commitment among stakeholders to goal achievement.

3. Handle all sorts of organizational communications, within and beyond.

4. Demonstrate cross - cultural skills in a trans-national business environment

**Pedagogical Tool:**

- Lectures
- Illustrative cases and case discussions
- Assignments

**Suggested Readings**


1. Munter, Mary. *Guide to Managerial Communication*. 7th ed. Upper Saddle River, NJ: Prentice Hall, 2005. ISBN: 0131467042.
2. Harvey, Gordon. *Writing with Sources: A Guide for Students*. Indianapolis, IN: Hackett Publishing, 1998. ISBN: 0872204340.
3. Williams, Joseph. *Style: Toward Clarity and Grace*. Chicago, IL: University of Chicago Press, 1995. ISBN: 0226899152.
4. Kessler, Lauren, and Duncan McDonald. *When Words Collide: A Media Writer's Guideto Grammar and Style*. Belmont, CA: Wadsworth Publishing, 1999. ISBN:0534561330.
5. Zelazny, Gene. *Say It with Charts: The Executives Guide to Visual Communication*. New York, NY: McGraw-Hill, 2001. ISBN:007136997X.

6. Brent, Douglas. "Indirect Structure and Reader Response." *The Journal of Business Communication* 22, no.2 (Spring 1985):5-8.
7. Daly, John, and Isa Engleberg. "Coping with Stagefright." *Harvard Management Communication Letter* 2, no. 6 (June 1999):1-4.
8. "Handling Q&A: The Five Kinds of Listening." *Harvard Communications Update* (February 1999):6-7.
9. Von Hoffman, Constantine. "Getting the Most from Presentation Software." *Harvard Management Communication Letter* 2, no. 6 (June 1999):7-8

**Prepared by:** Mr. Vinay Sharma & Montu Bose

**Course Reviewer:**

1. Dr. Runa Sarkar, IIT Kanpur
2. Prof. Asha Kaul, IIM Ahmedabad

| | | | |
|---|---|---|---|
| **Course title:** Business to Business Marketing | | | |
| **Course code: PPM 109** | **No. of credits:** 2 | **L-T-P distribution:** 28-0-0 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator (s):** | | **Course instructor (s):** | |
| **Contact details:** | | | |
| **Course type** | Elective | **Course offered in:** 3rd Semester | |

**Course description**

The importance of B2B marketing is increasing in India day by day, as the economy is growing and the government is focusing more on manufacturing sector. In any value-chain, all the upstream companies are engaged in B2B relationship. Businesses selling to other businesses constitute the majority of the transactions in the real life since apart from the final transaction (which is the only business to consumer dealing), rest all are business-to-business transactions in any value chain. Also, the B2B revenue is a significant contributor to the sales of any organization today; right from totally industrial product / services companies on one end to even the totally consumer goods companies on the other. Most of the marketing subjects taught in B-schools are designed from a consumer marketing perspective. Thus the students' assumptions about business-to-business marketing are often based on their familiarity with consumer marketing. Hence, for any student who wants to understand all the dimensions of marketing, this course is very important.

**Course objectives**

This course has been designed to impart to the students, the points of comparisons and departures between B2C and B2B fields in order to clarify how the principles of marketing are the same but there are distinguishing characteristics of B2B practices. The specific learning objectives are:

- To appreciate the concepts of B2B Marketing
- To understand the difference between B2B markets and consumer markets
- To understand the growing complexity of business transactions and integration of technology in B2B Marketing practices
- To understand the purchasing orientations of various customer firms
- To become aware of various technological B2B platforms available on the internet and how the firms can leverage them

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| | | | | |
| 1. | Course overview, Introduction to Business Marketing,<br>Article in class Discussion: The Invisible Hand of Business Marketing | 2 | 0 | 0 |
| 2. | Guiding principles in B2B marketing, Comparisons and contrast between B2B and B2C marketing.<br>Industrial and institutional products and services, B2B selling in consumer good companies, e-based B2B services, Business Networks and Alliances<br>Article for presentation from HBR: What is Industrial marketing | 2 | 0 | 0 |
| 3. | *Crafting B2B Marketing Strategy*<br>Article for presentation: Business Mktg in India<br><br>Case Study for assignment: Derrick's Ice Cream | 2 | 0 | 0 |
| **Organizational Buying & Marketing strategies** | | | | |
| 4. | *Firms as customers, Organizational Buyers' Decision Process, Role of various influencers*<br><br>Article for presentation: Take the Qualified Lead | 3 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| 5. | Assessing business markets, Segmentation, Targeting & Positioning in Business markets<br>Discussion in class: Panasonic Case<br>6 Elements of a winning B2B Brand Strategy | 3 | 0 | 0 |
| 6. | Branding in B2B, Innovation, Customization<br>Article for presentation: The dynamics of B2B Marketing | 3 | 0 | 0 |
| 7. | Pricing in B2B marketing, creating customer value<br>Case discussion in class: Computron Inc. | 3 | 0 | 0 |
| 8 | Business Channel management, E-comm in B2B,<br>Technology Platforms<br>Article for presentation: How to leverage new technology in B2B Marketing | 3 | 0 | 0 |
| 9 | Gaining Customers, Personal selling principles in B2B situations, Customer Retention, B2B marketing Metrics<br>Article for presentation: 7 sins of selling | 3 | 0 | 0 |
| 10 | Communicating with the Business markets<br>Various Promotion-mix and use of trade shows<br>Illustration from Lohia Corps Ltd. Trade Shows | 3 | 0 | 0 |
| | **B2G marketing in India** | | | |
| 11 | Government as a buyer, Selling through Kendiya Bhandar and NCCF, Role of DGS&D, Selling to CSD, Wrap-up<br>**Article for presentation: What is B2G Marketing** | 1 | 0 | 0 |
| | | 28 | 0 | 0 |
| | **Total** | 28 | | |

***Note: The articles given in the session plan may be changed with enough time being given to the presenting group.***

**Evaluation criteria**

- **Test 1: Class participation** 10% (Based on attentiveness and active participation during the entire course)
- **Test 2: Article presentations** 10%
- **Test 3:**10% (After completion of 9 sessions – written exam to test the understanding of concepts of Business marketing, organizational buying behaviour and how to categorize the buyer segments in B2B)
- **Test 4:**10% (After completion of 21 sessions – written exam to test the understanding of concepts of product development, pricing and channel management in B2B)
- **Test 5: Case study discussion / activity** 10% (In Session 16-17, Structure – 1. Identifying the situation of the company and the protagonist. 2. Understanding the competition. 3. Devising a plan for participation in a Bid. 4. Justifying the plan with clarity of purpose)
- **Test 6: Assignments** 10% (Study of STP done by IBM through secondary sources)
- **Test 7:**40% (Written examination covering the entire course)

**Learning outcomes:**

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

- Adopt the market planning process for B2B markets (Minor exam 1 and 2, Article presentations)
- Develop the marketing strategies for any firm for its B2B marketing (Case study and Assignments)
- Fine-tune the marketing strategies for the B2G dealings for a firm (End Term exam)
- Apply various new technologies in the entire B2B marketing-mix of a firm (Article presentations, End Term exam)

**Pedagogical approach**

- Lectures
- Illustrative cases and case discussions (in groups)
- Assignments (group)

**Materials**

Textbooks: B2B Marketing: A South-Asian Perspective by Michael D. Hutt, Dheeraj Sharma & Thomas W. Speh, (Cengage Learning; 11th Edition).

**Reports & other references:**

- Handouts
- Business to Business Marketing, Vitale & Giglierano, Thomson Press, India Edition
- Business Marketing Management, Anderson & Narus, Pearson Education
- Business Marketing, K.K. Havaldar, Tata McGraw-Hill

**Additional information (if any)**

**Student responsibilities**

**Prepared By**: Dr. Ritika Mahajan & Montu Bose

**Reviewers:**

Dr, Asif Zamir, FORE School of Management, Delhi.
Dr. Mohan Agarwal, IIM Lucknow
Dr. SK Pandey, IIM Rohtak

| **Course title: Derivatives and Risk Management** | | | |
|---|---|---|---|
| **Course code: PPM 123** | **No. of credits:** 2 | **L-T-P distribution: 28-0-0** | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business & Sustainability | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type:** Elective | | **Course offered in:** 3rd Semester | |

**Course description**

Risk is all pervasive. For business the various kinds of risk relate to price, interest rates, foreign exchange rates, credit etc. Of late tactical management of these risks has gained prominence especially with advent of derivative products. The course concerns with tactical management of these risk through investment in financialassets. More specifically, the course will deal with the pricing and use of financial derivatives, including options, forwards, futures, swaps and credit derivatives as risk management tools. Financial derivatives are used by institutions as well as investors, sometimes to hedge (reduce) unwanted risks, sometimes to take on additional risk motivated by views regarding future market movements. Through this perspective, the course will also highlight the uses and abuses of financial derivatives with respect to the various incidents that had already happened in the markets.

**Course objectives**

The objective of this course is to familiarize the participants with the various instruments available for risk management. It covers rather simpler instruments such as options, futures, swaps, and credit derivatives. Besides discussing the pricing of these instruments and hedging principles the course would also aim at introduction of some complex instruments such as options on futures and swapsetc.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | Forwards and Futures, Trading and Settlement, Margins,<br>Marking to Market, Open Interest | 2 | 0 | 0 |
| **2** | **Commodity Futures**<br>Hedging, Speculation, Arbitrage with commodity futures, Pricing of forward and futures, Normal Backwardation<br>Convergence, Basis risk, optimal hedge ratio<br>**Chapter 3** | 2 | 0 | 0 |
| **3** | **Currency Forwards and Futures**<br>Foreign Exchange Markets, and Rates, Hedging with Forwards, Non-Deliverable Forwards, Currency Futures, Pricing Currency Futures, Hedging, Speculation, and Arbitrage with Currency Futures<br>**Chapter 5** | 2 | 0 | 0 |
| **4** | **Stock and Index Futures**<br>Trading of Index Futures, Pricing, Risk Adjustment, Hedging, Speculation, and Arbitrage with Index Futures<br>**Chapter 4** | 2 | 0 | 0 |
| **5** | **Options**<br>Basics of call and put options, their payoffs, Intrinsic value and time value, American and European options, At the money, out of money and in the money options, Bounds to option pricing, | 2 | 0 | 0 |
| | Arbitrage based price limits, Put call parity<br>Chapter 8 & 9 | | | |

| | | | | |
|---|---|---|---|---|
| **6** | **Option Pricing**<br>Binomial Option Pricing model<br>**Chapter 10**<br>**Chapter 12 & 13** | 2 | 0 | 0 |
| **7** | **Option Pricing**<br>Risk Neutral valuation,<br>Black Scholes option pricing model and assumptions,<br>Interpretation of Black Scholes model. | 2 | 0 | 0 |
| **8** | **Option Trading Strategies**<br>Straddle, Strangle, Butterfly, Bull and Bear spread, Ratio spread, Box spread, Condor, Synthesizing with options<br>**Chapter 12** | 2 | 0 | 0 |
| **9** | **Exotic Options**<br>Introduction (definitions, payoff and applications) to Forward Start option, Digital Option, Chooser Option, Barrier option, Shout option, Asian option, Compound option<br>**Chapter 13** | 2 | 0 | 0 |
| **10** | **Option Greeks (Option Sensitivities)** Delta,<br>Theta, Gamma, Delta Hedging **Chapter 11** | 2 | 0 | 0 |
| **11** | **Swaps**<br>Forward Rate Agreement, Currency Swaps, Interest Rate Swaps, Applications of swaps, Cancellation and<br>Valuation of Swap<br>**Chapters 6 and 7** | 2 | 0 | 0 |
| **12** | **Interest Rate Derivatives (Black's Model and applications)** Caps, Floor,<br>Collars,<br>Swaptions, Options on Bonds,<br>Options on futures, Interest rate futures<br>**Chapter 15** | 4 | 0 | 0 |
| | TOTAL | 28 | 0 | 0 |

**Evaluation criteria**

- Test 1: Class Participation 10%
- Test 2: Project 30%
- Test 3: Written Test 20%
- Test 4: Written test 40%

**Learning Outcomes:**

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

1. Recognize the role of derivatives in financial risk management.
2. Demonstrate critical thinking, analytical and problem-solving skills in the context of derivatives pricing and hedging practice.
3. Evaluate alternative risk management strategies and tactics.
4. Demonstrate an understanding of pricing forwards, futures and options contracts.

**Pedagogical approach**

The course will be delivered through lectures and discussion of case studies, practical in Finance Lab, research papers and articles.

**References:**

**Suggested Reading**

Srivastava R. (2015). Derivatives and Risk Management**.** Oxford University Press, 2nd Edition. NY.

**Desired Readings**

**1.** Hull JC (2013). Options, Futures, and Other Derivatives. 7th Edition. Pearson Education. London.
**2.** Kolb R. (2011). Futures Options and Swap. Blackwell Publishing. NY.
3. Redhead K (1992). Financial Derivatives. Prentice Hall. New Delhi.
4. Strong RA. (1995). Derivatives; An Introduction. Thomson. SW.
3. Bhalla, V.K. (2012). Investment Management. Sultan Chand. ND
4. Wimott, P. (2012). Quantitative Finance. Wiley & Sons. NY.
5. Jarrow, R. & Stuart, T. (1995). Derivative Securities. Thompson SW.
6. Chance, D.M., & Brooks, R. (2008). Derivatives and Risk Management Basics. Cengage Learning India.
7. Pliska, S. (1997). Introduction to Mathematical Finance. Wiley-Blackwell Publishing.

**Additional information (if any)**

**Modules**

Sessions plan as above would be followed with following module objectives:

*An overview of risk and derivatives:*

The objective of the session is to draw distinction between various kinds of risks that a firm is exposed to. Some of these risks are manageable with derivative instrument. The session on Introduction to derivatives is intended to provide an overview of derivatives, their characteristics and misconceptions about them.

*Forwards and Futures:*

These sessions are aimed at introducing the terminology of forwards and futures, their applications of hedging fro variety of underlying assets such as commodities, currencies, stocks and interest rates. This would also cover the pricing principles and methods of trading, settlement etc. Separate sessions for commodities, currencies and stock indices would deal extensively with the examples of hedging, speculation and arbitrage.

*Options:*

Sessions on options are aimed at developing an understanding about the complex nature of the derivative. The objective is to familiarize the participants with the various ways to value options. Hedging using options would be discussed in details with suitable real life applications. Trading strategies with options would deliberate upon how the combination of options can be used to achieve the desired risk profiles of different classes of investors. Sessions on exotic options would concentrate on how the parameters of options can be modified to suit the individual needs of hedging and cost associated with them.

*Swaps and Interest Rate Derivatives:*

These sessions are useful for the sectors such as banking, construction and infrastructure that are sensitive to broad economic factors and interest rate structures and changes in them. The tools of managing the interest rate risk would be introduced with emphasis on swaps and interest rate futures.

**Student responsibilities**

All students are expected to read the assigned readings prior to the class. Students are expected to analyze the case following the 'discussion questions'. All students must maintain full attendance and do timely submission of assignments. Full Class Participation is expected from all students.

**Prepared By:**

Prof. Manipadma Datta

**Course Reviewer:**

Mr P.S.Narayan, Ecoeye, Social and Community Initiatives, Wipro
Mr Brij Sethi, Ecoeye, Social and Community Initiatives, Wipro
Mr Rakesh Sharma, Strategy & Business Development, Philips Electronics India Limited
Mr Pawan Deep Singh, Strategy & Business Development, Philips Electronics India Limited.

| | | | |
|---|---|---|---|
| **Course title:** Financial Intermediaries, Institutions and Regulations | | | |
| **Course code: PPM 125** | **No. of credits:** 2 | **L-T-P distribution: 28-00-00** | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business & Sustainability | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type:** Elective | | **Course offered in:** | |

**Course description**

It's not only important to create wealth. It's more important to ensure that such wealth is best managed. Unless it's efficiently channelized to the best possible investments, no nation can grow. Financial intermediation is a process that helps the prospective saver-investors facilitate the productive use of the surplus wealth with reduced risk of judgment. Financial intermediaries thus play a very important role in a nation's economy. Nations with stronger and better regulated network of financial institutions and markets are found to be better developed.

This course is designed to familiarize the students with the Indian scenario in a global context. This will help them to understand and develop expertise for making the best of financial decisions as management professionals.

**Course objectives**

To develop an understanding of the working of various segments of the finance markets.
To develop an understanding of the working of the financial system the manager has to interact with. To develop a holistic perspective about all the financial institutions and their economic significance.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | Course Overview | 2 | 0 | 0 |
| **2** | Economic growth and financial intermediation: an introduction to Indian financial system | 2 | 0 | 0 |
| **3** | Types of financial institutions | 2 | 0 | 0 |
| **4** | Financial markets and regulations | 2 | 0 | 0 |
| **5** | Recent trends in Indian financial markets | 2 | 0 | 0 |
| **6** | Introduction to market instruments and securities analysis | 2 | 0 | 0 |
| **7** | Financial sector reforms | 2 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| **8** | Financial markets:<br>Call money market Treasury<br>bills market Commercial<br>bills market<br>Market for commercial papers Discount<br>market<br>Government securities market Securities<br>market<br>Financial derivatives market | 4 | 0 | 0 |
| **9** | Institutions for market regulation and promotion and their functions:<br>RBI<br>SEBI | 2 | 0 | 0 |
| **10** | Commercial banks and their activities | 2 | 0 | 0 |
| **11** | Co-operative banks and their activities | 2 | 0 | 0 |
| **12** | Non-Banking Intermediaries:<br>Provident funds<br>Pension funds Mutual<br>funds Insurance<br>companies<br>UTI | 2 | 0 | 0 |
| **13** | Non-banking statutory financial organizations | 2 | 0 | 0 |
| | Total | **28** | **0** | **0** |

**Evaluation criteria**
Test 1: Quiz 30%
Test 2: Assignments/Projects 30%
Test 3: written test 20%
Test 4: Written test 20%

**Learning Outcome:**
After successful completion of the course, the students would be able to -

- Develop a comprehensive understanding of the financial system & institutions of India.
- Analyze the trends of Indian financial markets and functioning of its various segments.
- Develop a holistic perspective about all the financial institutions and their functions.
- Acquire knowledge about the regulatory framework of finance markets.

**Pedagogy**
The course will be taught in 28 sessions of 60 minutes duration each. It will be a combination of interactive class lectures and project works undertaken by the students.

**References:**
Text:
Bhole LM & Mahakud (2000). Financial Institutions and Markets: Structure, Growth and Innovations. TATA McGrow Hill. 5th edition. ND.
References:
Bhasin N. (2010). Financial Institutions and Financial Markets in India: Functioning and Reforms. New Century Publications. New Delhi.
Fabozzi FJ & Modigliani (1998). Capital markets: Institutions and Instruments. PHI. 3rd edition. NY.

**Additional information (if any)**

**Student responsibilities:** Attendance, timeline adherence for assignments, come prepared with readings when provided.

**Prepared by**: Prof. Manipadma Datta
**Course Reviewers:**
Prof. Madhu Vij, FMS, DU
Dr. Ria Sinha, TERI, ND

| | | | |
|---|---|---|---|
| **Course title:** Security Analysis & Portfolio Management | | | |
| **Course code:** PPM 126 | **No. of credits:** 2 | **L-T-P distribution:** 28-0-0 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator (s):** | | **Course instructor (s):** | |
| **Contact details:** | | | |
| **Course type** | Elective | **Course offered in:** 3rd Semester | |

**Course description**

Security Analysis and Portfolio Management concerns itself with investment in financial assets with specific attention to the returns and risk associated with investing in securities. The subject is aimed at providing insight to the various analytical techniques used in evaluation of the various investment opportunities. The course also provides of extension of these concepts to the portfolio of securities and the concept of diversification, management of a portfolio.

**Course objectives**

Analyzing securities & managing portfolios to generate required return can be intimidating for individuals. The key objective of this course is to provide the students in-depth knowledge and equip them with essential tools, techniques, models and investment theory necessary for analyzing different types of securities, making sound investment decisions and optimal portfolio choice.

**Course content**

| Unit | Topic | L | T | P |
|---|---|---|---|---|
| **1** | Introduction to Investments – Meaning and nature, Risk-return trade off, Investment environment, Financial markets – Nature and types, Capital Market – Primary & Secondary, Stock exchange, Trading in securities, Financial market participants | **4** | **0** | **0** |
| **2** | Time value of money – Concept & Applications, Discounting & Compounding for different cash flow patterns, Multi period compounding | **4** | **0** | **0** |
| **3** | Risk & Return – Concept, Measures of return – Holding period rate of return, Return relative, CAGR. Types of risk – Systematic vs. Unsystematic risk, Standard deviation & beta as a measure of risk | **4** | **0** | **0** |
| **4** | Valuation of Securities – Equity, Preferred stock and Debt. Yield till maturity, Yield to call, Bond duration, Dividend discount model, CAPM model, Earnings based models. | **4** | **0** | **0** |
| **5** | Approaches to Security Valuation - Fundamental Analysis- EIC framework, Using Ratios for analysis, Technical Analysis – Basic premise and Dow theory, Types of charts and Chart patterns, Moving average analysis, Market indicators and stock specific indicators, Odd lot theory. Efficient market hypothesis - Forms of market efficiency and their implications, Tests of different forms of market efficiency. | **4** | **0** | **0** |
| **6** | Portfolio Analysis and Selection – Calculating risk and return of portfolio, Mean Variance Approach, Sharpe Model, Theory of Portfolio Selection – Markowitz Model, CML & CAPM. Stock market anomalies (Size effect, Value effect, Seasonality effect, Overreaction effect), Arbitrage Pricing Theory and Multifactor Asset Pricing Models including Fama French Five factor model. | **4** | **0** | **0** |
| **7** | Portfolio Management, Evaluation & Revision - Active and Passive portfolio management; Investment strategies- value investing, momentum and contrarian strategies; Portfolio performance evaluation (Sharpe index, Treynor's Index, Jensen's | **4** | **0** | **0** |

| | | | | |
|---|---|---|---|---|
| | alpha, Information ratio and Fama's decomposition measure). | | | |
| | Total | **28** | **0** | **0** |

**Evaluation criteria**
Test 1: Quizzes – 20%

Test 2: Group work / Assignments / Presentation – 20%

Test 3: Written Test - 60%

**Learning outcomes:**
On successful completion of this course, the student will be able to

1. Evaluate the investment environment, alternative investment avenues and understand the risk return framework.
2. Calculate the intrinsic value of different types of securities.
3. Analyze equity shares using different approaches and models.
4. Construct, analyze, select and evaluate portfolios along with a deep understanding of Capital market theory and associated models.

**Pedagogical approach**
The pedagogy would be a mix of Lectures, Discussions, Case analysis, Quizzes, Assignments & Group work.

**Materials**
**Reference Books:**


1. Prasanna C (1994). Investment Analysis & Portfolio Management, McGraw Hill, ND.
2. Bodie Z., Kane A. & Marcus A. (2014). Investments, McGraw Hill. NY.
3. Donel E. Fischer and Ronald J. Jordan (2000). Security Analysis and Portfolio Management, Pearson Education, London.


**Additional information (if any)**

**Student responsibilities**


**Prepared by:** Dr. Swati Dhawan & Prof. Manipadma Datta


**Course Reviewers:**
Prof. Madhu Vij, DU
Mr. Vikram Dhawan, Founder, Mint Wealth Management

Course title: **Corporate Accounting and Reporting**

| **Course code: PPM 128** | **No. of credits: 3** | **L-T-P distribution: 28-14-0** | **Learning hours: 42** |
|---|---|---|---|

**Pre-requisite course code and title (if any):**

**Department:** Department of Business & Sustainability

| **Course coordinator(s):** | **Course instructor(s):** |
|---|---|
| **Contact details:** | |
| **Course type:** Core | **Course offered in: First Semester** |

**Course description**

Accounting is the language of business. It attempts to measure and report corporate performance. Managers use accounting in making decisions; while investors use it for valuing stocks. The bankers and lender rely on accounting information to decide to whether to lend money to business. The accounting information is also crucial in evaluating the performance of employees at various levels in an organization. Thus, this is a very useful course in management education in almost every graduate management program the world over, a full course on accounting and reporting remains an obvious choice. This course is indispensable as the first step towards understanding the financials of business.

**Course objectives**

The course is designed for students participants

- To Understand the basics of accounting;
- To make them comfortable looking through an annual report.
- To develop the ability in them to use financial statements to assess a company's performance
- To understand how the accounting information system works in a firm;
- To interpret the need of accounting information in managerial decision making process;
- To analyze the performance vis-à-vis financial health of the firm; and,
- To understand the role of accounting acts as a control mechanism.

**Course contents**

| **Module** | **Topic** | **L** | **T** | **P** |
|---|---|---|---|---|
| **1** | Accounting and Business Decisions:<br>• What is accounting?<br>• Different forms of business organization<br>• Financial and Management Accounting<br>• Accounting Information System<br>• Users of accounting information<br>• Role of accounting in capital market and corporate governance<br>• Accounting Equation<br>• Accounting Ethics | 2 | 0 | 0 |
| **2** | Recording of business transactions:<br>• Double-entry system<br>• Accounts<br>• Recording transactions<br>• Error checks through trial<br>• Balance | 4 | 2 | 0 |
| **3** | Measuring business income:<br>• Income measurement<br>• Adjustments to be done<br>• Preparing Profit &Loss<br>• Account<br>• Concept of consolidated<br>• Income statement | 3 | 1 | 0 |
| **4** | Assignment Discussion | 0 | 1 | 0 |

| | | | | |
|---|---|---|---|---|
| **5** | Balance Sheet:<br>• What it is?<br>• Why is it so called?<br>• How to prepare it?<br>• Consolidated balance sheet<br>• What it says?<br>• The new format for its presentation | 3 | 1 | 0 |
| **6** | Annual Reports:<br>• What it contains<br>• The regulatory framework<br>• Why the companies disclose more than what is legally required?<br>• The disclosure system<br>• Qualitative and Qualitative<br>• Reporting<br>• Component-wise discussion | 3 | 0 | 0 |
| **7** | Case discussion with live annual reports | 0 | 1 | 0 |
| **8** | Statement of Cash Flows:<br>• What is it?<br>• Why is it?<br>• How to prepare it?<br>• What does it say? | 1 | 1 | 0 |
| **9** | Analyzing Financial Statements:<br>• Why is it done?<br>• Benchmarking and its problems<br>• Intra and inter-firm comparison<br>• Quality of earnings<br>• Using financial ratios<br>• Du-Pont analysis | 3 | 2 | 0 |
| **10** | Case Discussion | 0 | 1 | 0 |
| **11** | Presentation of Group Assignment | 0 | 2 | 0 |
| **12** | Basics of Cost Accounting:<br>• Costs classification<br>• Cost absorption<br>• Cost-Volume-Profit relationship<br>• Marginal costing and managerial decisions. | 6 | 2 | 0 |
| **13** | Accounting standards and IFRS: a brief introduction:<br>• What is an accounting standard?<br>• Why standardization is necessary?<br>• Indian accounting standards<br>• The regulatory framework<br>• International standards and the regulatory framework. | 3 | 0 | 0 |
| | | 28 | 14 | 0 |

**Evaluation criteria**

- Test 1: Quiz 30%
- Test 2: Assignment 20%
- Test 3: Written Test 25%
- Test 4: Written Test 25%

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

- Understand various principles on which financial statements are prepared. (Modules #1, #2, #3, #5))
- Understand how an Accounting Information System (AIS) works. (Modules #6, #7, #8)
- Acquire skills to fortify managerial ability with utilizing accounting information for a conscious decision making. (Modules #9, #10, #11).
- Develop a basic understanding of cost accounting( Module #12).
- Develop an overall understanding of emerging corporate reporting framework in the context of International Financial Reporting Standards (IFRS). (Module #13)

**Pedagogical approach**

The course will be delivered through lectures and discussion of case studies, videos, annual reports of the companies, research papers and newspaper articles.

**References:**

Suggested Readings –


- Swamy NR. (2008). Financial accounting: a managerial perspective. PHI. NY.
- Banerjee B. (2002). Cost Accounting: theory and practice. PHI. ND.


Desirable Readings –


- Bhattacharya AK. (1994). Principles and Practice of Cost Accounting. Prentice-Hall. ND.
- Anthony RN. Hawkins DF. And Merchant KA. (2001). Accounting: Text and Case. 13th Edition, Tata McGraw Hill. London.


Text


- Bhattacharya SK. And Dearden J. (2011). Accounting for Management: Text and Cases. Vikas Publishing House; Third edition
- Homgren CT. Srikant M. Foster DG. (2010). Cost Accounting - A Managerial Emphasis. Pearson Education, Thirteenth Edition. NY.
- Homgren CT. Sundem GL. And Stratton WO. (2013). Introduction to Management Accounting. Pearson Education, Thirteenth Edition. NY.


Websites and Web resources –


- Maria B. & Alexandru IC. (2005). Economic decision-making and the role of accounting information. retrieved from. http://www.oeconomica.uab.ro/upload/lucrari/1020081/17.pdf
- Damodaran A. (2006). Understanding Financial Statements. retrieved from http://people.stern.nyu.edu/adamodar/pdfiles/valn2ed/ch3.pdf
- The Institute of Company Secretaries of India. retrieved from https://www.icsi.edu/
- Financial Times. Retrieved from https://www.ft.com/,
- Learn Accountancy the Easy Way. Retrieved from http://accounting-simplified.com/,


**Additional information (if any)**

**Student responsibilities**

All students are expected to read the assigned readings prior to the class. Students are expected to analyze the case following the 'discussion questions'. All students must maintain full attendance and do timely submission of assignments.

**Prepared By:** Manipadma Datta

**Course Reviewers:**

Prof. Madhu Vij, FMS, DU
Prof. Vivek Suneja, FMS, DU

| | | | |
|---|---|---|---|
| **Course title:** Managerial Economics | | | |
| **Course code:** PPM 148 | **No. of credits:** 3 | **L-T-P distribution:** 32-10-0 | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator (s):** | | **Course instructor (s):** | |
| **Contact details:** | | | |
| **Course type** | Core | **Course offered in:** Semester 1 | |

**Course description**

This is the first economics course that the students will take at TERI School of Advanced Studies and for most students, this may be their first ever exposure to the subject economics. The basic objective is to equip students with skill sets in applying an analytical approach to the study of how individuals and business units deal with the fundamental problems of scarce resources, understanding of the nature of prices and of markets, role of information and interventions, etc. Specific topics to be covered include applications of supply and demand, market structure, laws of production, market failure and game theory. Examples from services sector, energy and infrastructure sectors would be particularly important in attaining course goals.

The course would provide the base for macroeconomics, organizational behavior, marketing, finance and strategic management.

**Course objectives**

The course objectives are;

- To increase students understanding of economic way of thinking to business decision making problems
- To develop students critical thinking and analytical abilities is resolving business problems by employing various tools and techniques of managerial economics
- To make students understand the rigors of various economic models and their applications.

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | Introduction to Economics Human<br>Wants and scarce resources Basics of<br>demand, supply and market Concept<br>of market<br>Demand and supply schedules and equilibrium<br>Changes in price when demand/supply shift<br>Demand Analysis<br>Derivation of demand curve<br>Concept of Elasticity – point, arc, income and cross elasticity's<br>Application of elasticity | 6 | 2 | 0 |
| 2. | Utility, Preferences and Choice<br>Utility Theory<br>How people make decisions?<br>Utility – total, marginal<br>Marginal analysis and its use in economic analysis Preferences,<br>budget constraints, choices and optimal choices Consumer<br>Behavior<br>Changes in income and prices<br>Income and substitution effects<br>Consumer surplus – impact of taxes, subsidies, etc. | 6 | 2 | 0 |

| | | | | |
|---|---|---|---|---|
| 3. | Production and Cost<br>Production Theory<br>Production function and different forms<br>Total, average and marginal products<br>Returns to scale<br>Tech. progress, innovation, sources of competitive advantage<br>Theory of costs<br>Nature of production costs, concepts of costs and short-run and long run costs<br>Total, average and marginal costs<br>Economies of scope, learning curve<br>Applications of the above concepts in different classes of firms particularly in service industry | 6 | 2 | |
| 4. | Theory of Firms<br>Market and market structure<br>Concept of market<br>Market equilibrium and price determination Market structure<br>Perfect Competition, monopoly, duopoly, oligopoly<br>Some special subjects – auctions, network markets<br>Imperfect competition<br>Price discrimination (definition and types of price discrimination, necessary conditions for the existence of price discrimination, price discrimination and the price elasticity of demand)<br>Oligopoly (classical and collusive oligopoly)<br>Average cost pricing<br>Market structure, efficiency and regulation<br>Relevance of efficiency related issues<br>Monopoly power and social costs<br>Regulation of public monopolies | 8 | 4 | 0 |
| 5. | Economics of Information<br>Search costs<br>Asymmetric information and adverse selection<br>Information and moral hazard<br>Market signaling<br>Switching costs<br>Principal agent problem | 6 | 0 | 0 |
| | **Total** | **32** | **10** | **00** |

**Evaluation criteria**

The overall course grade will be allocated as follows:

- Test 1 & Test 2: Written Test - 30 %
- Test 3: Assignment -20 %
- Test 4: Written test - 50 %

**Learning outcomes**

**After the completion of the course, the students will**

- Understand the key concepts, models, tools and techniques of managerial economics (Test 1, 2& Test 3)
- Understand and appreciate the applications of various tools and techniques of managerial economics (Assignment)
- Develop abilities of applying the tools, techniques and models in resolving real life business problems (Assignment &Test 3)

**Pedagogical approach**

Pedagogical approach consists of classroom teaching; interactive sessions; case study discussion, students' presentation.

**Materials**

Textbooks and Readings:

- Dominick S., (2012), Managerial Economics, 7th Ed., Oxford University Press.
- Frank, R. and B. Bernanke (2004), Principles of Economics, 2nd Ed., Tata McGraw Hill Dominick S., (2009), Principles of Microeconomics, International Version, 5th Ed., Oxford University Press.
- Varian, H. R., (2006), Intermediate Microeconomics, 8th ed. W. W. Norton & Company
- Sen, A., (2006), Microeconomics – Theory and Applications, 2nd Ed., Oxford University Press.
- Pindyck, R. S., D. J. Rubinfeld and P. L. Mehta (2009), Microeconomics, 7th Ed., Pearson Education, India.

**Additional information (if any)**

**Attendance**

All exams are based on lecture and classroom discussion. Attendance will be taken on a regular basis and it is expected that all students attend ALL sessions which will be counted for overall grade. Showing up late for class, use of gadgets (mobile phones,tablets or laptops etc.) during class is disruptive and should be avoided

**Student responsibilities**

Attendance, feedback, discipline etc.

**Prepared By:** Dr. Gopal Sarangi

**Course reviewers:**

Dr. Santanu Gupta, XLRI, Jamshedpur
Dr. Ananya Ghosh Dastidar, DU South Campus

**Course title:** International Financial Management

| **Course code:** PPM 191 | **No. of credits:** 2 | **L-T-P:** 28-00-00 | **Learning hours:** 28 |
|---|---|---|---|

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

**Department:** Department of Business and Sustainability

| **Course coordinator:** | **Course instructor:** |
|---|---|

**Contact details:**

| **Course type: Elective** | **Course offered in: 3rd Semester** |
|---|---|

**Course description:**

International Finance concerns itself with aspects of financial planning and investment in financial assets in the global scenario in this age of free trade and increasing internationalization. The subject is aimed at providing insight to the various analytical techniques required to take decisions involving foreign exchange, hedging, and an understanding of foreign exchange markets and monetary systems. The course also provides background of international trade, factors governing exchange rates and new developments taking place in terms of various financial instruments in vogue.

The course provides international perspective in various areas of finance assuming that basic exposure is already given. The course deals with six distinct areas of finance and sessions may be split as follows;
International Trade and Economics : Sessions 1, 2, 3, 4
Corporate Finance : Sessions 8, 9,
10 Accounting : Sessions 13
Commercial : Sessions 11, 12
Exchange Rate Management : Sessions 5, 6, 7

**Course objectives:**

The objective of this course is to familiarize the participants with the foreign exchange markets, its features, terminology, types of instruments, the determinants of the exchange rates, analytical framework for taking corporate finance decisions, and to provide a conceptual in sight to risk management.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1 | **INTERNATIONAL FINANCIAL MANAGEMENT**<br>• An Introduction<br>• Goals of MNCs<br>• Conflicts, issues, constraints in MNCs<br>• objectives/operations<br>• Theories of International Trade | 2 | 0 | 0 |
| 2 | **INTERNATIONAL MONETARY SYSTEMS Gold Standard:**<br>• History,<br>• Price Specie Flow Mechanism<br>• Quantity Theory of Money, Fiat Money<br>• Reasons for failure of Gold Standard<br>**Bretton Woods System:**<br>• Operational Framework<br>• Introduction to IMF Evaluation<br>• Smithsonian agreement and Jamaica Agreement<br>• Failure of Bretton Woods System<br>**European Monetary System**<br>• Introduction<br>• Comparison with Bretton Woods<br>**Euro Currencies and Markets** | 4 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| | • Introduction<br>• Evolution | | | |
| **3** | **DETERMINATION OF FOREIGN EXCHANGE RATES**<br>• Factors determining demand and supply<br>• Central Bank Intervention, Clean and Dirty Float<br>• Sterilisation<br>• Comparison of Flexible and Fixed Exchange Rate System | 2 | 0 | 0 |
| **4** | **FOREIGN EXCHANGE MARKETS**<br>• Participants, Operation, Terms<br>• Spot and Forward markets<br>• Fedai Rules<br>• Option Forwards, Swap Points | 2 | 0 | 0 |
| **5** | **PARITY RELATIONSHIP AND FORWARDS**<br>• Absolute and Relative Purchasing Power<br>• Parity<br>• Interest Rate Parity and linkages with the<br>• forward markets<br>• Calculation of forward rates<br>• Problems and Numerical | 2 | 0 | 0 |
| **6** | **TRANSACTION EXPOSURE**<br>• Nature of exposures faced by MNCs<br>• Definition of Transaction Exposure<br>• Forward Hedge<br>• Money Market Hedge<br>• Cost of Hedging<br>• Hedging through Invoicing<br>• Hedging through Lead and Lag<br>• Exposure Netting | 2 | 0 | 0 |
| **7** | **COST OF CAPITAL, CAPM & CAPITAL STRUCTURE FOR MNCs**<br>• WACC & Value of the firm<br>• Cost of capital for MNCs<br>• Conventional and International CAP-M<br>• Beta and cost of equity for MNCs<br>• Cross Border Listing<br>• Capital structure for subsidiary and<br>• MNC | 2 | 0 | 0 |
| **8** | **INTERNATIONAL CAPITAL BUDGETING**<br>• Capital Budgeting<br>• Subsidiary vs. Parent : Cash flow and discount rate<br>• WACC and APV<br>• Lessard's APV Model<br>• Case on capital budgeting with APV application | 2 | 0 | 0 |
| **9** | **FDI and POLITICAL/COUNTRY RISK**<br>• Why FDI<br>• Causes of political and country risk<br>• Measurement of political and country risk | 2 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| **10** | **Mid-term Test TRANSFER PRICING**<br>• Objective<br>• Concept of control<br>• Methods of calculating transfer price | 2 | 0 | 0 |
| **11** | **INTERNATIONAL TRADE FINANCE**<br>• Letters of Credit<br>• Bill of Exchange<br>• For fainting<br>• Factoring | 2 | 0 | 0 |
| **12** | **TRANSLATION EXPOSURE**<br>• Meaning<br>• Impact<br>• Translation Methods- An example<br>• Accounting Standards applicable to<br>• translation (AS 11 and AS21)<br>• Managing Translation Exposure<br>• Limitations of managing translation<br>• Exposure | 2 | 0 | 0 |
| **13** | **ECONOMIC EXPOSURE**<br>• Meaning<br>• Impact<br>• Measuring economic and operating<br>• exposure<br>• Managing economic exposure<br>• Limitations of managing<br>• economic/operating exposure | 2 | 0 | 0 |
| | **Total** | **28** | **0** | **0** |

**Evaluation procedure**

1. Test 1: Written Test 20%
2. Test 2 (Surprise Tests) 10%
3. Test 3: Each Case 15 marks each (Best two) 30%
4. Test 4: Written Test 40%

**Assignments**

1. CaseV.2 on Euro Disneyland: Page605, Multinational Financial Management by Alan Shapiro, Seventh Edition.

2. VOGL Case-Integrative problem on exchange rate risk management; Chapter12, International Financial Management by Jeff Madura

**All cases can be submitted in groups of size not more than five (5).**

**Learning outcomes:**

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

1. Understand international capital and foreign exchange market
2. Identify and appraise investment opportunities in the international environment
3. Identify risk relating to exchange rate fluctuations and develop strategies to deal with them
4. Develop strategies to deal with other types of country risks associated with foreign operations
5. Express well considered opinion on issues relating to international financial management.

**Pedagogical approach**

The course will be delivered through lectures and discussion of case studies, research papers and articles.

**Materials:**

**Suggested readings Text:**

**1.** Multinational Financial Management, By Alan Shapiro (Wiley Eastern Publication), 10th edition

**Desired Readings**

1. Buckley, A. (2009). *Multinational Finance.* (5thed.). Pearson Education.
2. Brigham, E.F.,&Daves, P.R. (2016). *Intermediate Financial Management.* (12thed.).South-Western.
3. Resnick, B. G., &Eun, C. S. (2014). *International Financial Management.* (7thed.). McGraw Hill International.
4. Madura, J. (2018). *International Financial Management.* (13thed.). Cengage Learning India Pvt Ltd.
5. Butler, K.C. (2012). *Multinational Finance: Evaluating Opportunities, Costs, Risks of Operations.* (5thed.). Thomson South-Western.
6. Kim, S & Kim, S.H. (2006). *Global Corporate Finance: Text & Cases.* (6th ed.).Blackwell Publications.
7. Levi, M.D. (2018). *International Finance*. (6th ed.). Routledge Publications
8. Vij, M. (2018). *International Financial Management (*3rd ed.). Excel Books

**Additional information (if any):**

**Student responsibilities:**

All students are expected to read the assigned readings prior to the class. Students are expected to analyze the case following the 'discussion questions'. All students must maintain full attendance and do timely submission of assignments

**Prepared by**: Dr. Ritika Mahajan & Dr. Manipadma Datta

**Course Reviewers**:
Prof. B. Banerjee, CU
Prof. Madhu Vij, FMS, DU

| | | | |
|---|---|---|---|
| **Course title:** Brand Management | | | |
| **Course code:** PPM 195 | **No. of credits:** 2 | **L-T-P:** 28-00-00 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department: Department of** Business and Sustainability | | | |
| **Course coordinator:** | | **Course instructor:** | |
| **Contact details: Mob: Email ID:** | | | |
| **Course type**: Elective | | **Course offered in:** Semester 3 | |

**Course description:**

More and more organizations of all types have come to the realization that one of the most valuable assets they have is the brand names associated with their products or services. Despite this recognition, very little attention has been paid to the subject in management, especially in MBA programs. Brand Management is an advanced MBA elective that addresses important branding decisions faced by an organization.

**Course objectives:**

The course's basic objectives are:

1) To increase understanding of the important issues in planning and evaluating brand strategies;

2) To provide the appropriate theories, models, and other tools to make better branding decisions and;

3) To provide a forum for students to apply these principles at the customer/consumer level that will improve managerial decision-making with respect to brands.

The aim of the course is to make these concepts relevant for any type of organization (public or private, for profit and not for profit, large or small, etc.).

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1 | **Module 1:** Introduction to the module Brand Management<br>• What is a Brand and why do brands matter?<br>• The Science of Branding Understanding commodity branding, Business to Business Branding, High- Tech Branding, and Place branding<br>• Branding challenges and opportunities in times of economic downturn<br>• The Brand Equity Concept and Strategic Brand Management Process<br>Case 1: Himalaya Herbal<br>Case 2: Super Shampoo | 6 | 0 | 0 |
| 2 | **Module 2 :** Developing a Brand Strategy<br>• Customer-based Brand Equity and role of Brand Knowledge<br>• Sources of Brand Equity<br>• Brand positioning and Positioning Guidelines<br>• Brand Mantra<br>• Brand Resonance and Brand Value Chain<br>• The four steps of Brand Building<br>• Luxury Branding<br>• Brand Value Chain<br>• Creating Customer Value<br>Case 3: JSW Shoppe<br>Case 4: Infosys | 4 | 0 | 0 |
| 3 | **Module 3:** Designing and Implementing Brand Marketing Programs<br>• Choosing Brand Elements to build Brand Equity<br>• Criteria, options and tactics for Brand Elements<br>• Designing Marketing Programs to Build Brand Equity<br>• Integrated Marketing Communications to Build Brand Equity<br>• Leveraging Secondary Brand Associations to Build Brand Equity | 4 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| | Case 5: Centuryply<br>Case 6: Reebok | | | |
| **4** | **Module 4:** Measuring and Interpreting Brand Performance<br>• Developing a Brand Equity Measurement and Management System<br>• Conducting Brand Audits<br>• Designing Brand Tracking Studies<br>• Measuring Sources of Brand Equity: Qualitative and Quantitative Research Techniques<br>• Measuring Outcomes of brand Equity: Capturing Market performance through comparative and holistic methods<br>Case 7: Brand Equity | 4 | 0 | 0 |
| **5** | **Module 5 :** Growing and Sustaining Brand Equity<br>• Designing and Implementing Brand Architecture Strategies<br>• Brand Portfolios<br>• Brand Hierarchies<br>• Corporate Branding<br>• Introducing and Naming New Products and Brand Extensions<br>• Managing Brands over time<br>• Managing Brands over Geographic Boundaries and Market Segments<br>Case 8 : Luis Vuitton In India<br>Case 9: Saffola<br>Case 10: Coke and Pepsi | 6 | 0 | 0 |
| **6** | **Module 6: Project Presentations-**Branding and Brand Audit | 4 | | |
| | **Total** | 28 | 0 | 0 |

**Evaluation criteria:**

Performance is evaluated on the following parameters:

1. Test 1: Group-based Case Analysis :20%
2. Test 2: Group-based Branding Project (Study and its Report) :30%
3. Test 3: Class Participation :10%
4. Test4: Written Test :40%

**Indicators for Assessment:** Group Based Case Analysis: Identification of the actual Decision-Making problem/Issues, Identification of appropriate data, Quality of analysis of data from within the case, Clarity in presentation of relevant conclusions that address the problems identified.

Group Based Branding Project: Formulation/definition of the actual Research Problem, Collection of appropriate primary and secondary data related to Brand chosen for study, Quality of analysis of data, Clarity in presentation of relevant conclusions that state various aspects of the Brand and its current status and future outlook.

Class Participation: Appropriateness of the response to the queries raised by faculty member and fellow students during classroom session, quality of contribution to case analysis/discussions, quality of questions raised in class for furthering the discussions around brands and branding.

Test: Accuracy of answers as well as robustness of analysis in response to questions asked in the examination.

**Learning Outcomes**

**After completing the course, the students will be able to**

1. Develop a professional understanding of Brand management decisions that must be made to build, measure and manage brand equity (Group Based Case Analysis).
2. Familiarize themselves with the art of applying direct and indirect measures of brand equity and choosing brand elements and develop marketing programs. (Group Based Branding project, Class Participation).
3. Consolidating all the learning related to theory and application of Branding theory and practice (Test 4).

**Pedagogical approach**

The course will be delivered through lectures and discussion of case studies, research papers and articles.

**References/Materials:**
Prescribed Textbook- Kevin Lane Keller **(KLK)**, Parmeswaran Ambi M.G., Jacob Isaac, Strategic Brand Management, Fourth Edition, Pearson, 2015

**Additional Readings:**


1. Kapferer, Jean-Noël. The New Strategic Brand Management: advanced Insights &Strategic Thinking, Fifth Edition, Kogan Page, 2012.
2. Ind, Nicholas. Living the Brand: How to Transform Every Member of Your Organization into a Brand Champion, Kogan Page, 2007.
3. Roberts, Kevin. Love marks: the future beyond brands, Second Edition, Power House Books, 2005.
4. Taylor, David. Brand Stretch: Why 2 in 1 extensions fail, and how to beat the odds, John Wiley & Sons, Ltd, 2004.
5. Weeler, Alina. Designing Brand Identity: An Essential Guide for the Whole Branding Team. John Wiley & Sons, Inc, 2017.



**Prepared by**: Sanjay Chandwani & Montu Bose


**Course Reviewers:**
Dr. Gagan Katiyar, Birla Institute of Management Technology, Greater Noida
Prof. Dhruva Chak, Birla Institute of Management Technology, Greater Noida
Prof. Pinaki Dasgupta, IMI Delhi.

| | | | |
|---|---|---|---|
| **Course title: Marketing Management** | | | |
| **Course code: PPM 196** | **No. of credits:** 3 | **L-T-P distribution:** 42-00-00 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator (s):** | | **Course instructor (s):** | |
| **Contact details:** | | | |
| **Course type** | Elective | **Course offered in:** 3rd Semester | |

**Course description**

This is a core course in Marketing meant to build a foundation for students in the MBA 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

| Module | Topic | L | T | P |
|---|---|---|---|---|
| | | | | |
| 1. | Introduction: Marketing concepts and philosophies | 2 | 0 | 0 |
| 2. | **Marketing Myopia**<br>What Business Are you In: Theodore Levitt<br><br>HBR October 2006<br><br>(Marketing Myopia) | 2 | 0 | 0 |
| 3. | Concept of Marketing Mix<br><br>Marketing Plan<br>The sixth P of Marketing | 1 | 0 | 0 |
| 4. | The changing face of Marketing Mix<br>The New marketing mix | 1 | 0 | 0 |
| 5. | Strategic Marketing<br>PEST analysis<br>Porter's Generic Strategies<br>Michael Porter's Big Ideas | 2 | 0 | 0 |
| 6. | Application and Evaluation of Strategy<br>BCG Matrix<br>Nokia's Strategy<br>Derrick's Ice Cream Company | 2 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| 7. | Understanding Customer – Customer Value<br>What have you done for me lately? | 1 | 0 | 0 |
| 8 | Customer loyalty and satisfaction<br>Why satisfied customers defect | 1 | 0 | 0 |
| 9 | Consumer Behaviour – Basic Concepts<br>Get inside the lives of your customers | 1 | 0 | 0 |
| 10 | Consumer behavior<br>Milk<br>Pulling the family strings<br>Unmarried America | 1 | 0 | 0 |
| 11 | Segmenting the consumer markets<br>Basis of segmentation<br>Product diff and market segmentation strategies | 2 | 0 | 0 |
| 12 | Targeting and positioning<br>Lessons from faded Levi Strauss<br>We try harder | 2 | 0 | 0 |
| 13 | Dealing with competition<br>Marketing warfare<br>Guerilla marketing | 1 | 0 | 0 |
| 14 | Gaining competitive advantage<br>Kodak Vs. Fuji | 1 | 0 | 0 |
| 15 | **MID Term Exam**<br>Product Management<br>In Praise of Purple Cow | 2 | 0 | 0 |
| 16 | Depth and Breadth of products<br>HP | 2 | 0 | 0 |
| 17 | Branding Decisions<br>What's in a name<br>Building strong brands | 2 | 0 | 0 |
| 18 | Pricing Strategies | 2 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| 19 | Distribution Strategies | 4 | 0 | 0 |
| 20 | Retailing | 2 | 0 | 0 |
| 21 | Promotion Strategies<br>Integrated Marketing Communications<br>IMC<br>Message evolution by McDonald's in India | 4 | 0 | 0 |
| 22 | Services Marketing<br>Servqual Model | 2 | 0 | 0 |
| 23 | Group Presentations | 2 | 0 | 0 |
| | **Total** | 42 | | |

Important Sessions to Remember – (Remember no 'make-ups' allowed for any component)

Session 21: Mid Term Test, Session 39: Submission of the group project report,

Session 41-42: Group Presentation on the project

**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 behvaiour)
- **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:

1. a problem definition statement, which identifies the key issues facing management (not more than a few lines);
2. the objectives
3. alternative plan of action
4. 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;

5. 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)

**Pedagogical approach**

- Interactive Lectures
- Case discussions and presentations
- News crunching

**Materials**

1. **Text Book**:
   - Marketing Management by Philip Kotler, Kevin Keller, Pearson, New Delhi, 15th edition 2016, ISBN:978-81-317-3101-7
2. **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**: Shruti Rana Sharma & Sanjay Chandwani

**Course Reviewers:**

Prof. Pinaki Dasgupta, IMI Delhi.

Prof. Asif Zameer, FORE School of Management

| | | | |
|---|---|---|---|
| **Course title: Business Ethics** | | | |
| **Course code: PPM 157** | **No. of credits:** 2 | **L-T-P:** 28-00-00 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department:** Department of Business and Sustainability | | | |
| **Course coordinator:** | **Course instructor:** | | |
| **Contact details:** | | | |
| **Course type**: CORE | **Course offered in:** Semester 1 | | |

**Course description:**

An important element of any corporate organization, during its interactions with its external environment, is how it deals with ethical issues. What does business consider as acceptable /unacceptable and the extent to which it accepts its responsibility are some key issues for study in this course.

From time to time corporate scandals have demonstrated that managerial decision-making invariably has ethical implications. However, these ethical implications are seldom given any serious thought and get viewed as just byproducts of mistaken action, instead of understanding that they comprise the prime ingredients of business decisions.

This course on Business Ethics will provide the students with the various frameworks, often conflicting, that have been evolved by moral philosophers to guide in the handling of ethical dilemmas. Additionally, it will help them to find how to voice their inner concerns and values, in a meaningful way, when they are confronted by such ethical issues in life and at work.

**Course objectives:**

The course on Business Ethics will focus on the perspective of managers who must formulate policies to address issues based on ethical dimensions. The principal objective of the course is to infuse a basic ethical intuition among the next generation managers on issues such as well-being, rights, and justice.

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1 | **Module 1: Introduction to Business Ethics**<br>Course Introduction, Pedagogy and evaluation pattern discussion<br>followed by an ice-breaker session. A broad introduction to the various Ethical frameworks will be provided and students would be introduced to the book "Justice" by the Harvard don, Michael Sandel. | 2 | | |
| 2 | **Module 2: Framework for Giving Voice to Values (GVV)**<br>An introduction to the framework developed by Dr Mary Gentile on how to "speak" up for your convictions**.** This framework would be used right through the course in parallel to the theoretical ethical frameworks. | 2 | | |
| 3 | **Module 3: Moral Framework for Ethics versus Corporate Social Responsibility**<br>The importance of CSR in today's business and how Business Ethics differs from CSR | 2 | | |
| 4 | **Module 4: Moral Framework for Ethics /Ethics in Business**<br>An appreciation of the various Framework/Theories for addressing Ethical Dilemma – Utilitarian, Rights, Duty, Egalitarian, Aristotelian -using case studies (from Prof Sandel's online course) the objective would be for students to see that there are multiple ways to look at the same ethical issue.<br>Students will be given a brief introduction to the principles of all leading Ethical Theories and their founding thinkers. | 8 | | |
| 5 | **Module 5**: **Moral Framework for Ethics/Ethics in a Global Economy**<br>Discuss cross cultural and cross-national issues on Ethical behaviour by businesses across different countries across the world with some examples/case lets. | 2 | | |
| 6 | **Module 6: Moral Framework for Ethics/Ethics and Environment**<br>Understand new trends in environmentalism and the emerging role of interest groups, business and government. Also discuss how the fundamental objective of business has changed over the | 2 | | |

| | | | | |
|---|---|---|---|---|
| | years. | | | |
| **7** | **Module 7: Ethical Standards**<br>These sessions will introduce the 8 principles that make up the GBS Codex and will introduce the students to some example of Code of Ethics followed by leading organizations. | 2 | | |
| **Group Presentation- Case Studies I**<br>Through small group assignments the class will analyse situations involving ethical dilemmas and discuss/debate possible solutions. | | 4 | | |
| **Group Presentation – Case Studies II**<br>To address the issue of how real-life ethical dilemmas should be handled, the class will be divided into groups and the groups will be asked to prepare a common case study and present it to the rest of the class. Group assignments will be around current, real life ethical issues from what we see around us, for instance one group could research some the modern ethical dilemma like say the issue around the right to privacy and details on Aadhar being provided to the Government, another group could examine the issues involved in Apple's stand (with the FBI) of not cooperating in a terrorism investigation and refusing to unlock an iphone recovered from a slain terrorist and so on. | | 4 | | |
| | **Total** | 28 | 0 | 0 |

**Evaluation criteria:**

- Test 1: Group presentation I 20%
- Test 2: Group Presentation II 30%
- Test 3: Written Test 20%
- Test 4: Written Test 30%

The course would rely on analyzing real life ethical issues (in addition to text book cases) that make newspaper headlines and a large part of the learning would be through exercises done in the class room and would be experiential. For evaluation, in addition to the formal exams, this program shall on two group assignments that must be presented by the groups in the class so that there is some shared learning among the groups.

**Learning outcomes:**

The course will encourage the students to reason about issues from multiple perspectives. Further it will:

1. Expose the students to a diverse and important set of ethical systems
2. Increase the knowledge and awareness on ethics and ethical behavior
3. Apply ethical systems to specific business problems

**Pedagogical approach:**

Most of the classes will be mixed session comprising of;
(a) A pre-reading/pre-viewing/class lecture that will introduce the topic
(b) An interactive discussion of the general conceptual material;
(c) Followed by group presentations on issue-based cases to which the ethical concepts would be applied.

To give to the students, an appreciation of the theoretical framework of Ethics, the course would draw upon Prof Miachel Sandel's course on "Justice" available online through Harvard University. This will be used to teach the abstracts concepts of the moral philosophers -Aristotle, Jeremy Bentham, Immanuel Kant, John Stuart Mill, Robert Nozick, John Rawls and others and would help the students to understand *"what is the right thing to do"* and also appreciate that there could be different possible ways in which people respond to the same ethical dilemmas.
In parallel, there would also be some experiential learning and the course, that would provide inputs on how to 'speak up' for your convictions; that part of the program would be more hands on and practical and would draw upon the pedagogy developed by Dr Mary Gentile. This part of the program would address the issue of *"how do you act when you know(intuitively) what is the right thing to do".*
Two set of small study-group presentations (by the students) will play an important role in course delivery as they will allow the students to articulate their views of what is defensible and non-defensible in each case.

**Suggested readings:**

1. Sandel M. (2010). Justice: What's the right thing to do? Penguin. UK.
2. Gentile M. (2012). Giving Voice to Values - How to speak your mind when you know what's right. YUP.
3. Fernando AC. (2009). Business Ethics: An Indian perspective. Pearson.

**Additional Readings/Viewings:**

Lecture Videos from Miachel Sandel's course on Justice at Harvard University – this is compulsory viewing as the videos would form the basis of class room discussions in the first half of the course.
http://justiceharvard.org/
A lot of material around Dr Mary Gentile's pedagogy (GVV) --teaching aids, work books, you tube videos etc around her model, even a free coursera course on GVV on offer by the University of Virginia – are available on the internet and students would be encouraged to access the same. Students are also encouraged to access the link from the Darden School of Business (University of Virginia) which houses the GVV program and has is an excellent repository of GVV resources;
https://www.darden.virginia.edu/ibis/initiatives/giving-voice-to-values/

**Student responsibilities:**

Attendance, feedback, discipline: as per university rules.

**Prepared by:** Dr. Ritika Mahajan Montu Bose

**Course reviewers:**

1. Dr. Santosh Pande, Cofounder, Nihilent Technologies
2. Dr Rjat Kathuria, ICRIER

**Enclosure 5**

## Guidelines and course outlines of project/thesis/internships

<table>
<tr><td colspan="4">Course Title: Major Project Part 1</td></tr>
<tr><td>Course Code: MEU 102</td><td>No. of Credits: 12</td><td>L-T-P: 0-0-336</td><td>Learning Hours: 336<br><br>*This excludes hours devoted for self-learning and Dissertation writing.</td></tr>
<tr><td colspan="4">Pre-requisite Course Code and Title (if any): Nil</td></tr>
<tr><td colspan="4">Department: Department of Energy and Environment</td></tr>
<tr><td colspan="2">Course Coordinator(s):</td><td colspan="2">Course Instructor(s):</td></tr>
<tr><td colspan="4">Contact Details:</td></tr>
<tr><td colspan="2">Course Type: Core</td><td colspan="2">Course Offered in: Third Semester</td></tr>
<tr><td colspan="4">Course Description<br><br>Major Project Part 1 is a mandatory internship of a minimum 12-week duration designed against the backdrop of intensive academic training in urban development and management sector, particularly in the domain of urban policy, finance and planning which students get from taught courses in the first two semesters of the programme. As a part of this internship, students work with Urban Local Bodies, Parastatals and Special Purpose Vehicles of Smart Cities in various parts of the country. They are supervised by an External Supervisor from the host institution and a faculty member of TERI SAS as an Internal Supervisor. The internship outputs are a presentation and a dissertation, which are evaluated by a panel of examiners.</td></tr>
<tr><td colspan="4">Course Objectives<br><br>1. To provide an exposure and experiential learning to students to work with local government institutions managing cities, which include ULBs/Parastatals/SPVs<br>2. To enhance their understanding of management and governance of cities in domains such as basic services, planning, infrastructure, municipal finance, and attendant dimensions of urban development<br>3. To develop in them solutions-oriented approach towards issues and challenges of ongoing urban development projects and schemes of the government through this hands-on engagement with ULB/Parastatal/SPV</td></tr>
</table>

**Course Content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| | Towards achieving the objectives stated above, the first one to two weeks of internship are to be devoted to a holistic orientation on the organisational structure of ULB/Parastatal/SPV for gaining understanding about functioning of key departments related with service delivery. In the remaining period of internship, students are to be attached to one department of ULB/Parastatal/SPV under the supervision of concerned department head or a person assigned by him/her, and work on any ongoing project(s). The students are supervised by their External and Internal Supervisors, and their progress of work is monitored jointly. The experiential learning on functioning of ULB/Parastatal/SPV and in-depth knowledge and analysis of ongoing project(s) are to be demonstrated in the form of Major Project Part 1 outputs which are duly approved by External and Internal Supervisors. These shall be evaluated by a panel of examiners decided by the Major Project Coordinator. | **0** | **0** | **336** |

**Evaluation Components**

A Evaluation Distribution

A.1. Timeline adherence – 10% with its sub-components as follows:

a. Joining report – 10%
b. Synopsis and topic – 10%
c. Progress report – 10% each for 3 progress reports
d. Feedback form – 10%
e. Final dissertation – 40%

A.2. Feedback from the Host Organisation/External Supervisor – 15%

A.3. Final presentation and viva – 25%

A.4. Dissertation – 50 %

B Grading Criteria

B.1. 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).

B.2. Grading of the Major Project will be done as per the Table 1:

**Table 1: Grading for Major Project Part 1**

| Marks | Grade |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |

| | |
|---|---|
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

C Plagiarism

C.1. Plagiarism is unacceptable and the institute has a very strict policy to deal with it. If a student engages in plagiarism, it could attract serious penal actions. All reported cases of plagiarism are dealt as per the process mandated by Departmental Academic Integrity Panel (DAIP) and Institutional Academic Integrity Panel (IAIP).

D Submission

D.1. For various submissions, students must follow the Major Project Guidelines and instructions as issued by Major Project Part 1 Coordinator.

D.2. All instructed submissions (including joining report, synopsis, monthly progress report and final dissertation) must be uploaded on the portal as per the issued instructions. No monthly progress report will be accepted until the Joining report has been submitted.

D.3. If a student fails to appear for the Major Project presentation on the presentation date assigned by the Major Project 1 Coordinator, then the candidate will be assigned zero marks for the presentation and will be graded accordingly.

D.4. Final Dissertations that are submitted after the mentioned date will not be considered for evaluation and "0" marks would be awarded for the same.

D.5. The Major Project Part 1 is considered as completed only after the Final Dissertation with certificate is submitted as mentioned in the issued instruction and Major Project Guidelines. Any non-compliance regarding certificate, and formatting instructions as mentioned in the guidelines will be considered incomplete and would lead to non-submission of the final dissertation.

**Learning Outcomes**

1. The engagement with ULB/Parastatal/SPV will enable students to garner a heightened sense of awareness and understanding among students about functioning of these institutions, processes involved in managing and governing different domains of a city, information flow, implementation of various government schemes and projects, and challenges in delivery of mandated tasks.
2. By working on specific project as entrusted by these institutions, students will be able to analyse and evaluate projects being implemented by the ULB/parastatal/SPV as well as gain meaningful experience in preparation of development activities at city level.
3. By embedding and investing three months in a city, students will hone their skills at (a) observation of urban landscapes, i.e. city-specific socio-economic and cultural phenomenon; (b) identification of and interaction with different stakeholders involved in urban development; (c) developing critical thinking about various issues confronting the city and offering workable solutions.

**Pedagogical approach**

Major Project Part 1 is hands-on internship at the host institution. Specific pedagogy will be as per the requirements of the Dissertation thematic and research questions pursued therein.

**Course Reading Materials**

Published material - books, research papers in peer-reviewed journals and reports (published by Government and/or other reliable sources) which are relevant to thematic of the Dissertation should be consulted. Research papers can be sourced online from:

www.scopus.com

www.sciencedirect.com

www.springer.com

www.wiley.com

www.jstor.com

www.taylorandfrancis.com

These are indicative only. Students are encouraged to find and use other relevant reading material as well.

**Student responsibilities**

Students must adhere to instructions and Major Project Guidelines in entirety as issued by the Major Project Coordinator before commencement of the semester.

1. For all matters related with conduct of the students and grievances during Major Project internships in host institutions, relevant sections of the Students Handbook shall apply. Students must refer Chapter 13 on Important Policies, Section 13.13 on Student Disciplinary Committee and Chapter 14 on the Students' Honor Code of the Students Handbook.
2. Students must regularly update progress of their work to both Internal and External Supervisors.
3. Students must make timely submission of all required documents on the portal.

**Course Reviewers:**

1. Prof. OP Mathur, Senior Fellow and Head Urban Studies, Institute of Social Sciences, New Delhi
2. Prof. Usha Raghupathi, Retired Professor, National Institute of Urban Affairs, New Delhi

| **Course title: Major Project Part 2** | | | |
|---|---|---|---|
| **Course code: MEU 104** | **No. of credits: 15** | **L-T-P: 0-0-420** | **Learning hours: 420***<br><br>*This excludes hours for self-learning and dissertation writing |
| **Pre-requisite course code and title (if any):** None | | | |
| **Department:** Department of Energy and Environment | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type**: Core | | **Course offered in:** Fourth semester | |

**Course description:**

The first three semesters of MTech – Urban Development Management program are designed to equip the students with cutting-edge technical skills like data modelling, managerial capabilities, and understanding of socio-economic, environmental, and legal issues associated with urban development sector. The major project part 2 requires students to utilise above mentioned skills through an internship (a minimum engagement of 15 weeks) with bilateral or multilateral agencies/consulting firms/financial institutions/research organizations working in urban development sector. At the end of the major project, the student is expected to submit a dissertation and make a presentation in front of a committee for evaluation based on the issued guideline.

**Course objectives:**

- To provide exposure in bilateral or multilateral agencies/consulting firms/financial institutions/research organizations working in the urban development sector to widen the students' perspective and understanding of real-life projects.
- To develop skills and capacities in formulation, execution, and monitoring of the assigned research/development projects, and enhancing understanding of critical issues of the urban development sector at grassroot levels.

**Course content**

| **Module** | **Topic** | **L** | **T** | **P** |
|---|---|---|---|---|
| 4. | The topic of the student-work for the project would be mutually decided by the host organisation and the student and the student would notify it to the Major Project Coordinator through the portal during submission of the joining report. A synopsis with the title of the topic to be submitted after | 0 | 0 | 420 |

| | | | | |
|---|---|---|---|---|
| | discussion with both external and internal supervisors via portal. | | | |

**Evaluation criteria:**

**A. Evaluation distribution**

A.1. Timeline adherence – 10%, distribution as follows

i. Joining report – 10%
ii. Synopsis and topic – 10%
iii. Progress report – 5% each (4 progress reports to be submitted)
iv. Feedback form – 10%
v. Final dissertation – 50%

A.2. Presentation and viva – 30%

A.3. Dissertation – 40%

A.4. Feedback from the Host Organization/External Supervisor – 20%

**B.** Grading Criteria

D.6. 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).

D.7. Grading of the Major Project will be done as per the Table 1:

**Table 1: Grading for Major Project Part 1**

| **Marks** | **Grade** |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

**C.** Plagiarism

C-1 Plagiarism is unacceptable, and the institute has a very strict policy to deal with it. If a student engages in plagiarism, it could attract serious penal actions. All reported cases of plagiarism are dealt as per the process mandated by Departmental Academic Integrity Panel (DAIP) and Institutional Academic Integrity Panel (IAIP).

**D. Submission**

(a) For various submissions, students must follow the Major Project guidelines and instructions as issued by major project part 2 coordinator.

(b) All instructed submissions (including joining report, synopsis, monthly progress report and final dissertation) must be uploaded on the portal as per the issued instructions. No monthly progress report will be accepted until the Joining report has been submitted.

(c) If the student fails to appear for the Major Project presentation on the presentation date assigned by the Major Project 2 coordinator then the candidate will be assigned zero marks for the presentation and will be graded accordingly.

(d) Final Dissertations that are submitted after the mentioned date won't be considered for

evaluation and "0" marks would be awarded for the same.

(e) The major project part 2 is considered as completed only after the Final Dissertation with certificate is submitted as mentioned in the issued instruction and guidelines. Any non-compliance regarding certificate, and formatting instructions as mentioned in the guidelines will be considered incomplete and would lead to non-submission of the final dissertation.

**Learning outcomes:**

At the end of this course, the student should be able to –

- Conceptualise research questions, objectives, methodology and conduct appropriate analysis for a chosen research/development project in urban sector.
- Gain insight of existing research and case studies on a chosen topic and gain relevant industry experience.
- Deliver effective presentations and produce authentic professional work.

**Pedagogical approach:**

As required by the dissertation topic identified by the student and organisation and agreed by internal and external supervisors.

**Course Reading Materials:**

Relevant books and published papers and reports as per the chosen topic of research/development project. Sources can be found on but not limited to –

www.scopus.com

www.sciencedirect.com

www.springer.com

www.wiley.com

www.jstor.com

www.taylorandfrancis.com

**Student responsibilities:**

- Students must adhere to instructions and Major Project Guidelines in entirety as issued by the Major Project Coordinator before commencement of the semester.
- For all matters related with conduct of the students and grievances during Major Project internships in host institutions, relevant sections of the Students Handbook shall apply. Students must refer Chapter 13 on Important Policies, Section 13.13 on Student Disciplinary Committee and Chapter 14 on the Students' Honor Code of the Students Handbook.
- Students must regularly update progress of their work to both Internal and External Supervisors.

- Students must make timely submission of all required documents on the portal.

**Course Reviewers**

- Prof. OP Mathur, Senior Fellow and Head Urban Studies, Institute of Social Sciences, New Delhi
- Prof. Usha P. Raghupathi (Retd.), National Institute of Urban Affairs, New Delhi.

**Department of Energy and Environment**

**TERI School of Advanced Studies (TERI SAS)**

**Guidelines for Minor Project Work**

**Course No.** NRE 103/ENR 108

## 1. Course Description

The minor project is a 2-credit summer project (8 weeks), designed for MSc students and is positioned at the end of the first year of studies. Students are expected to submit a dissertation and present his/her work in the university before a committee which will evaluate the work based on the minor project guidelines

## 2. Timeline for minor project activities

| **Activity** | **Due date** |
|---|---|
| **Joining**<br><br>Reporting to the host organization | 1st/2nd Week of May |
| **Joining report**<br><br>Dispatch of joining report from the host organization | 2nd Week of May |
| **Monthly progress report**<br><br>Brief progress report–I<br><br>Brief progress report–II | Last Week of Each Month |
| Joining back to the TERI SAS for third semester registration | 4th Week of July, 2020 |
| **Feedback form of the external supervisor**<br><br>Response/Feedback from the Host Organization/Supervisor–submission | 3rd Week of July |

| | |
|---|---|
| **Dissertation (Draft)**<br><br>The dissertation should be emailed as single .pdf file | 4th Week of July |
| **Presentation of minor project**<br><br>Presentation and question & answers/viva-voce | 2nd Week of August |
| **Dissertation (Final) or Final Report submission**<br><br>Submit soft copy by email only. Failure to submit the final thesis by assigned date, minor project will be considered incomplete and the student will be assigned zero marks in the evaluation | 3rd /4th Week of August |

- If any of the students are doing the minor project in group should seek an approval from the placement coordinator and inform to minor project department assistant; in case, it's not reported then this won't be allowed.
- Naming convention for the report should follow your name, report name (i.e. the naming convention for the thesis should follow your name, your stream and report name (i.e. Name_CSP_Minor Project Dissertation). Not following the naming convention would be disregarded as report submission.
- All communication related to minor project including submission of all reports and documents must be communicated through email to departmental Programme Assistant **Mr. Raj**
- The students who are repeating the minor project due to exceptional circumstances would be allowed to repeat in the assigned duration for the minor project in the academic calendar for the next year. The students should ascertain that the work carried out during repeating the Minor project should either be an extension of the research done in previous minor project or should be entirely a different topic of research.

## 3. Evaluation Criteria

An evaluation committee will be formed to assess the work. The distribution of marks for the evaluation will as follows (weights of each is indicated in parenthesis)

(a) Response/feedback from the host organization/supervisor (10%)
(b) Minor project report (20%)
(c) Minor project presentation (30%)
(d) Question & answers/viva voce (30%)
(e) Meeting timeline (10%) (Consisting of: joining report (2), progress reports (2 each), feedback form (2), final thesis (2).

## 4. Grading criteria

**A.** 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).
**B.** If the student fails to appear for the Minor project presentation as per the schedule assigned by the TERI-SAS then the candidate will be assigned zero marks for the presentation and will be graded accordingly.
**C.** It is responsibility of the student to meet the timeline for the minor project as mentioned above.
**D.** It is the responsibility of the student to get the response/feedback duly filled from the affiliated organization/supervisor and email the same through the supervisor to Minor Project Coordinator/ department assistant as per the date mentioned in the guideline.
**E.** Attending presentation is mandatory for all the students. An attendance for this will be maintained.
**F.** Grade 'F' may be awarded if the student does not abide with the aforesaid points.
**G.** Grading of the Minor Project would be done as per the table 2:

**Table 1. Minor project part – grading**

| | |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

## 4. Presentation and Question & Answer/Viva Voce

The time allotted for the Presentation is only 5 minutes (maximum) which would be followed by 5 minutes questions and answer by the examination panel. If the students are presenting this in group, then each student will add 2 minutes extra amounting to a total of 7 minutes for the presentation. The presentation should explain (a) Broad Structure/Scope of Proposed Research; (b) Objective(s); (c) Results/Learning; (d) Limitations of study.

## 5. Plagiarism

TERI SAS has zero tolerance for plagiarism. As per UGC (Regd. no. D. L.-33004/99) dissertation/thesis or any other such documents are free of 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 mentor/supervisor to address the plagiarism concerns. The plagiarism report and its percentage would be evaluated with a plagiarism check/verify committee within the department and would be analysed in terms of similarity section if that can be treated as plagiarised such as in case of mathematical formulations/ derivations etc. Based on the finalized plagiarism percentage (of similarity) the marks would be deducted as given in Table 1. It would be responsibility of the student in consultation with internal supervisor to resolve the plagiarism issue and the thesis would deemed to be fit for submission upon written consent of mentor/supervisor to minor project coordinator.

**Table 2. Percentage of marks to be deducted from total mark assigned to dissertation/thesis submission based on plagiarism**
**Penalty imposed on the student based on plagiarism as per UGC guidelines.**

| **Levels of Plagiarism** | **Percentage of similarity** | **Maximum percentage marks to be deducted from dissertation/thesis** |
|---|---|---|
| Level 3 | > 60% | Students registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | Student repeats the major project next year |
| Level 1 | > 10% ≤ 40% | The student is required to resubmit the thesis within a week |
| Level 0 | ≤ 10% | 0% |

**6. Honor Code**

If a student is found to be misrepresenting any fact with respect to minor project in any organization as well as at TERI SAS, this will be brought to the notice of Dean (Academic) by the Minor Project Committee. The Dean (Academic) will decide on further action to be taken. The matter would be dealt as per the honor code of TERI SAS.

**Note**: You must send emails regarding any concern to respective departmental assistant as mentioned in point 2.

**IT related issues**

In case of any IT related problem during minor project, student should send a mail to ITHELP ithelp@terisas.ac.in with the screenshot of the error. If the problem is not resolved within 2 working days, it should be forwarded to Ms. Pooja Choudhary (poojachoudhary@terisas.ac.in). Students can expect a response within 3 working days.

**Contact:**

| **Program Name** | **Minor Project Coordinators** | **Department Assistants** |
|---|---|---|
| MSc (ESRM) | Dr. C K Singh (chander.singh@terisas.ac.in) | Raj (raj@terisas.ac.in) |
| MSc (CSP) | Dr. C K Singh (chander.singh@terisas.ac.in) | Raj (raj@terisas.ac.in) |

# FORMAT OF THE PROJECT REPORT

The length of the report should be limited to 25 to 30 pages (counting both sides) only. The basic elements of a minor project report are title, (*acknowledgement, declaration, certificate from organization*), abstract, introduction, literature review, results, discussion, and conclusion followed by the list of references. The report should be structured as:

- **Abstract**: This is a summary of the work done within 300 words. Broadly, it defines the concepts studied and key findings.
- **Introduction**: This is the beginning section, which states the purpose and goals of the work. It is supported by the background of the work done and some ideas about the achievements in the proposed research. It ends with a few lines that introduces the chapters of work.
- **Literature Review**: It is an optional part of the Minor Project Report but provides all the concepts that affect your project. The reference sources shall be textbooks, journal, statutory and legal report and publications. Limit yourself to authentic sources. All references are to be reported in the references section in an appropriate manner. Please use the Harvard style of referencing (see below). Avoid using too much of website references.
- **Aims and objectives:** The project may be purely scientific or would be addressing corporate/ industrial topics. Whatever your work is on, it will try to achieve on output/aim. State this aim here and objectives leading to this aim (if any) as clear as possible.
- **Methodology:** Explain what methods/techniques/tools have been used in project to achieve the aims and objectives. Organize this chapter according to the stated objectives so that the reader understands which methodology was applied for respective objective.
- **Results**: This is the final outcome of the work done during the minor project period. It is to be expressed qualitatively or quantitatively. Organize this chapter also according to the objectives. This will help the reader to link your results with the methodology applied.
- **Discussion and Conclusion:** This section should have reflection of findings against the state-of-art-knowledge in the field. If a literature review has been conducted in the study, here is the space to compare the findings of this with your findings. You can address further the important advances in the proposed research area, critics, gaps, limitations, and scope for further research.
- **References**: Refer to Harvard System of Referencing Guide (http://libweb.anglia.ac.uk/ referencing/harvard.htm). Make sure that the references listed here do appear as citations in the text and vice versa. Avoid too much references to the websites.
- **Annexure(s)**: Any graphs, boxes and tables that could not be accommodated in the main section.

## PAGE SETUP COMPULSORY FOR DISSERTATION/THESIS

- A page size of A4
- Left margin: 42 mm, right margin: 30 mm, top: 15 mm, bottom: 20 mm
- Times New Roman 12 point as the base font and 1.5 lines spacing
- Page numbers in the bottom margin, centered and printed on both sides
- Captions must explain table/figures without reference to the text: Position: above tables and below figures

## DECLARATION

This is to certify that the work that forms the basis of this project “TITLE” (Capital Letter) is an original work carried out by me and has not been submitted anywhere else for the award of any degree.

I certify that all sources of information and data are fully acknowledged in the project thesis.

YOUR NAME

Date:

**CERTIFICATE**

This is to certify that NAME OF CANDIDATE (Capital Letter) has carried out his minor project in partial fulfillment of the requirement for the degree of Master of Science in YOUR STREAM on the topic "TITLE" (Capital Letter) during June 2020 to August 2020. The project was carried out at the ORGANISATION YOU ARE WORKING WITH.

Date:

| | |
|---|---|
| XXXXX (Name-Supervisor) | Dr Shaleen Singhal |
| XXXXX (Designation) | Professor & Head |
| XXXXX (Organisation) | Department of Energy and Environment |
| | TERI School of Advanced Studies |

**TITLE (Bold + Capital Letter)**

***Minor Project Thesis (Bold + Italics)***

*Submitted by (italics*)

**NAME OF CANDIDATE (Bold + Capital Letter)**

*For the partial fulfillment of the (italics)*

**Degree of Master of Science in (Bold)**

**YOURSTREAM (Bold + Capital Letter)**

*Submitted to (italics***)**

Department of Energy and Environment

TERI School of Advanced Studies

August 2020

| **Course title: Minor Project** | | | |
|---|---|---|---|
| **Course code:** NRE 103 | **No. of credits:** 2 | **L-T-P:** 0-0-56 | **Learning hours:** 56 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Energy and Environment | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type**: Core | | **Course offered in:** Summer Break | |

**Course description:**

The minor project is a 2-credit summer project (8 weeks), designed for MSc students and is positioned at the end of the first year of studies. Students are expected to submit a dissertation and present his/her work in the university before a committee which will evaluate the work based on the minor project guidelines

**Course objectives:**

The purpose of minor project is

- To widen the student's perspective by applying fundamental knowledge and skill sets and to provide an exposure to problem solving for an environmental concern/problem.
- To construct, build, execute and innovate unified systems that include stakeholders, skills, knowledge, resources taking account of socio-economic and environmental perspectives.
- Appreciate the need and continue to develop aptitude and expertise to incorporate understanding of climate, environment, and resource management issues.

**Course content**

| **Module** | **Topic** | **L** | **T** | **P** |
|---|---|---|---|---|
| 1. | The student will carry out the minor project dissertation/thesis either in an organization or internally within TERISAS. The student will choose a topic based on mutual interests, the student's research aspirations and affiliated organisations goals. The student will continuously be supervised by the assigned mentor/supervisor in the affiliated organisation. | 0 | 0 | 56 |

## 1.Evaluation criteria:

An evaluation committee will be formed to assess the minor project. The distribution of marks for the evaluation would be as per the following criteria (marks of each component is indicated in parenthesis)

### 1.1 Evaluation distribution

1. Meeting timeline (10 %) (Consisting of:
    a. Joining report (20%),

b. Two progress reports (20% each),
c. Feedback form (20%),
d. Final thesis (20%).

**2.** Minor project report (20%)
**3.** Minor project presentation (30%)
**4.** Question & answers/viva voce (30%)
**5.** Response/feedback from the host organization/supervisor (10%)

## 2. Grading criteria

1. 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).
2. If the student fails to appear for the Minor project presentation as per the schedule assigned by the TERI-SAS then the candidate will be assigned zero marks for the presentation and will be graded accordingly.
3. It is responsibility of the student to meet the timeline for the minor project as mentioned above.
4. It is the responsibility of the student to get the response/feedback duly filled from the affiliated organization/supervisor and email the same through the supervisor to Minor Project Coordinator/ department assistant as per the date mentioned in the guideline.
5. Attending presentation is mandatory for all the students. An attendance for this will be maintained.
6. Grade 'F' may be awarded if the student does not abide with the aforesaid points.
7. Grading of the Minor Project would be done as per the table 1:

**Table 3. Minor project part – grading**

| | |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

## 3. Plagiarism

Plagiarism is unacceptable and the institute has a very strict policy to deal with it. If a student engages in plagiarism, it could attract serious penal actions. All reported cases of plagiarism would be dealt as per the process mandated by Departmental Academic Integrity Panel (DAIP) and Institutional Academic Integrity Panel (IAIP).

## 4. Non-adherence to timelines

1. Reports must be uploaded on the portal as per the date mentioned in timeline.
2. Monthly progress report: No monthly progress report will be accepted until its is complete and

signed/approved by mentor/supervisor.

3. Submission of draft and final report for evaluation: The softcopy for draft and final report must be uploaded as per the timeline. Report that is submitted after the mentioned date will not be considered for evaluation and "0" marks will be awarded for the same. Further, the regulations of the TERI-SAR apply as laid down in the student handbook (available at the TERI School of Advanced Studies web page).
4. Minor Project Report: The Minor project is completed after the plagiarism free report is submitted as mentioned in the guidelines. Any non-compliance regarding certificate, formatting instructions as suggested for different sections of the report and any other requirement as mentioned in the guidelines will be considered incomplete and would lead to non-submission of the dissertation/thesis. Thus, students are advised to follow all the guidelines of Minor project.

**5.Learning outcomes:** At the end of this course, the student should be able to –

- To appreciate the impact of sustainable solutions in a societal and environmental framework and to express the knowledge of, and need for sustainable development.
- To understand ethical principles and commitment to professional ethics and responsibilities.
- Work effectively as an individual, and team member in multidisciplinary settings.
- Communicate effectively on complex environmental problems/concerns with community and society at large, to comprehend and transcribe effective results resulting into reports and documentation.
- Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of climate change, environmental resource management and meet the societal needs and demands in sustainable manner.

**6.Pedagogical Approach:** Minor project is hands-on internship at the host institution. Specific pedagogy will be as per the requirements of the Dissertation thematic and research questions pursued therein.

**7.Course Reading Materials:**

1. Topic relevant books and published papers and reports. Sources can be found on but not limited to –
   www.scopus.com

   www.sciencedirect.com

   www.springer.com

   www.wiley.com

   www.jstor.com

   www.taylorandfrancis.com

**Additional Information:**

1. A Minor project guideline indicating timeline of different activities and other details will be issued by the department before the start of the semester.
2. If students are doing a combined project, they are required to seek approval from the Minor project coordinator by writing a justification for the joint/combined work. Only if the approval is given by the minor project coordinator the student will be allowed for joint work. However, the students are required to upload separate progress reports and other documents on their portal. The individual reports should not be verbatim copy of each other.

3. Feedback form – Follow-up with the respective mentor/supervisor is to be done by the student and any delay due to technical reasons should be informed before final submission with a copy to external supervisor. It is solely the responsibility of the student to get the feedback submitted by external before the deadline.
4. Plagiarism report would be shared with the mentor/supervisor and the students

**Mentor/Supervisor:**

1. Each student has one mentor/supervisor from her/his host organization. Mentor/supervisor is to be identified by the host organization. Guest/visiting faculty can act as mentor/supervisor, if mutually agreed upon it.

**Student responsibilities:**

Following the issued instructions and guidelines of the minor project in entirety.

Regular updating the progress of work to the mentor/supervisor.

Timely submission of all required documents through portal.

**Course Reviewers:**

1. **Prof. Pawan Kumar Joshi,** School of Environmental Sciences, Chairperson, Special Centre for Disaster Research, Jawaharlal Nehru University
2. **Dr. Anshumali, Associate Professor,** Department of Environmental Science and Engineering, Indian Institute of Technology (Indian School of Mines)
3. **Prof. Umesh Kumar Singh,** Head of the Dept., Centre for Environmental Sciences, Central University of South Bihar

**Department of Energy and Environment**

**Guidelines for Major Project**

**Course No.** NRE 104/ENR 109/MEU 104

**1. Course Description:**

It is an opportunity for the students to apply knowledge and skillsets, which they have obtained during classroom teaching, practical course work and field visits, spread over three semesters. The major project is conceptualized to independently think and engage in research to provide sustainable solutions based on learning during the master's degree course work. It requires a deeper understanding of the development process, the driving factors, and the inter-linkages within the earth system science, climate change issues, sustainable development challenges, renewable energy, community engagement, legal frameworks, among others. The students are required to hypothesize a research problem and carry out detailed and substantial amount work with their original thoughts and frameworks. At the end of the major project, students are expected to submit a Dissertation/Thesis/thesis, which is reflection of knowledge acquired in previous studies and demonstrates the prospect to probe profoundly into a research question and integrate the learning while findings the answer. Along with the Dissertation/Thesis/thesis the students are required to present the entire work before an evaluation committee based on the major project guidelines (see additional information).

**2. Timeline for important activities:** The entire activity of submissions would be performed through TERISAS online portal

| Activity | Due date |
|---|---|
| **Joining**<br><br>Joining the host organization and internship | 1st week of January |
| Joining report<br><br>Certified Letter from host organization/supervisor Attesting your joining date in the organization/supervisor. | 2nd- 3rd week of January |
| Monthly Progress Report (MPR) | Last working day of every |

| | |
|---|---|
| Monthly progress report format given in Annexure 4 | month |
| Synopsis with Final Title of the Thesis | 1st week of February |
| Dissertation/Thesis/thesis (Draft Submission)<br><br>upload as single .pdf file with bookmarks for main chapters | 2nd week of May |
| Presentation of major project<br><br>Dates will be announced 7 working days before 12 May 2019 | 3rd week of May |
| Certificate<br><br>It is the sole responsibility of the student to take the signature from their respective external and internal supervisors and then submit it to the programme assistant. | 4th week of May |
| Final Dissertation/Thesis/thesis | 4th week of May |
| Feedback form of the external supervisor.<br><br>Link would be sent to the external supervisor/host organization. The students are required to follow-up with the external supervisor/host organization so that feedback is received before/on the deadline. | 4th week of May |

- Students are required to upload each and every report/three supervisor choice on TERI SAS portal. Report/details submitted via email will not be acceptable.
- Topic on the main cover page and on the certificate must be same; otherwise thesis/ Dissertation/Thesis will not be accepted.
- Please check the formatting, especially cover page (word to word)/certificate and thesis are submitted in accordance to the major project guidelines. If the thesis does not comply with the guidelines, then the submission would be considered incomplete and won't be evaluated further.
- Plagiarism report would be shared with the internal supervisors and the students through the link provided on **onedrive**
- If students are doing a combined project, they are required to seek approval from the Major project coordinator by writing a justification for the joint/combined work. Only if the approval is given by the major project coordinator the student will be allowed for joint work. However, the students are required to upload separate report/progress report etc. on their portal. The individual reports should not be verbatim copy of each other.
- Feedback form – Follow-up with the respective supervisor is to be done by the student and any delay due to technical reasons should be informed before final submission with a copy to external supervisor. Its solely the responsibility of the student to get the feedback submitted by external before the deadline.
- Students must finalize the topic/title of thesis/Dissertation/Thesis before the synopsis submission. The title and objectives cannot be changed post synopsis submission.

- Students are required to sign the declaration form in the thesis/Dissertation/Thesis.
- In case student did not submit any report mentioned in the guidelines may attract marks deduction which would be decided by the MPEC.
- Naming convention for the report should follow your name, your stream, major project Dissertation/Thesis (i.e. Name_ESRM_Progress report 1 or Name_ESRM_Major Project Dissertation/Thesis, do not write title of your major project Dissertation/Thesis/report). Not following the naming convention would be disregarded as report submission.

**3. Internal Supervisor**

Each student is required to have one internal supervisor from TERI School of Advanced Studies (exceptions on the number can be granted if verified); the student must provide a list of three faculty members of TERI School of Advanced Studies preferred as supervisor along with the joining report. Failure to provide the three choices of supervisor will be considered as non-compliance to major project guidelines.

The students should choose the internal supervisor from the Department or outside the Department from TERI SAS. In case the preference is given for the faculty from any other department, the student should communicate with the concerned faculty well in advance and inform major project department assistant about it marking a copy to internal supervisor.

The preference for a supervisor should be purely based on research domain/expertise required for the work during major project. The students are required to give the preferences of the internal supervisor within a week of joining the organization/institution. Department will nominate one of the faculty members as supervisor to the student by 2$^{nd}$ week of January. The students are required to communicate with the assigned internal supervisor as soon as they are assigned their respective internal supervisor. The preference for the supervisor given by the student should not be considered final and the allocation of the supervisor can be assigned beyond the given choices of the students. The decision for the internal supervisor would be final and no requests should be made for the change of supervisor. In case mutual understanding between an internal supervisor and student has been agreed for major project, it should be communicated by 1$^{st}$ week of January marking a mail to Major project coordinator and major programme assistant.

**4. External Supervisor**

Each student has one external supervisor from her/his host organization. External supervisors are to be identified by the host organization. Guest/visiting faculty can act as internal/external supervisor.

External supervisor is not required, if a student is doing his/her major project under direct supervision of a faculty from TERI SAS. Such that the mentor at TERISAS will be acting as external and internal supervisor.

**5. 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 (weights of each is indicated in parenthesis)

(a) Timeline adherence (10 marks) consisting of: joining report (1), synopsis and topic (1), progress report (0.5 each), feedback form (1), final Dissertation/Thesis (5).
(b) Feedback from the Host Organization/Supervisor (20 marks)
(c) Dissertation/Thesis (40 marks)
(d) Presentation and viva (30 marks)

(The presentation will be evaluated based on the contents, delivery (structure and flow), research component and timing of the presentation)

(e) The students scoring less than or equal to 50% (or ≤ 50%) overall marks in the evaluation would be considered fail.
(f) If the student fails to appear for the Major Project presentation on the presentation date assigned by the TERISAS then the candidate will be assigned zero marks for the presentation and will be graded accordingly.

## 6. Grading criteria

**a.** 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).
**b.** Grading of the Major Project will be done as per the table 1:

**Table 1. Major project part – grading**

| | |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

**7. Plagiarism**

TERI SAS has zero tolerance for plagiarism. As per UGC (Regd. no. D. L.-33004/99) Dissertation/Thesis/thesis or any other such documents are free of 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/verify committee within the department and would be analyzed in terms of similarity section if that can be treated as plagiarized such as in case of mathematical formulations/ derivations etc. 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 in consultation with external/internal supervisor to resolve the plagiarism issue and the thesis would deemed to be fit for submission upon written consent of external/internal supervisors to minor project coordinator.

| **Levels of Plagiarism** | **Percentage of similarity** | **Maximum percentage marks to be deducted from Dissertation/Thesis/thesis** |
|---|---|---|
| Level 3 | > 60% | Students registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | Student repeats the major project next year |
| Level 1 | > 10% ≤ 40% | The student is required to resubmit the thesis within a week |
| Level 0 | ≤ 10% | 0% |

**7. Late submission**

a. Joining report: Reports must be uploaded as per the dates mentioned on portal.
b. Monthly progress report: No monthly progress report will be accepted until the filled joining report has been submitted.
c. Synopsis: The synopsis must be uploaded as mentioned in point 2.
d. Submission of final Dissertation/Thesis for evaluation: The softcopy for evaluation must be uploaded on the date mentioned in point 2. Dissertation/Thesiss that are submitted after the mentioned date won't be considered for evaluation and "0" marks would be awarded for the same. Further, the regulations of the TERI School of Advanced Studies apply as laid down in the actual student handbook (available at the TERI School of Advanced Studies web page).
e. Dissertation/Thesis: The major project is completed after the Dissertation/Thesis is submitted as mentioned in the guidelines. Any non-compliance regarding certificate, formatting instructions not followed for different sections of the thesis and any other requirement as mentioned in the

guidelines will be considered incomplete and would lead to non-submission of the thesis/Dissertation/Thesis. Thus, the students are advised to follow all the guidelines of major project.

**8. Presentation and Question & Answers/Viva Voce**

The time allotted for the Presentation is only 10 minutes (maximum) which would be followed by 10 minutes questions answer by the panel. If the students are presenting this in group, then each student will add 2 minutes extra amounting to a total of 12 minutes for the presentation. The presentation should explain (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.

**9. Honor Code**

If a student is found to be misrepresenting any fact with respect to major project in any organization as well as at TERI SAS, this will be brought to the notice of Dean (Academic) by the Major Project Committee. The Dean (Academic) will decide on further action to be taken. The matter would be dealt as per the honor code of TERI SAS.

**IT related issues**

In case of any IT related problem during major project, student should send a mail to ITHELP ithelp@terisas.ac.in with the screenshot of the error. If the problem is not resolved within 2 working days, it should be forwarded to Ms. Pooja Choudhary, poojachoudhary@terisas.ac.in. Students can expect a response within 3 working days.

**Contact:**

| **Program Name** | **Major Project Coordinator** | **Department Assistant** |
|---|---|---|
| MSc (ESRM) / (CSP) | Dr. C K Singh<br>(chander.singh@terisas.ac.in) | Raj (raj@terisas.ac.in) |

**ANNEXURE 3:**

The students who are repeating the major project should ascertain that the work carried out during repeating the Major project should either be an extension of the research done in previous major project or should be entirely a different topic of research.

## Monthly Progress Report Format

*Major Project Work, TERI School of Advanced Studies, New Delhi*

<table>
<tr><td>1</td><td>Name of the student</td><td colspan="2"></td></tr>
<tr><td>2</td><td>Title of the research project</td><td colspan="2"></td></tr>
<tr><td>3</td><td>Period of progress report</td><td colspan="2"></td></tr>
<tr><td rowspan="3">4</td><td colspan="3">Progress during the current reporting period</td></tr>
<tr><td colspan="2">4a. Approved objectives</td><td>4b. Progress made towards the objectives enlisted in (4a)</td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td>5</td><td colspan="3">What have been the constraints during the current reporting period? What have you done to address this?</td></tr>
<tr><td>6</td><td colspan="3">Activities against approved objectives proposed for the next reporting period:</td></tr>
<tr><td></td><td>Date:</td><td colspan="2">Comments of the Internal Supervisor (TU):</td></tr>
</table>

Please ensure that file name is Nameofcandidate_stream_ProgressReport_X
X represents the number of progress report

The **Monthly Progress Report (MPR)** must have Internal Supervisor's comments before uploading them on the portal.

The students can send the MPR preferably on every 25th day of the month to the Internal Supervisor in MS-Word format and the internal supervisor may write his comments in the same word file and revert to the student. In that case scan and upload the MPR with his/her handwritten comments. The students are required to upload MPR's on the portal duly signed and approved by internal supervisor.

## FORMAT OF THE SYNOPSIS

The length of the synopsis is limited to six printed pages. The synopsis should be structured as:

- **Cover Page**: Clearly indicate title, name of candidate, stream and Department & TERI SAS with month and year at the bottom.
- **Introduction**: State the background of your work, the purpose, and goals
- **Background**: This is a literature review related concepts that affect your work. The reference sources should be textbooks, journals, statutory and legal reports, and publications. Limit yourself to authentic sources. All references are to be reported in the references section.
- **Objectives**: Limit yourself to objectives which are doable in a semester. It is advisable not to do more than 3 objectives
- **Materials and Methodology**: Please mention very explicitly the materials (data, software, equipment etc.) and methods you propose to achieve your aim and objectives. Indicate clearly, which methodology you use for which objective.
- **Expected Outcomes**: This should list the major products/knowledge gained through the Independent Study and, if possible, how the work can be carried forward.
- **References**: Refer to Harvard System of Referencing Guide (http://libweb.anglia.ac.uk/referencing/harvard.htm).

- **Timeline/schedule**: Use a Gantt-Chart (PERT) format to represent the timeline of the proposed work.

# FORMAT OF DISSERTATION/THESIS

5. The length of the Dissertation/Thesis should be limited to 40 to 60 pages. Please refer to the annexure at the end of document for detailed structure. The Dissertation/Thesis will be evaluated chapter wise. Missing chapters will lead to loss of marks. The Dissertation/Thesis should be structured as following:
   (Students are required to start each chapter/annexure/reference from the new page)

- **Abstract:** This is a summary of the work done within 300 words. Broadly, it defines the concepts studied and key findings. (Use times new roman 10 font and italics in this section. It should be followed by five key words.
- **Introduction:** As above plus an introduction in the structure of your work**.**
- **Background.** This is a literature review giving an overview of the knowledge regarding your work and relevant concepts. The reference sources should be textbooks, journals, statutory and legal reports, and publications. Limit yourself to authentic sources. All references are to be reported in the references section.
- **Material and Methods:** Study area, if applicable, should be part of this chapter. Mention further very explicitly the materials (data, software, equipment etc.) and methods you used to achieve your aim and objectives. Indicate clearly, which methodology you use for which objective.
- **Results and discussion:** This is the final outcome of the work done. It is to be expressed qualitatively or quantitatively. Please establish relation between the objectives defined and the results obtained. In this chapter, you should discuss the key findings of your research in the context of the overall study, existing studies, and the state-of-the-art knowledge in the field. The results in this section should be structured in such a way that it follows and adheres to the methodology.
- **Conclusion:** This section should have your assessment (in terms of important advances in the field of study, critics, gaps, limitations, and scope for further research) against the background of the state-of-art-knowledge in the field. It helps if you follow the structure of the previous two chapters and address each objective separately.
- **References:** Refer to Harvard System of Referencing Guide. (http://libweb.anglia.ac.uk/referencing/harvard.htm).

- **Annexure(s):** Any graphs, boxes and tables that could not be accommodated in the main section.

**PAGE SETUP COMPULSORY FOR SYNOPSIS/DISSERTATION/THESIS**

A page size of A4 with

- Left margin: 42 mm, right margin: 30 mm, top: 15 mm, bottom: 20 mm
- Times New Roman 12 point as the base font and 1.5 lines spacing
- Page numbers in the bottom margin, centered
- The Dissertation/Thesis should not extend beyond 60 pages in softcopy
- Captions must explain table/figures without reference to the text: Position: tables heading above tables and figures heading below figures

Examples:

**Table 1: Water use Reduction** (bold/above the table and with table number)

**Figure 1: Basin model with various elements of the watershed** (bold/below the figure and with figure number)

**DECLARATION**

This is to certify that the work that forms the basis of this project XXX (TITLE) is an original work carried out by me and has not been submitted anywhere else for the award of any degree.

I certify that all sources of information and data are fully acknowledged in the project Dissertation.

XXX (name and signature of the student)

Date:

**CERTIFICATE**

This is to certify that XXX (Name of Candidate) has carried out XXX (his/her) major project in partial fulfillment of the requirement for the Degree of Master of XXX in XXX (Your Stream) on the topic XXX (Title) during January 2020 to May 2020. The project was carried out at the XXX (organization you are working with).

This Dissertation embodies the original work of the candidate to the best of our knowledge.

Date:

| | |
|---|---|
| Dr/Mr./Prof. XXXX | Dr/Mr./Prof. XXXX |
| Department of XXXXX | Department of XXXXX |
| XXXX Organization | XXXX Organization |

Prof. Shaleen Singhal

Head of the Department

Department of Energy and Environment

TERI School of Advanced Studies

**DISSERTATION/THESIS OUTLINE**

ACKNOWLEDGMENT

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

INTRODUCTION

LITERATURE REVIEW

MATERIAL AND METHODS

RESULTS AND DISCUSSION

CONCLUSION

REFERENCES

ANNEXURE(S)

**TITLE (example CLIMATE SCIENCE AND POLICY)**

***Major Project Dissertation/Thesis (*Bold *+ Italics)***

*Submitted by (Italics)*

**NAME OF CANDIDATE (example PRAJAPATI SIKKA)**

*For the partial fulfillment of the (Italics*)

Degree of Master of XXX in

YOURSTREAM (**example ENVIRONMENTAL STUDIES AND RESOURCE MANAGEMENT**)

*Submitted to* (*Italics*)

Department of Energy and Environment

TERI School of Advanced Studies

May 2020

| | | | |
|---|---|---|---|
| **Course title:** Major Project | | | |
| **Course code:** NRE 104 | **No. of credits:** 15 | **L-T-P:**0-0-420 | **Learning hours:** 15 weeks |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Energy and Environment | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type**: Core | | **Course offered in:** 4 semester | |

**Course description:**

It is an opportunity for the students to apply knowledge and skillsets, which they have obtained during classroom teaching, practical course work and field visits, spread over three semesters. The major project is conceptualized to independently think and engage in research to provide sustainable solutions based on learning during the master's degree course work. It requires a deeper understanding of the development process, the driving factors, and the inter-linkages within the earth system science, climate change issues, sustainable development challenges, renewable energy, community engagement, legal frameworks, among others. The students are required to hypothesize a research problem and carry out detailed and substantial amount work with their original thoughts and frameworks. At the end of the major project, students are expected to submit a dissertation/thesis, which is reflection of knowledge acquired in previous studies and demonstrates the prospect to probe profoundly into a research question and integrate the learning while findings the answer. Along with the dissertation/thesis the students are required to present the entire work before an evaluation committee based on the major project guidelines (see additional information).

**Course objectives:**

The purpose of major project is

- To enable the student to develop deeper knowledge, understanding, capabilities and attitudes in the context of the climate science, environmental resource, its management, policy implications, development issues, community engagement, holistic approach for energy, environment and sustainable development and providing them opportunity/exposure to real environmental issues.
- To enhance skills, capacity and techniques needed for efficient utilization and management of resources to ensure sustainable development.
- To independently emphasize on technical/scientific/socio-behavioral aspects of the environmental resource management/ environmental problems/ community-based interventions/ adaptations and to develop critical and analytical thinking towards simplifying and solving such problem/issue.

**Course content**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1. | The students carry out the major project dissertation/thesis either in an organization/institution/industry or internally within TERISAS. The students choose a topic based on their research interests while associating with an organization. The students are continuously supervised by their external and internal supervisors, and the progress is monitored jointly. Students working in TERISAS might have only one supervisor (having roles of both external and internal supervisors). | 0 | 0 | 420 |

**1.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 (marks of each component is indicated in parenthesis)

**1.1Evaluation distribution**

1. Timeline adherence (10 %) consisting of:
    a. joining report (10%),

b. synopsis and topic (10%),
c. four progress reports (5% each),
d. feedback form (10%),
e. final dissertation/thesis (5%).

2. Feedback from the Host Organization/Supervisor (20 %)
3. Dissertation/thesis (40 %)
4. Presentation and viva (30 %) - The presentation will be evaluated based on the contents, delivery (structure and flow), research components and timing of the presentation)

2. **Grading criteria**
   1. 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).
   2. Grading of the Major Project will be done as per the Table 1:

**Table 1. Major project part – grading**

| | |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

**3.Plagiarism**

Plagiarism is unacceptable and the institute has a very strict policy to deal with it. If a student engages in plagiarism, it could attract serious penal actions. All reported cases of plagiarism would be dealt as per the process mandated by Departmental Academic Integrity Panel (DAIP) and Institutional Academic Integrity Panel (IAIP).

**4.Learning outcomes:** At the end of this course, the student should be able to –

- Conceptualise research questions, objectives, methodology and conduct appropriate analysis for a chosen research/development project.
- Independently demonstrates/display the knowledge and capability to conduct research and contribute to large scale research and development works.
- Approach and analyse a problem holistically, and to recognize, formulate and deal with complex issues critically, independently, and innovatively.
- Integrate knowledge critically and systematically, and clearly present and discuss the findings in addition to the knowledge and arguments, which constitute the basis for the findings.
- Identify, analyse, and critically evaluate the environmental issues that must be addressed within the framework while taking account of all dimensions of sustainable development.
- Realize the ethical and moral aspects of research work while learning and applying the techniques.

**5.Pedagogical Approach:** Major project is hands-on internship at the host institution. Specific pedagogy will be as per the requirements of the Dissertation thematic and research questions pursued therein..

**6.Course Reading Materials:**

1. Topic relevant books and published papers and reports. Sources can be found on but not limited to –
   www.scopus.com
   www.sciencedirect.com

www.springer.com
www.wiley.com
www.jstor.com
www.taylorandfrancis.com

**Additional Information:**

1. A separate Major project guideline indicating timeline of different activities, and other details will be issued by the department before the start of the semester.
2. Only students meeting the CGPA criteria of 6, for third 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 third semester.
3. The students who need to repeat the major project due to exceptional circumstances with due approval by the competent authority, would be allowed to carry out the major project only in the semester meant for the major project dissertation/thesis. Student should ascertain that the work carried out during repeating the major project should either be an extension of the research done in the previous major project or should be entirely a different topic of research.

**Internal Supervisor**

1. Each student is required to have one internal supervisor from TERI-SAS (exceptions on the number can be granted if agreed upon and verified); the student must provide a list of three faculty members of TERI-SAS preferred as supervisor along with the joining report. Failure to provide the three choices of supervisor will be considered as non-compliance to major project guidelines and the major project coordinator would be assigning the internal supervisor based on the area of dissertation/thesis proposed matched with expertise of faculty at TERI-SAS.
2. The students should choose the internal supervisor from the Department or outside the Department from TERI-SAS. In case the preference is given for the faculty from any other department, the student should communicate with the concerned faculty well in advance and inform major project department assistant about it by marking a email copy to internal supervisor.
3. The preference for a supervisor should be purely based on research domain/expertise required for the work during major project. The students are required to give the preferences of the internal supervisor within a week of joining the organization/institution. Department will nominate one of the faculty members as supervisor to the student by 2nd week of January. Only in extra-ordinary circumstances the department may nominate faculty other than the preference list as supervisor to the student. The decision for the internal supervisor would be final and no requests should be made for the change of supervisor.

**External Supervisor**

1. Each student must have one external supervisor from her/his host organization. External supervisors are to be identified by the host organization. Guest/visiting faculty can act as internal/external supervisor, if mutually agreed upon it.
2. External supervisor is not required, if a student is doing his/her major project under direct supervision of a faculty from TERI-SAS. In such cases faculty at TERI-SAS will be acting as external and internal supervisors.

**Student responsibilities:**

Following the issued instructions and guidelines of the minor project in entirety.
Regular updating the progress of work to the mentor/supervisor.
Timely submission of all required documents through portal.

**Course Reviewers:**

**Prof. Pawan Kumar Joshi,** School of Environmental Sciences, Chairperson, Special Centre for Disaster Research, Jawaharlal Nehru University

**Dr. Anshumali,** Associate Professor, Department of Environmental Science and Engineering, Indian Institute of Technology (Indian School of Mines)

**Prof. Umesh Kumar Singh,** Head of the Dept., Centre for Environmental Sciences, Central University of South Bihar

**Course title:** Field visits / exposure to RE plants

| **Course code:** ENR 103 | **No. of credits:** 1 | **L-T-P:** 2-2-20 | **Learning hours:** 14 |
|---|---|---|---|

**Pre-requisite course code and title (if any):** NA

**Department:** Department of Energy and Environment

**Course Coordinator:** Programme Coordinator

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

**Course description**

The course is designed to provide the students an exposure to some of the operational renewable energy projects such as solar photovoltaic, solar thermal, wind energy, biomass energy and green energy technology projects such as green building, waste to energy etc. through field visit. The course includes visiting operational renewable energy plants, attending techno-economic lectures, visiting different equipment blocks and open interaction with the plant operators and managers.

**Course objective**

- To provide exposure of the design, infrastructure and energy generation/conservation capacities of renewable energy plant and green energy projects.
- To help the students develop a thorough understanding of the design & implementation, operation strategies, maintenance and performance parameters of RE plants.
- To aware students of the local, national and global impact of these plants/projects.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| 1 | **Introduction to specific plants (before visit)**<br><br>Types of projects, their basic technology and broad system design, key performance parameters related to power generation, water to energy, biogas generation for cooking, solar water heating, hot water, energy conservation etc. | 2 | 0 | 0 |
| 2 | **Field visit and discussion**<br><br>proaches to organizational level planning and feasibility analysis<br>ign and implementation of project<br>nponent/block level specifications<br>hnologies used and theirs advantages and limitations<br>ject performance and financial viability<br>ver evacuation and project stakeholders<br>eration, monitoring and maintenance of plant<br>ial-environmental benefits | 0 | 0 | 14 |
| 3 | **Analysis and reporting (after visit)**<br><br>ject background review<br>hnical specifications sheet and plant layout<br>formance and financial data<br>llenges and scope of improvement | 0 | 2 | 6 |
| | **Total** | **2** | **2** | **20** |

**Evaluation criteria**

- Test 1:Interaction during visit (during Module 2): 10%
- Test 2: Report submission(after Module 3): 40%
- Test 3: Presentation (after Module 3): 50%

**Learning outcomes**

- Understand and assess the implementation and operation of renewable energy plants/ green energy projects (Test 1, 2).
- Record and analyze system design and specification of major components of large projects (Test 2, 3).
- Assess and analyze plant performance and maintenance issue (Test 2,3).
- Analyze overall impact of the plant/project in renewable energy context (Test 1-3).

**Pedagogical approach**

Class-room interactions; Field study; Interaction with expert; Group Discussion

**Materials**

Available project report or annual reports of the respective plants/projects
Reports available on MNRE/Govt. of India/Other organization relevant to specific plant/projects

**Additional information (if any)**

**Student responsibilities**

Attendance; discipline; Q&A with the experts during field visit

**External reviewers:**
Dr. Anish Modi, Assistant Professor, IIT Bombay
Mr. Mudit Jain, Head (Research), Tata Cleantech Capital Limited
Mr. Alok Kumar Jindal, GM (RE), Tractebel Engineering Pvt. Ltd.

**Course title:** Summer Internship

| | | | |
|---|---|---|---|
| **Course code:** ENR 108 | **No. of credits:** 2 | **L-T-P:** 0-0-56 | **Learning hours:** 240* |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department:** Department of Energy and Environment | | | |
| **Course Coordinator:** Project/ Placement coordinator | | **Course Instructor:** Assigned supervisor(s) | |
| **Contact details:** email of assigned supervisors | | | |
| **Course type**: Core | | **Course offered in:** Semester 3 (During summer break before semester 3) | |

**Course description**

The course offers thorough problem-based learning approach, guided by realistic and challenging industry requirements. The course includes a 6-8 weeks of on-job training on current industry-relevant problem through supervised self-learning approach. The students shall apply their classroom learnings for identification of problem, execute analysis based on available literature, data& reports and present the output.

**Course objective**

- To provide industrial exposure to student to the real time problems related to contemporary areas of power sector, RE industry, green energy projects, energy efficiency, energy audit & management and policy & regulations.
- Enable the students to work on short industry projects and come up with the solutions commensurate with the assigned problem to the students.
- To impart skills in preparing detailed report describing the project and results/findings.
- Identify gap in existing knowledge to help develop a specialization

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | • Problem identification on thematic area in consultation with the host industry/organization<br>• Define objective and relevant tasks to be performed<br>• Define methods to be followed and tools to be used | 0 | 0 | 16 |
| **2** | • Define objective and relevant tasks to be performed<br>• Define methods to be followed and tools to be used<br>• Review of internal or external reports, articles, accumulated data, academic literatures on the specific problem<br>• Perform survey-based research, if required<br>• Analysis and interpretation of data/results | 0 | 0 | 40 |
| | **Total** | **0** | **0** | **56** |

* The remaining learning hours are allocated for self-learning, interaction with expert, training at the organization, report writing etc.

**Evaluation criteria**

- Meeting timeline (10%) (Consisting of: joining report (2%), progress reports (2% each), feedback form (2%), and final thesis (2%). [during Module 1, 2]
- Test 1: Test Internship report (40%) [after Module 2]
- Test 2: Presentation and Viva (30%) [after Module 2]
- Response/feedback from the host organization/supervisor (20%) [after Module 2]

- Plagiarism is unacceptable and the institute has a very strict policy to deal with it. If a student engages in plagiarism, it could attract serious penal actions. All reported cases of plagiarism would be dealt as per the process mandated by Departmental Academic Integrity Panel (DAIP) and Institutional Academic Integrity Panel (IAIP).

• The students scoring less than or equal to 40% (or ≤ 40%) overall marks in the evaluation would be considered to have failed in this course. Grading of the Summer Internship will be absolute in nature and would be done as per the following criteria:

| | |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

**Learning outcomes**

- Develop an understanding of real time problems/challenges in contemporary areas of power sector, RE industry, green energy projects, energy efficiency, energy audit & management and policy & regulations [Test 1, 2]
- Realizing Standard Operating Procedure of industry for specific project domain [Test 1, 2]
- Effectively communicate the learning through project report and oral presentation [Test 1, 2]

**Pedagogical approach**

Self-learning; discussion with supervisors; interaction with experts;

**Materials**

Literature and reports related to the specific problem.

**Additional information (if any)**

A detailed guideline along with important dates and format will be notified by the department, in advance, with other relevant details.
If there is any change in evaluation criteria/policy, it will be updated in the guideline every year.
Report submission and schedule of presentation will be coordinated by Project/Programme coordinators.

**Student responsibilities**

Attendance; Discipline; Research Ethics etc.

**External reviewers:**

1. Dr. Anish Modi, Assistant Professor, IIT Bombay
2. Mr. Mudit Jain, Head (Research), Tata Cleantech Capital Limited
3. Mr. Alok Kumar Jindal, GM (RE), Tractebel Engineering Pvt. Ltd.

**Course title:** Major Project

| | | | |
|---|---|---|---|
| **Course code:** ENR 109 | **No. of credits:** 16 | **L-T-P:** 0-0-448 | **Learning hours: 640*** |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department:** Department of Energy and Environment | | | |
| **Course Coordinator:** Project/ Placement coordinator | | **Course Instructor:** Assigned supervisor(s) | |
| **Contact details:** email of assigned supervisors | | | |
| **Course type**: Core | | **Course offered in:** Semester 4 | |

**Course description**

The course offers a research driven learning approach, guided by realistic and challenging industry problems. The course includes a 16-20 weeks of on-job training on concurrent industry-relevant problem through supervised self-learning approach. Based on need of contemporary areas of power sector, RE industry, green energy projects, energy efficiency, energy audit & management and policy & regulations, the students shall work on specific thematic areas for development of design specification of a system, analysis of data, assessing market potential of technologies and solutions or similar tasks assigned by the host organizations. The students shall implement their classroom learnings and specialization, test hypothesis through literature review, experiment or field survey, analyze and report the results/findings.

**Course objective**

- To train students to use analytical skills and knowledge for addressing problems/challenges in contemporary areas of power sector, RE industry, green energy projects, energy efficiency, energy audit & management and policy & regulations
- To impart skills and training relevant to the specific fields as mentioned above.
- To enable the students to execute independent research work depending on the problem and demonstrate the findings thoroughly

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | • Broad problem identification on thematic area in consultation with the host industry/organization<br>• Define overall aims and objective and relevant research questions and research objectives to be addressed | 0 | 0 | 40 |
| **2** | • Define methodology to be followed and identify materials/tools to be used for achieving each objective<br>• Systematic review of literature, internal or external reports etc. relevant on the specific problem and create benchmark | 0 | 0 | 40 |
| **3** | • Data collection/ system design/modelling/field survey/experimental or other relevant work depending on the objectives<br>• Optimization or parametric variation or scenario analysis depending on objectives<br>• Analysis and interpretation of the findings/results/data<br>• Developing overall conclusion based on inferences and findings and enlisting the limitations of the work. | 0 | 0 | 368 |
| | **Total** | **0** | **0** | **448** |

* The remaining learning hours are allocated for self-learning, interaction with expert, training at the organization,

dissertation writing etc.

**Evaluation criteria**

- Timeline adherence (10%) [Consisting of: joining report (1%), synopsis and topic (1%), progress report (0.5% each), feedback form (1%), final dissertation (5%)] [during Module 1-3]
- Test 1: Dissertation (40%) [after Module 3]
- Test 2: Presentation and viva (30%) [after Module 3]
- Feedback from the Host Organization/Supervisor (20%) [after Module 3]

- Plagiarism is unacceptable and the institute has a very strict policy to deal with it. If a student engages in plagiarism, it could attract serious penal actions. All reported cases of plagiarism would be dealt as per the process mandated by Departmental Academic Integrity Panel (DAIP) and Institutional Academic Integrity Panel (IAIP).

• The students scoring less than or equal to 40% (or ≤ 40%) overall marks in the evaluation would be considered to have failed in this course. Grading of the Major Project will be absolute in nature and would be done as per the following criteria:

| | |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

**Learning outcomes**

- Develop an understanding of problems/challenges in contemporary areas of power sector, RE industry, green energy projects, energy efficiency, energy audit & management and policy & regulations [Test 1,2]
- Gain requisite skills through on-job training on various aspects such as system design, modeling, scenario analysis, data analysis, experimental research, field survey etc. [Test 1,2]
- Develop ability to innovate for novel product/process development or to mitigate challenges in the fields/areas mentioned above. [Test 1,2]
- Effectively communicate and demonstrate the learning through structured thesis/dissertation and oral presentation [Test 1,2]

**Pedagogical approach**

Self-learning; discussion with the supervisors; interaction with experts; field work; laboratory work, etc.

**Materials**

Peer-reviewed journal articles
Reputed conference proceedings
Reports related to the specific project
Learning materials provided by the host organization

**Additional information (if any)**

A detailed guideline along with important dates and format will be notified by the department, in advance, with other relevant details.
If there is any change in evaluation criteria/policy, it will be updated in the guideline every year.
Dissertation submission and schedule of presentation will be coordinated by Project/Programme coordinators.

| |
|---|
| **Student responsibilities**<br>Attendance; Discipline; Research Ethics etc. |

**External reviewers:**

1. Dr. Anish Modi, Assistant Professor, IIT Bombay
2. Mr. Mudit Jain, Head (Research), Tata Cleantech Capital Limited
3. Mr. Alok Kumar Jindal, GM (RE), Tractebel Engineering Pvt. Ltd.

**Course title:** Masters' Thesis (M.Sc Economics)

| **Course code:** MPE 108 | **No. of credits:** 20 | **L-T-P:** 0-0-560 | **Learning hours:** 280 |
|---|---|---|---|

**Pre-requisite course code and title (if any):** MPE 176 -**Methods of Research in Economics**

**Department:** Department of Policy Studies

| **Course type**: Core | **Course offered in:** Semester 4 |
|---|---|

**Course description:** Master's Thesis requires the student to conduct meaningful and grounded research in economics with a focus on ecological, environmental and resource economics, the specialization of the MSc Economics program.

The first three semesters of M.Sc Economics program are designed in a way to provide skills and sound knowledge in basic economic theory and its practices. The foundations of the thesis are laid down in the core course titled ―Methods of Research in Economics‖ (MPE 176; third semester). It takes the students through the entire spectrum of research design that begins with theories, concepts, frameworks and models and ends with a Research Proposal for a Masters' Thesis (Assessment 3). Ordinarily, the student will write a Master's Thesis based on this Research Proposal, under the supervision of faculty/external experts, as decided by MPEC of MSc Economics programme (see, Additional Information).

**Course objectives:** To provide the student hands-on training in research in Economics that results in a structured output within a time frame

**Course content**

| **Module** | **Topic** | **L** | **T** | **P** |
|---|---|---|---|---|
| 1. | The research proposal including research plan submitted by the student as Assessment 3 of Methods of Research in Economics, and evaluated by faculty members shall determine the requirements of the thesis, subject to approval by the assigned supervisor and Masters Programme Executive Committee. | 0 | 0 | 560 |

**Evaluation criteria:**

- Assessment 1 : Mid–term presentations (15%) to assess the mid-term progress on the thesis (evaluation sheet in Annexure 1)
  Format of Presentation:
  (a) 15 minutes of presentation per student followed by 10 minutes of Q & A
  (b) Maximum 10 slides per presentation excluding title and references
  (c) Contents of the presentation must cover a recap of the proposed research question and methodology, progress regarding collection and analysis of data/theoretical modelling, as the case may be, and problem areas if any
- Assessment 2: Final presentations (25%) to assess the oral presentation of the final thesis (evaluation sheet in Annexure 2)
  Format of Presentation:
  (a) 20 minutes of presentation per student followed by 10 minutes of Q & A
  (b) Maximum 15 slides per presentation excluding title and references
  (c) Contents of the presentation must cover a brief recap of the proposed research question and methodology, detailed results, interpretation and analysis, policy implications and further directions, if any.
- Assessment 3: Final Thesis (60%) to assess the written presentation of the final thesis (evaluation sheet in Annexure 3)
  Students must submit two copies of the final thesis in electronic format only to the Office of the Head of the Department on or before the submission date announced by the Thesis Coordinator, incorporating the comments received in the course of their presentations. This should be accompanied by the scan of Thesis Submission form (Annexure 6). The Thesis must be submitted in the prescribed structure and format (Annexure 5).

**Learning outcomes:** At the end of this course, the student should be able to demonstrate the ability

- to conduct original and meaningful research in Economics (Tests 1-3)
- to deliver effective oral presentations of such research (Tests 1-2)
- to motivate, conceptualise, design and execute original research questions in the form of written output (Test 3)

**Pedagogical approach:** As required by the research question pursued in the Thesis**.**

**Course Reading Materials:**

1. Background material on research methods: The student may refer to MPE176 course material for specific references on research methods. The following books are suggested as ready reference:

- 1.John W Creswell and David J Creswell. 2018. *Research Design: Qualitative, quantitative and Mixed methods approaches*, New Delhi: Sage
- Mark Kanazawa. 2018. *Research Methods for Environmental Studies*. London and New York: Earthscan

2. Other material: As mandated by the topic of research, subject to approval from the supervisor

**Additional information:**

**1.** Thesis must be written *individually*.

**2.** A student who has obtained a letter grade of ―C‖ or higher in the course titled ―Methods of Research in Economics‖ (MPE 176) must continue with the topic and research plan submitted (Assessment 3 in it). A proposal to modify the topic or research plan must be accompanied by appropriate justification and consent from the supervisor assigned. It has to be placed before the Masters Thesis Coordinator who shall seek approval from the MPEC. The modified topic must reflect the overall focus and specialization of the program, i.e. Environment and Resource Economics.

**3.** The MPEC of M.Sc Economics programme shall assign one of its members as (internal) supervisor. This will take place in the third semester after the presentation of the Research Concept Note (Assessment 1 in MPE 176) in consideration with the expertise of the faculty, the time that they can offer, and aiming at a balanced distribution of (Internal) supervisors. The MPEC may also assign a TERI SAS faculty member who is not a member of MPEC or even an individual from outside TERI SAS as an external supervisor. In such cases, an MPEC member will serve as the internal supervisor.

A student or a supervisor can request a change in the assignment of supervision to the Thesis Coordinator by making a request with justification. Consent of the student and both the supervisor(s) are necessary.

A student or a supervisor may request for having a co-supervisor. Consent of the student and both the supervisor(s) are necessary. All such requests must be sanctioned after approval of the MPEC. No such request can be considered after the mid-term presentations.

**4.** Students are expected to spend a minimum of 40 hours per week on thesis work throughout the semester. Students are also expected to meet the supervisor (internal as well as external) at least once a fortnight to report on the progress made. The Thesis Coordinator will solicit the monthly confidential progress report from (both) the supervisors in an electronic form (Annexure 4).

**5.** Plagiarism: [1] Students will be penalised for plagiarism offences, if any, in any of the submissions.

**6.** Without valid reason and prior approval of the Dean (Academic), a student cannot postpone/change date of his/ her presentation(s) or submission(s) from the schedule announced by the Thesis Coordinator. Even in case of any emergency, a valid proof and an approval from the Dean is required.

**7.** The timeline for the Master's Thesis presentations and submissions will be notified by the Thesis Coordinator. The deadline for presentations and submissions, unless approved a priori by the Thesis Coordinator in special circumstances, are strict: all submissions must electronically reach the office of the Thesis Coordinator with a time stamp within 2359 hours of the due date. No late submission will be accepted and zero marks will be assigned to the

[1] Plagiarism is defined as presenting someone else's work, including the work of other students, as one's own. Any ideas or materials taken from another source for either written or oral use must be fully acknowledged, unless the information is common knowledge. What is considered "common knowledge" may differ from programme to programme.

a. A student must not adopt or reproduce ideas, opinions, theories, formulas, graphics, or pictures of another person without acknowledgment.

b. A student must give credit to the originality of others and acknowledge an indebtedness whenever:

1. Directly quoting another person's actual words, whether oral or written;
2. Using another person's ideas, opinions, or theories;
3. Paraphrasing the words, ideas, opinions, or theories of others, whether oral or written;
4. Borrowing facts, statistics, or illustrative material; or
5. Offering materials assembled or collected by others in the form of projects or collections without acknowledgment.

[also see, https://portal.teriuniversity.ac.in/Rules/Plagiarism.pdf]

corresponding submission component.

**8.** The Thesis Coordinator will set up the panel for evaluation of presentations. Weights will be as follows:

(a) For those with only Internal Supervisor—Supervisor(s)[2] and 1 faculty member (or an expert fromoutsideif any; weightage 60:40 respectively).

(b) For those with Internal and External Supervisor/co-supervisor[3], both the Supervisors; weightage 60:40 respectively.

**9.** Evaluation of the Thesis will be as per the following process:

(a) only the Internal Supervisor (in case of absence of external supervisor or a co-supervisor), or,

(b) by both Internal and External Supervisor/Co-supervisor; weightage 60:40

**Student responsibilities:** Regular meetings with the supervisor

**Prepared by:** Nandan Nawn, Seema Sangita and Soumendu Sarkar

**Course reviewers:**

1. **Vikram Dayal, Professor, Institute of Economic Growth, New Delhi**
2. **Anirban Dasgupta, Associate Professor, South Asian University, New Delhi**

[2] In case the supervisor(s) is not available due to unavoidable circumstances, a faculty member with expertise in the topic of research will examine the presentation.

[3] In case the supervisor(s) is not available due to unavoidable circumstances, a faculty member with expertise in the topic of research will examine the presentation.

**Annexure 1: Master's Thesis Mid-term Presentation evaluation sheet**

M.Sc. Economics Programme, Department of Policy Studies, TERI School of Advanced Studies

| | |
|---|---|
| Name of Examiner | |
| Name of Student | |
| ***Evaluation carried out as*** | Internal supervisor ☐ External Supervisor /Examiner ☐ |

Please fill each field in a way that the outlined points are addressed providing an impression on the quality of the research proposal and justification for the allocated marks.

**1. Introduction, Problem Statement and Research Question**

| |
|---|
| *Relevance, Clarity, Innovativeness* |
| |

**2. Literature review**

| |
|---|
| *Coverage, Ability to review the relevant literature, Inferences of gaps in the literature* |
| |

**3. Method**

| |
|---|
| *Choice of method, Appropriateness of method, Comprehensive background, description and limitations of the method; Discussion of conjectures/ variables/ data sources/ sampling strategy and questionnaire (if relevant)* |
| |

**4. Expected findings**

| |
|---|
| *Clarity on expected outcome* |
| |

**5. Integration and Coherence**

| |
|---|
| *Linkages between the introduction, problem statement, research question, method, results, conclusion etc.* |
| |

**6. Clarity of Presentation**

| |
|---|
| *Audible and comprehensible; Information is presented in logical sequence; Good language skills and pronunciation; Appropriate pace of presentation* |
| |

**7. Quality of visual presentation**

| |
|---|
| *Clarity; Organization and layout* |
| |

**8. Responses during Q&A session**

| |
|---|
| *Response to questions and comments* |
| |

**9. Additional comments/justification, if any***

| |
|---|
| |

**Suggested weights in total marks:**

20% each on (a) method of analysis, (b) integration & coherence and (c) clarity of presentation
10% each on (d) introduction, (e) literature review, (f) expected findings,
10% in total on (g) quality of visual presentation and (h) responses during Q & A session.

**Marks* :_____(out of 100)**

**Date** **Signature**

| Grade-marks links | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Letter Grade** | A+ | A | B+ | B | C+ | C | D+ | D |
| Range of Marks | 91-100 | 86-90 | 81-85 | 76-80 | 71-75 | 66-70 | 61-65 | <= 60 |

* For marks awarded above 90 or below 66, additional justification may be provided in a separate sheet. For example, marks above 90 may be awarded in works with a potential for publication in a decent journal; likewise marks below 66 may be awarded for a work grossly dissatisfactory on most counts.
** See Grading Guidelines.

**Grading Guidelines from Student Handbook of TERI School of Advanced Studies [4]**

**A+/A**

_ The thesis shows creativity and substantial effort. Significant and credible results have been obtained; or there is a logical explanation and analysis on what went wrong and suggestions for improvements.
_ The thesis is clearly written, including the technical aspects. Data is presented in an easy-to-understand format. Diagrams are clearly labelled. Grammar, typing, and spelling errors are absent.
_ The oral presentation is done in a professional and organized manner, describing the main highlights and contributions of the project.

**B+/B**

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

**C+/C**

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

**D**

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

**F**

_ The thesis shows a lack of effort and produces poor results.
_ The thesis is not submitted in full.
_ The oral presentation is not done or done in an unprofessional manner.

[4] https://www.terisas.ac.in/pdf/student-handbook.pdf

**Annexure 2: Master's Thesis Final Presentation Evaluation Sheet**

M.Sc. Economics Programme, Department of Policy Studies, TERI School of Advanced Studies

| | |
|---|---|
| Name of Examiner | |
| Name of Student | |
| ***Evaluation carried out as*** | Internal supervisor ☐ External Supervisor /Examiner ☐ |

Please fill each field in a way that the outlined points are addressed providing an impression on the quality of the research proposal and justification for the allocated marks.

**1. Introduction, Problem Statement and Research Question**

| *Relevance, Clarity, Innovativeness* |
|---|
| |

**2. Literature review**

| *Coverage, Ability to review the relevant literature, Inferences of gaps in the literature* |
|---|
| |

**3. Method**

| *Choice of method, Appropriateness of method, Comprehensive background, description and limitations of the method; Discussion of conjectures/variables/data sources/sampling strategy and questionnaire (if relevant)* |
|---|
| |

**4. Discussion of results**

| *Interpretation and implications of results* |
|---|
| |

**5. Integration and Coherence**

| *Linkages between the introduction, problem statement, research question, method, results, conclusion etc.* |
|---|
| |

**6. Clarity of Presentation**

| *Audible and comprehensible; Information is presented in logical sequence; Good language skills and pronunciation; Appropriate pace of presentation* |
|---|
| |

**7. Quality of visual presentation**

| *Clarity; Organization and layout* |
|---|
| |

**8. Responses during Q&A session**

| *Response to questions and comments* |
|---|
| |

**9. Additional comments/justification, if any***

| |
|---|

**Suggested weights in total marks:**

20% each on (a) method of analysis, (b) integration & coherence and (c) discussion of results
10% each on (d) introduction, (e) literature review, (f) clarity of presentation
10% in total on (g) quality of visual presentation and (h) responses during Q & A session.

**Marks* :_____(out of 100)**

**Date** **Signature**

| Grade-marks links | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Letter Grade** | A+ | A | B+ | B | C+ | C | D+ | D |
| Range of Marks | 91-100 | 86-90 | 81-85 | 76-80 | 71-75 | 66-70 | 61-65 | <= 60 |

* For marks awarded above 90 or below 66, additional justification may be provided in a separate sheet. For example marks above 90 may be awarded in works with a potential for publication in a decent journal; likewise marks below 66 may be awarded for a work grossly dissatisfactory on most counts.
** See Grading Guidelines.

**Grading Guidelines from Student Handbook of TERI School of Advanced Studies [5]**

**A+/A**

- The thesis shows creativity and substantial effort. Significant and credible results have been obtained; or there is a logical explanation and analysis on what went wrong and suggestions for improvements.
- The thesis is clearly written, including the technical aspects. Data is presented in an easy-to-understand format. Diagrams are clearly labelled. Grammar, typing, and spelling errors are absent.
- The oral presentation is done in a professional and organized manner, describing the main highlights and contributions of the project.

**B+/B**

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

**C+/C**

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

**D**

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

**F**

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

[5] https://www.terisas.ac.in/pdf/student-handbook.pdf

**Annexure 3: Master's Thesis Final Thesis Evaluation Sheet**

M.Sc. Economics Programme, Department of Policy Studies, TERI School of Advanced Studies

| | |
|---|---|
| Name of Examiner | |
| Name of Student | |
| ***Evaluation carried out as*** | Internal supervisor ☐ External Supervisor ☐ |

Please provide comments below on various attributes of the research ranging from appreciation, constructive criticism and suggestions for improvement.

**1. Abstract**

| |
|---|
| *Comprehensiveness, Appropriate length* |
| |

**2. Introduction, problem statement and research question**

| |
|---|
| *Background information, Relevance of problem statement; Innovativeness of the research question* |
| |

**3. Literature review**

| |
|---|
| *Coverage; Ability to review the relevant literature; Inferences of gaps in the literature* |
| |

**4. Method**

| |
|---|
| *Choice of method; Appropriateness of method; Comprehensive background, description and limitations of the method* |
| |

**5. Results of the study and interpretation**

| |
|---|
| *Interpretation of results; Discussion and implications of results; Conclusion* |
| |

**6. Integration and coherence**

| |
|---|
| *Linkages between the introduction, research question, method, findings and conclusion; Overall clarity* |
| |

**7. List of references**

| |
|---|
| *Adequate use of references through-out the text; Link between list of references to text; Citation style, both in-text and in reference* |
| |

**8. Regularity in supervisor interaction and attending presentations**

| |
|---|
| *Regular interaction with supervisor (at least fortnightly updates by students in expected)* |
| |

**9. Additional comments/justification, if any***

| |
|---|
| |

**Suggested weights in total marks:**

30% on (a) results and its interpretation

10% each on (b) abstract, (c) introduction, (d) literature review, (e) method, (f) integration & coherence, (g) list of references and (h) regularity of the student in consulting you.

**Marks* :_____(out of 100)**

**Date** **Signature**

| Grade-marks links | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Letter Grade** | A+ | A | B+ | B | C+ | C | D+ | D |
| Range of Marks | 91-100 | 86-90 | 81-85 | 76-80 | 71-75 | 66-70 | 61-65 | <= 60 |

* For marks awarded above 90 or below 66, additional justification may be provided in a separate sheet. For example marks above 90 may be awarded in works with a potential for publication in a decent journal; likewise marks below 66 may be awarded for a work grossly dissatisfactory on most counts.
** See Grading Guidelines.

**Grading Guidelines from Student Handbook of TERI School of Advanced Studies [6]**

**A+/A**

- The thesis shows creativity and substantial effort. Significant and credible results have been obtained; or there is a logical explanation and analysis on what went wrong and suggestions for improvements.
- The thesis is clearly written, including the technical aspects. Data is presented in an easy-to-understand format. Diagrams are clearly labelled. Grammar, typing, and spelling errors are absent.
- The oral presentation is done in a professional and organized manner, describing the main highlights and contributions of the project.

**B+/B**

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

**C+/C**

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

**D**

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

**F**

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

[6] https://www.terisas.ac.in/pdf/student-handbook.pdf

**Annexure 4: Format for Submission of Confidential Progress Report (Master's Thesis)**
M.Sc Economics Programme, Department of Policy Studies, TERI School of Advanced Studies

CONFIDENTIAL PROGRESS REPORT
For / / to / /

Name of the Student:

Title of the Research Topic:

| | | |
|---|---|---|
| 1 | Status of the work | |
| 2 | List out the work related activities accomplished so far | |
| 3 | Future Work Plan and Time Line | |
| 4 | Comments from Supervisor (s) | |

Date:

[Signature of Student] [Signature of Internal/External Supervisor]

**Annexure 5: Structure of the Master's Thesis**

M.Sc. Economics Program, Department of Policy Studies, TERI School of Advanced Studies

The Contents of the Thesis should be in this order (may refer to the Thesis submitted earlier):

| | | |
|---|---|---|
| 1 | Title Page | |
| 2 | Declaration by the Student | |
| 3 | Certificate by the Supervisor and the Head of the Department | |
| 4 | Acknowledgment Page | |
| 5 | Table of Contents | |
| 6<br>7 | Abstract<br>List of Tables (if any) | Page numbering in Roman, i.e., i, ii |
| 8 | List of Figures (if any) | |
| 9 | List of Symbols/Abbreviations (if any) | |
| 10 | Introduction | |
| 11 | Literature Review | |
| 12 | Method (including data if it is an empirical study) | |
| 13 | Analysis | |
| 14 | Conclusion | |
| 15 | References | |
| 16 | Annexures (if any) [Page numbering in Roman with A as a prefix, i.e. Ai, Aii..,] | |

Brief Details

**Abstract:** This is a summary of the completed work, from Introduction to Conclusion, within 250 words. Broadly, it defined the area of study, states the objectives of the thesis, describes the study area and the methodology used, major findings, and their significance. Write this section after the rest of the work is complete.

**Introduction:** This describes the topic and the problem within 3-4 pages. Introduction must be brief and informative. It must describe the problem, its relevance and scope. The hypothesis must be clearly stated and a summary of research may be presented that places the problem in the context. The objectives and expected outcomes from the study must also be stated. All references need to be included in the references section.

**Literature Review:** The literature review must be a critical evaluation of existing work and explain the relevance of previous efforts and the gaps in research. The review should be more than just a collection of summaries of research papers. The reference sources will be textbooks, journals, and publications. Limit yourself to authentic sources. All references are to be reported in the references section.

**Data and Methodology:** A brief description of the data along with the summary statistics must be given. The student may choose a secondary source, or do a study by the questionnaire method. If the interview method is chosen, the sample details such as profile and size, and reasons behind such a choice may be described. It describes the methods and techniques of survey, analysis, etc. The method should be carefully formulated, identifying problems that may arise and possible solutions.

**Results and Analysis:** Explain and discuss the main results of the study, relating to the objective and hypotheses stated at the beginning. The results may be supplemented with brief tables and graphs. All the tables and figures should be self-contained, numbered and referred in the text. Avoid description of the tables and figures in the text; rather include the interpretation.

**Conclusion:** This section should be an assessment describing the gaps, limitations and scope for further research, based on the analysis that have been done to answer specific questions. Also sum up the main conclusions.

**Acknowledgments:** Acknowledge all the individuals and the agencies who have helped you in your work.

**Annexure:** This includes field data, questionnaire format, graphs, boxes and tables that could not be accommodated in the results section. All annexure should be referred in the main text.

General Formatting Instructions for the Master's Thesis

1. Please refer to thesis submitted in previous years for the color scheme ofthe cover and the binding requirements. Copies are available with the library.
2. The suggested format is as follows.
   a. A page size of A4 (210 by 297 mm)
   b. Left and right margins: 0.98‖ top and bottom: 1‖, justified,
   c. One-and-a-half spacing
   d. Times New Roman 12 point as the base font
   e. Page numbers at the bottom of the page and at the centre
   f. Printed on both sides; so, Gutter 0.5‖
   i. Figures should be put on a separate page with no text in the back of that page; this page should be placed immediately after the text page where this figure was mentioned for the first time. Figures will not have page number.
3. References should be in alphabetical order with no numbering or bullet points.
4. Tables should not have vertical grids. Horizontal grids should be highlighted at the top 2 lines, and bottom line only.
5. Chapter heading should follow the following format:
   (a) All the main heading should be in UPPER CASE, BOLD and in the centre.
   (b) All sub-headings should be in the Title case, left justified and *bold-italics*. They shouldbe numbered.
6. Allow a spacing of 3 lines (double the usual line spacing) before you begin a paragraph or section.
7. Paragraphs and Sections within the subheading should not be numbered.

**Format of the Title Page**

***Title of the Master's Thesis***

*Master's Thesis*

***Submitted by:***

**<Name of student>**

**In partial fulfillment for the**
***Degree of M.Sc. (Economics)***

***Submitted to:***

**Department of Policy Studies TERI School of Advanced Studies**
**Plot 10,Institutional Area,**

**Annexure 6: Templates for Thesis Submission Form**

M.Sc Economics Programme, Department of Policy Studies, TERI School of Advanced Studies

Declaration to be made by the Student

This is to certify that the research that forms the basis of this thesis titled ― ---------- is an original work
carried out by me and has not been submitted anywhere else for the award of any degree.

I certify that, to the best of my knowledge, all sources of information and data have been fully acknowledgedin the report.

Name of
the
Student
M.Sc.
Econom
ics
TERI School of Advanced Studies

Certificate for Supervisor(s) and the Head

This is to certify that ---------has carried out a Master's Thesis, in partial fulfillment of requirements for the degree
of M.Sc. Economics on the topic ---------- during month year ( say, July 2018)― month year (say, April 2019).

The report embodies the original work of the candidate, to the best of our knowledge.

| | |
|---|---|
| Signature of Internal Supervisor<br>Co-supervisorName and Designation<br><br>Date | Signature of External Supervisor/<br>Name and Designation<br>Organisation Address<br>Date |

| | |
|---|---|
| Signature of Thesis Coordinator<br>Name and Designation<br>Date | Signature of Head of Department<br>Name<br>Date |

| | | | |
|---|---|---|---|
| **Course title:** Minor Project | | | |
| **Course code:** PPM 100 | **No. of credits:** 6 | **L-T-P: 00-00-240*** | **Learning hours: 240** |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department:** Department of Business & Sustainability | | | |
| **Course Coordinator:** Minor Project Coordinator | | **Course Instructor:** Assigned supervisor(s) | |
| **Contact details:** email of assigned supervisors | | | |
| **Course type**: Core | | **Course offered in:** Semester III | |

**Course description**

The course offers a practical learning approach, guided by real business-related problems. During the minor project, a student should work as an intern at least for 6 weeks at the project location/corporate sector and gain on-job training. The primary focus of the project is to enable students to deal with business/industry-related problems through supervised self-learning approach. Based on the need of the interning organization, the students should work on specific thematic areas like finance, economics, sustainability, CSR, business, management, policy & regulations during the internship. The students should identify the problem(s), review literature, analyze data/information, derive inferences from the information and/or complete similar other tasks assigned by the host organizations. The students are expected to implement their classroom learning's, managerial skills for the preparation of the minor project report.

**Course objectives**

- To develop the experience to work in corporate/industries as a team to meet the deadlines and targets;
- To train students to use analytical skills and knowledge for addressing problems/challenges in contemporary areas business, management and its sustainability;
- To impart skills and training relevant to the specific areas of business and management;
- To enable the students to execute independent research work and to solve real business-related problem.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | • Broad problem identification on thematic area in consultation with the host industry/organization<br>• Define overall aims and objective and relevant research questions and research objectives to be addressed | NA | NA | NA |
| **2** | • Define methodology to be followed and identify materials/tools to be used for achieving each objective;<br>• Systematic review of literature, internal or external reports etc. relevant on the specific problem and create benchmark | NA | NA | NA |
| **3** | • Data collection/ system design/modeling/field survey/experimental or other relevant work depending on the objectives; | NA | NA | NA |

| | | | | |
|---|---|---|---|---|
| | • Analysis and interpretation of the findings/results/data<br>• Developing overall conclusion based on inferences and findings and enlisting the limitations of the work. | | | |
| | **Total** | | | **240** |

**Evaluation criteria**

- Test-1: Presentation & Viva – 50%
- Test-2: Dissertation - 50%

**Learning outcomes**

- Develop an understanding of problems/challenges in contemporary areas of business, management, finance and economics.
- To gain necessary skills through on-job training on various aspects such as problem identification, analyse data, report writing, teamwork etc.
- To effectively communicate and demonstrate the learning through structured thesis/dissertation and oral presentation

**Pedagogical approach**

Self-learning; discussion with the supervisors; interaction with experts; field work etc.

**Materials**

Peer-reviewed journal articles

Reputed conference proceedings

Reports related to the specific project

Learning materials provided by the host organization

**Additional information (if any)**

A detailed guideline along with important dates and format will be notified by the department, in advance, with other relevant details.
If there is any change in evaluation criteria/policy, it will be updated in the guideline every year. Dissertation submission and schedule of presentation will be coordinated by Project coordinators.

- If plagiarism is detected using plagiarism checking software (e.g., Turnitin), it will be referred to the MPEC (comprising of supervisors and faculty members), which would take a decision and penalty to be imposed/disciplinary action to be taken. The guidelines for the MPEC are as follows:

| **Levels of Plagiarism** | **Percentage of similarity** | **Maximum percentage marks to be deducted from dissertation/thesis** |
|---|---|---|
| Level 3 | > 60% | Students' registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | Student repeats the course next year |
| Level 1 | > 10% ≤ 40% | The student is required to resubmit the report after necessary changes within the deadline |
| Level 0 | ≤ 10% | 0% |

• The students scoring less than or equal to 50% (or ≤ 50%) overall marks in the evaluation would be considered to have failed in this course. Grading of the Minor Project will be absolute in nature and would be done as per the following criteria:

| | |
|---|---|
| > 90 | A+ |
| >80 & ≤ 90 | A |
| >70 & ≤80 | B+ |
| >60 & ≤70 | B |
| >50 & ≤60 | C+ |
| >45 & ≤50 | C |
| >40 & ≤45 | D |
| ≤40 | F |

**Student responsibilities**
Timeline adherence, Discipline; Research Ethics etc.

* The learning hour indicative only.

**Prepared by**: Montu Bose

**Course Reviewers**:
Prof. Pinaki Dasgupta, IMI Delhi
Dr. Santosh Pandey, Cofounder, Nihilent Technologies

| | | | |
|---|---|---|---|
| **Course title:** Major Project | | | |
| **Course code:** PPM 102 | **No. of credits:** 14 | **L-T-P: 00-00-600*** | **Learning hours: 600** |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department:** Department of Business & Sustainability | | | |
| **Course Coordinator:** Major Project Coordinator | | **Course Instructor:** Assigned supervisor(s) | |
| **Contact details:** email of assigned supervisors | | | |
| **Course type**: Core | | **Course offered in:** Semester IV | |

**Course description**

The course offers a practical learning approach, guided by real business-related problems. During the major project, a student should work as an intern at least for 15 weeks at the project location/corporate sector and gain on-job training. The primary focus of the project is to enable students to deal with business/industry-related problems through supervised self-learning approach. Based on the need of the interning organization, the students should work on specific thematic areas like finance, economics, sustainability, CSR, business, management, policy & regulations during the internship. The students should identify the problem(s), review literature, analyse data/information, derive inferences from the information and/or complete similar other tasks assigned by the host organizations. The students are expected to implement their classroom learning's, managerial skills for the preparation of the major project report.

**Course objectives**

- To develop the experience to work in corporate /industries as a team to meet the deadlines and targets;
- To train students to use analytical skills and knowledge for addressing problems/challenges in contemporary areas business, management and its sustainability;
- To impart skills and training relevant to the specific areas of business and management;
- To enable the students to execute independent research work and to solve real business-related problem.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | • Broad problem identification on thematic area in consultation with the host industry/organization<br>• Define overall aims and objective and relevant research questions and research objectives to be addressed | NA | NA | NA |
| **2** | • Define methodology to be followed and identify materials/tools to be used for achieving each objective<br>• Systematic review of literature, internal or external reports etc. relevant on the specific problem and create benchmark | NA | NA | NA |

| | | | | |
|---|---|---|---|---|
| **3** | • Data collection/ system design/modeling/field survey/experimental or other relevant work depending on the objectives<br>• Analysis and interpretation of the findings/results/data<br>• Developing overall conclusion based on inferences and findings and enlisting the limitations of the work. | NA | NA | NA |
| | **Total** | | | **600** |

**Evaluation criteria**

- Presentation and viva (30%)
- Dissertation (40%)
- Timeline adherence (10%) [Consisting of: joining report (1%), synopsis (1%), progress report-1,2 & 3 (1% each), feedback Final draft for presentation (2%), final dissertation (3%)]
- Feedback from the Host Organization/Supervisor (20%)

**Learning outcomes**

- Develop an understanding of problems/challenges in contemporary areas of business, management, finance and economics.
- To gain necessary skills through on-job training on various aspects such as problem identification, analyse data, report writing, team-work etc.
- To effectively communicate and demonstrate the learning through structured thesis/dissertation and oral presentation

**Pedagogical approach**

Self-learning; discussion with the supervisors; interaction with experts; field work etc.

**Materials**

Peer-reviewed journal articles
Reputed conference proceedings
Reports related to the specific project
Learning materials provided by the host organization

**Additional information (if any)**

A detailed guideline along with important dates and format will be notified by the department, in advance, with other relevant details.
If there is any change in evaluation criteria/policy, it will be updated in the guideline every year.
Dissertation submission and schedule of presentation will be coordinated by Project coordinators.

- If plagiarism is detected using plagiarism checking software (e.g. Turnitin), it will be referred to the MPEC (comprising of supervisors and faculty members), which would take a decision and penalty to be imposed/disciplinary action to be taken. The guidelines for the MPEC are as follows:

| **Levels of Plagiarism** | **Percentage of similarity** | **Maximum percentage marks to be deducted from dissertation/thesis** |
|---|---|---|
| Level 3 | > 60% | Students' registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | Student repeats the course next year |
| Level 1 | > 10% ≤ 40% | The student is required to resubmit the report after necessary changes |

| | | |
|---|---|---|
| | | within the deadline |
| Level 0 | ≤ 10% | 0% |

•The students scoring less than or equal to 50% (or ≤ 50%) overall marks in the evaluation would be considered to have failed in this course. Grading of the Major Project will be absolute in nature and would be done as per the following criteria:

| | |
|---|---|
| > 90 | A+ |
| >80 & ≤ 90 | A |
| >70 & ≤80 | B+ |
| >60 & ≤70 | B |
| >50 & ≤60 | C+ |
| >45 & ≤50 | C |
| >40 & ≤45 | D |
| ≤40 | F |

**Student responsibilities**

Timeline adherence, Discipline; Research Ethics etc.

* The learning hour indicative only.

**Prepared by**: Montu Bose

**Course Reviewers**:

Prof. Pinaki Dasgupta, IMI Delhi

Dr. Santosh Pandey, Cofounder, Nihilent Technologies

| | | | |
|---|---|---|---|
| **Course title:** Minor Project | | | |
| **Course code:** BSI 102 | **No. of credits:** 6 | **L-T-P: 00-00-240*** | **Learning hours: 240** |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department:** Department of Business & Sustainability | | | |
| **Course Coordinator:** Minor Project Coordinator | | **Course Instructor:** Assigned supervisor(s) | |
| **Contact details:** email of assigned supervisors | | | |
| **Course type**: Core | | **Course offered in:** Semester III | |

**Course description**

The course offers a practical learning approach, guided by the real business-related problems. During the minor project, a student should work as an intern at least for 6 weeks at the project location/corporate sector and gain on-job training. The primary focus of the project is to enable students to deal with business/industry-related problems through supervised self-learning approach. Based on the need of the interning organization, the students should work on specific thematic areas like finance, logistics & supply chain, public-private partnership and policy & regulations related to infrastructure sector during the internship. The students should identify the problem(s), review literature, analyse data/information, derive inferences from the information and/or complete similar other tasks assigned by the host organizations. The students are expected to implement their classroom learning's, managerial skills for the preparation of the minor project report.

**Course objectives**

- To develop the experience to work in corporate /industries as a team to meet the deadlines and targets;
- To train students to use analytical skills and knowledge for addressing problems/challenges in the infrastructure sector;
- To impart skills and training relevant to the specific areas of Infrastructure-business;
- To enable the students to execute independent research work and to solve real business-related problem.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | • Broad problem identification on thematic area in consultation with the host industry/organization<br>• Define overall aims and objective and relevant research questions and research objectives to be addressed | NA | NA | NA |
| **2** | • Define methodology to be followed and identify materials/tools to be used for achieving each objective<br>• Systematic review of literature, internal or external reports etc. relevant on the specific problem and create benchmark | NA | NA | NA |
| **3** | • Data collection/ system design/modelling/field survey/experimental or other relevant work depending on the objectives | NA | NA | NA |

| | | | | |
|---|---|---|---|---|
| | • Analysis and interpretation of the findings/results/data<br>• Developing overall conclusion based on inferences and findings and enlisting the limitations of the work. | | | |
| | **Total** | | | **240** |

**Evaluation criteria**

- Presentation and viva (50%)
- Dissertation (50%)

**Learning outcomes**

- Develop an understanding of problems/challenges in contemporary areas of Infrastructure-business;
- To gain necessary skills through on-job training on various aspects such as problem identification, analyse data, report writing, team-work etc.
- To effectively communicate and demonstrate the learning through structured thesis/dissertation and oral presentation

**Pedagogical approach**

Self-learning; discussion with the supervisors; interaction with experts; field work etc.

**Materials**

Peer-reviewed journal articles

Reputed conference proceedings

Reports related to the specific project

Learning materials provided by the host organization

**Additional information (if any)**

A detailed guideline along with important dates and format will be notified by the department, in advance, with other relevant details.

If there is any change in evaluation criteria/policy, it will be updated in the guideline every year.

Dissertation submission and schedule of presentation will be coordinated by Project coordinators.

- If plagiarism is detected using plagiarism checking software (e.g. Turnitin), it will be referred to the MPEC (comprising of supervisors and faculty members), which would take a decision and penalty to be imposed/disciplinary action to be taken. The guidelines for the MPEC are as follows:

| **Levels of Plagiarism** | **Percentage of similarity** | **Maximum percentage marks to be deducted from dissertation/thesis** |
|---|---|---|
| Level 3 | > 60% | Students' registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | Student repeats the course next year |
| Level 1 | > 10% ≤ 40% | The student is required to resubmit the report after necessary changes |

| | | |
|---|---|---|
| | | within the deadline |
| Level 0 | ≤ 10% | 0% |

•The students scoring less than or equal to 50% (or ≤ 50%) overall marks in the evaluation would be considered to have failed in this course. Grading of the Minor Project will be absolute in nature and would be done as per the following criteria:

| | |
|---|---|
| > 90 | A+ |
| >80 & ≤ 90 | A |
| >70 & ≤80 | B+ |
| >60 & ≤70 | B |
| >50 & ≤60 | C+ |
| >45 & ≤50 | C |
| >40 & ≤45 | D |
| ≤40 | F |

**Student responsibilities**

Timeline adherence, Discipline; Research Ethics etc.

* The learning hour indicative only.

**Prepared by**: Montu Bose

**Course Reviewers**:

Prof. Pinaki Dasgupta, IMI Delhi

Dr. Santosh Pandey, Cofounder, Nihilent Technologies

| | | | |
|---|---|---|---|
| **Course title:** Major Project | | | |
| **Course code:** BSI 106 | **No. of credits:** 14 | **L-T-P: 00-00-600*** | **Learning hours: 600** |
| **Pre-requisite course code and title (if any):** NA | | | |
| **Department:** Department of Business & Sustainability | | | |
| **Course Coordinator:** Major Project Coordinator | | **Course Instructor:** Assigned supervisor(s) | |
| **Contact details:** email of assigned supervisors | | | |
| **Course type**: Core | | **Course offered in:** Semester IV | |

**Course description**

The course offers a practical learning approach, guided by real business-related problems. During the major project, a student should work as an intern at least for 15 weeks at the project location/corporate sector and gain on-job training. The primary focus of the project is to enable students to deal with business/industry-related problems through supervised self-learning approach. Based on the need of the interning organization, the students should work on specific thematic areas like finance, logistics& supply chain, public-private partnership and policy & regulations related to infrastructure sector during the internship. The students should identify the problem(s), review literature, analyse data/information, derive inferences from the information and/or complete similar other tasks assigned by the host organizations. The students are expected to implement their classroom learning's, managerial skills for the preparation of the major project report.

**Course objectives**

- To develop the experience to work in corporate /industries as a team to meet the deadlines and targets;
- To train students to use analytical skills and knowledge for addressing problems/challenges in the infrastructure sector;
- To impart skills and training relevant to the specific areas of Infrastructure-business;
- To enable the students to execute independent research work and to solve real business-related problem.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | • Broad problem identification on thematic area in consultation with the host industry/organization<br>• Define overall aims and objective and relevant research questions and research objectives to be addressed | NA | NA | NA |
| **2** | • Define methodology to be followed and identify materials/tools to be used for achieving each objective<br>• Systematic review of literature, internal or external reports etc. relevant on the specific problem and create benchmark | NA | NA | NA |
| **3** | • Data collection/ system design/modeling/field survey/experimental or other relevant work depending on the objectives | NA | NA | NA |

| | | | | |
|---|---|---|---|---|
| | • Analysis and interpretation of the findings/results/data<br>• Developing overall conclusion based on inferences and findings and enlisting the limitations of the work. | | | |
| | **Total** | | | **600** |

**Evaluation criteria**

- Presentation and viva (30%)
- Dissertation (40%)
- Timeline adherence (10%) [Consisting of: joining report (1%), synopsis (1%), progress report-1,2 & 3 (1% each), feedback Final draft for presentation (2%), final dissertation (3%)]
- Feedback from the Host Organization/Supervisor (20%)

**Learning outcomes**

- Develop an understanding of problems/challenges in contemporary areas of Infrastructure-business;
- To gain necessary skills through on-job training on various aspects such as problem identification, analyse data, report writing, team-work etc.
- To effectively communicate and demonstrate the learning through structured thesis/dissertation and oral presentation

**Pedagogical approach**

Self-learning; discussion with the supervisors; interaction with experts; field work etc.

**Materials**

Peer-reviewed journal articles

Reputed conference proceedings

Reports related to the specific project

Learning materials provided by the host organization

**Additional information (if any)**

A detailed guideline along with important dates and format will be notified by the department, in advance, with other relevant details.

If there is any change in evaluation criteria/policy, it will be updated in the guideline every year.

Dissertation submission and schedule of presentation will be coordinated by Project coordinators.

- If plagiarism is detected using plagiarism checking software (e.g., Turnitin), it will be referred to the Major Project Committee (comprising of supervisors and faculty members), which would take a decision and penalty to be imposed/disciplinary action to be taken. The guidelines for the Major Project Committee are as follows:

| **Levels of Plagiarism** | **Percentage of similarity** | **Maximum percentage marks to be deducted from dissertation/thesis** |
|---|---|---|
| Level 3 | > 60% | Students' registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | Student repeats the course next year |
| Level 1 | > 10% ≤ 40% | The student is required to resubmit the report after necessary changes within the deadline |
| Level 0 | ≤ 10% | 0% |

•The students scoring less than or equal to 50% (or ≤ 50%) overall marks in the evaluation would be considered to have failed in this course. Grading of the Major Project will be absolute in nature and would be done as per the following criteria:

| | |
|---|---|
| > 90 | A+ |
| >80 & ≤ 90 | A |
| >70 & ≤80 | B+ |
| >60 & ≤70 | B |
| >50 & ≤60 | C+ |
| >45 & ≤50 | C |
| >40 & ≤45 | D |
| ≤40 | F |

**Student responsibilities**

Timeline adherence, Discipline; Research Ethics etc.

* The learning hour indicative only.

**Prepared by**: Montu Bose

**Course Reviewers**:

Prof. Pinaki Dasgupta, IMI Delhi

Dr. Santosh Pandey, Cofounder, Nihilent Technologies

| | | | |
|---|---|---|---|
| **Course title:** Minor Project | | | |
| **Course code:** NRG 107 | **No. of credits:** 02 | **L-T-P:** 0-0-42 | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Natural Resources | | | |
| **Course coordinator:** | | **Course instructor:** | |
| **Contact details:** | | | |
| **Course type**: Core | | **Course offered:** In the third semester | |
| **Course Description:** The minor project for MSc Geoinformatics students is projected to acquire practical knowledge in Geoinformatics. The students are directed to undertake a project in an industry/institution related to Geoinformatics for 6-8 weeks | | | |
| **Course objectives:** The objective of the minor project is to provide an opportunity for students to undertake short research training outside the classroom to solve real-world issues. That mainly involves the application of geoinformatics as a part of its solution, through a short project with an external institution/organization or TERI SAS. | | | |
| **Evaluation criteria [time of evaluation]**<br>The marks obtained by students in the minor project would be graded as per absolute grading scale given by the university (*Annexure 1*).<br>The distribution of marks for the minor project work as follows:<br>a. Timeline adherence – 10% [the marks are distributed among joining report, progress reports, feedback form and Dissertation submission]<br>b. Supervisor feedback – 10% [A feedback e-form would be sent to the supervisor of the host organization at the end of the course]<br>c. Dissertation – 30 % [Dissertation submitted in the format prescribed in the guideline will be evaluated by the examiner/s. The Dissertation submitted by the student will undergo a similarity check, and a penalty for plagiarism would be imposed as per the university policy (*Annexure 2*)]<br>d. Oral presentation / viva voce – 50% [An evaluation panel consist of internal faculty members and External/s (whenever necessary) would evaluate the oral presentation at the end of the course]. | | | |
| **Learning outcomes:** A fully engaged student shall be able to get exposure to undertake a short research project. Also, able to communicate and demonstrate the learning through structured thesis and oral presentation. | | | |
| **Pedagogical approach:** Student's conduct research under the mentorship of the research supervisor/s in an organization on a topic mutually agreeable to them. The minor project coordinator oversees the process and mentor students whenever required.<br>The guideline issued by the programme before the implementation of the minor project shall detail the mode of execution, reporting and evaluation. The outcome of the project is evaluated through an oral presentation and the dissertation. | | | |
| **Additional information:** For detailed process including timelines for submissions, format for various reports, and other items related to the thesis student should refer the minor project guideline. | | | |
| **Student responsibilities:** The students are expected to be in constant touch with the minor project coordinator and to follow minor project guideline strictly. | | | |
| **Course reviewers:**<br>Dr Shefali Agarwal, Group Head, Geospatial Technology & Outreach Programme Group, IIRS(ISRO).<br>Ms Seema Joshi, GM & Head – Strategic Solutions & Technology, Esri India | | | |

Prepared by Dr Nithiyanandam, Assistant Professor, DNR.

**Annexure 1: Minor project grading scale**

Table1. The absolute grading scale for the minor project

| **Mark obtained** | **Grade** |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

The students scoring overall marks less than or equal to 40% (≤ 40%) in the evaluation would be considered unsuccessful and would be graded F (fail).

**Annexure 2: Plagiarism in the Dissertation**

TERI SAS strongly encourages its students to submit the original dissertation work without plagiarism. TERI SAS has zero-tolerance for plagiarism. The similarity detected in the Dissertation submitted by the student would be examined by the Department Integrity Panel. The DIP would determine the final percentage of plagiarism. The penalty for plagiarism shall be imposed as per table 2 in line with the UGC notification dated 23rd July 2018 on "Promotion of academic integrity and prevention of plagiarism in higher education institutions, REGD. NO. D. L.-33004/99". The students are responsible for resolving the similarity in consultation with the supervisor, and for ensuring the document deemed fit for final submission upon written consent of the supervisors to the minor project coordinator along with the list of amendments.

Table 2. Different levels of plagiarism and its corresponding penalty (in line with UGC guidelines) for minor project dissertation.

| **Levels of Plagiarism** | **Percentage of similarity** | **Penalty** |
|---|---|---|
| Level 3 | > 60% | Student's registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | The student repeats the minor project next year |
| Level 1 | > 10% ≤ 40% | The student needs to revise and resubmit the thesis within a stipulated period decided by the MPEC not exceeding six months |
| Level 0 | ≤ 10% | Minor similarities, no penalty |

<table>
<tr><td colspan="4">Course title: Major Project</td></tr>
<tr><td>Course code: NRG 104</td><td>No. of credits: 15</td><td>L-T-P: 0-0-315</td><td>Learning hours: 315</td></tr>
<tr><td colspan="4">Pre-requisite course code and title (if any):</td></tr>
<tr><td colspan="4">Department: Natural Resources</td></tr>
<tr><td colspan="2">Course coordinator:</td><td colspan="2">Course instructor:</td></tr>
<tr><td colspan="4">Contact details:</td></tr>
<tr><td colspan="2">Course type: Core</td><td colspan="2">Course offered in Fourth semester</td></tr>
<tr><td colspan="4">Course Description: The major project provides an opportunity for students to conduct a research project in a reputed organization for 15 weeks.</td></tr>
<tr><td colspan="4">Course objectives: The objective of the major project is to widen the students' perspective by providing exposure to real-life issues. That mainly involves the application of geoinformatics as a part of its solution, through a project with external institution/organization or TERI SAS.</td></tr>
<tr><td colspan="4">Evaluation criteria:<br>The marks obtained by students in the major project would be graded as per absolute grading scale given by the university (Annexure 1).<br>The distribution of marks for the major project work as follows:<br>a. Timeline adherence – 10% [the marks are distributed among a timely submission of joining report, synopsis, progress reports, feedback form, and final Dissertation]<br>b. Supervisor feedback – 20% [A feedback e-form would be sent to the supervisor of the host organization at the end of the course]<br>c. Dissertation – 40 % [Dissertation submitted in the format prescribed in the guideline will be evaluated by the internal supervisor and a faculty member as examiner one and two with the weightage of 25% and 15% respectively. The Dissertation submitted by the student will undergo a similarity check, and a penalty for plagiarism would be imposed as per the university policy (Annexure 2)]<br>d. Oral presentation/viva voce – 30% [An evaluation panel consist of internal faculty members and External/s (whenever necessary) would evaluate the oral presentation at the end of the course]</td></tr>
<tr><td colspan="4">Learning outcomes: A fully engaged student shall be able to attain professional experience in the field and prepare themselves for solving spatial problems using geoinformatics technology and other related research tools. Also, able to communicate and demonstrate the learning through structured thesis and oral presentation</td></tr>
<tr><td colspan="4">Pedagogical approach: Student's conduct research under the mentorship of research supervisor/s on a topic mutually agreeable to the supervisor of the external host organization. The internal supervisor constantly monitors the progress of the work through the reports submitted periodically and help the student in all possible means. Intermittent evaluation and feedback from the main/internal supervisors to assess the progress and midterm correction, if necessary. The student can also undertake a major project at TERI SAS, in such case both the internal and external supervisors are from TERI SAS. The guideline issued by the Programme before the Major implementation shall detail the mode of implementation, reporting and evaluation. The outcome of the project is evaluated through an oral presentation and the Dissertation.</td></tr>
<tr><td colspan="4">Additional information: For detailed process including timelines for submissions, format for various reports, and other items related to the thesis student should refer the major project guideline uploaded in the student portal.</td></tr>
</table>

| |
|---|
| **Student responsibilities:**<br>The students are expected to be in constant touch with the internal supervisor, co-ordinate between supervisors, and to follow major project guideline strictly. |
| **Course reviewers:**<br>Dr Shefali Agarwal, Group Head, Geospatial Technology & Outreach Programme Group, IIRS(ISRO).<br>Ms Seema Joshi, GM & Head – Strategic Solutions & Technology, ESRI India |

Prepared by Dr Nithiyanandam, Assistant Professor, DNR.

**Annexure 1: Major project grading scale**

Table1. The absolute grading scale for the major project

| Mark obtained | Grade |
|---|---|
| >90 | A+ |
| >80≤90 | A |
| >70≤80 | B+ |
| >60≤70 | B |
| >50≤60 | C+ |
| >45≤50 | C |
| >40≤45 | D |
| ≤40 | F |

The students scoring overall marks less than or equal to 40% (≤ 40%) in the evaluation would be considered unsuccessful and would be graded F (fail).

**Annexure 2: Plagiarism in the Dissertation**

TERI SAS strongly encourages its students to submit the original dissertation work without plagiarism. TERI SAS has zero-tolerance for plagiarism. The similarity detected in the Dissertation submitted by the student would be examined by the Department Integrity Panel. The DIP would determine the final percentage of plagiarism. The penalty for plagiarism shall be imposed as per table 2 in line with the UGC notification dated 23rd July 2018 on "Promotion of academic integrity and prevention of plagiarism in higher education institutions, REGD. NO. D. L.-33004/99". The students are responsible for resolving the similarity in consultation with external/internal supervisors, and for ensuring the document deemed fit for final submission upon written consent of external/internal supervisors to the major project coordinator along with the list of amendments.

Table 2. Different levels of plagiarism and its corresponding penalty (in line with UGC guidelines) for major project dissertation.

| **Levels of Plagiarism** | **Percentage of similarity** | **Penalty** |
|---|---|---|
| Level 3 | > 60% | Student's registration to the program stands cancelled |
| Level 2 | > 40% ≤ 60% | The student repeats the major project next year |
| Level 1 | > 10% ≤ 40% | The student needs to revise and resubmit the thesis within a stipulated period decided by the MPEC not exceeding six months |
| Level 0 | ≤ 10% | Minor similarities, no penalty |

**Enclosure 6**

# Department of Natural Resources

## Outline of Ph.D programmes

### Programmes Overview

In-spite of a rich cultural history of scientific management of its natural resources, the country's varied ecosystems have been subject to different levels of degradation and stress. Degradation of ecosystems harbouring the natural resources has acquired menacing proportions and is required to halted, and degraded areas rehabilitated and restored. Management of natural resources needs to be strengthened and complemented with research using advancements in science and technology for assessment of ecosystem integrity, and ecological restoration under increasing incidences of natural and anthropogenic disasters.

Department of Natural Resources (DNR) at TERI School of Advanced Studies, TERI SAS provides a research platform for deeper understanding of the science of Natural Resources and its functioning for its addressal. The Department promotes and envisages scientific research in atmosphere, geosphere, hydrosphere including cryosphere and biosphere and aims to contribute to its sustainable use, better management and policy making.

### Programme USP

Natural resources are the backbone of any sustainable development programme of a country, hence, DNR strives to further strengthen its research activities in varied areas of natural resources (forests, wetlands, coastal and marine waters; and also, mineral resources) management. Increased emphasis is required to be laid on the research pertinent to Global and National targets on Sustainable Development Goals (SDGs), Disaster Risk Reduction (DRR), Ecosystem restoration, and INDC (India's Intended Nationally Determined Contribution towards mitigating climate change using contemporary techniques and tools. There is also a need to carry out research pertaining to crosscutting issues to alleviate poverty and increased livelihood opportunities.

The Department draws its strength from faculty members of department who specialize in Air pollution, watershed and wetland management, urban ecosystem and GIS and Remote Sensing and biodiversity and conservation, DNR also collaborates with other Departments at TERI SAS and with institutions of global and national eminence.

### Major Areas of Research at DNR:

The focal areas of research presently undertaken by DNR are asunder:

- Air quality, Atmospheric Dynamics

- Artificial Intelligence for Natural Resources
- Agricultural studies
- Biodiversity and Conservation
- Climate Modelling
- Disaster Management for ecosystem resilience,
- Environmental Health
- Ecosystem Restoration (Terrestrial and Aquatic)
- Geospatial Science for Environment,
- Geospatial Technology for Ocean monitoring
- Hydrological Modelling
- Impacts of Pollution on forests and species sensitive to pollution.
- Urban environment and modelling

The aforementioned are indicative and researchers are encouraged to undertake research on new and emerging topics related to science of Natural Resources

## Programme Outcomes

### I. Intellectual capabilities and indepth knowledge:

On completion of programme, students must have shown evidence of his/her capability to:

(1) Demonstrate thorough knowledge of relevant literature and nuances of the problems in the field of study
(2) Understand and apply scientific methods, associated tools and techniques to carry out high quality research work
(3) Investigate new research problems and effectively communicate new body of knowledge/outcomes through peer reviewed published research article.

### II. Personal competence and research management

On completion of programme, students must have shown evidence of his/her capability to:

(1) Develop and implement research independently
(2) Present and defend research outcomes in the field of study
(3) Have developed suitable communication and interpersonal skills, critical thinking and problem-solving attitude
(4) Independently plan and execute original research with high ethical standards

## Programmes Structure

Operational aspects of Ph.D. programme are governed and guided by the provisions laid

down in the '***TERI School of Advanced Studies Ph.D. Regulations***".

A research scholar registered at TERI SAS shall conduct research under the guidance of PhD research supervisor. A Co- Supervisor may be allotted to a student, if required. A Student Research Committee (SRC) will be formed comprising Supervisor(s) and other faculty members to monitor the progress. PhD Programme is structured into three stages, mentioned as under:

***Stage I: Ph.D. Course work***

The Ph.D. Course work is governed by the 'TERI School of Advanced Studies Ph.D. Regulations-2019' (and subsequent amendments) and UGC (Minimum Standards and Procedure for Award of M.Phil./Ph.D. Degrees) Regulations, 2016 (and subsequent amendments).

A minimum of 8 credits and a maximum of 16 credits will have to be completed by the Ph.D. students in order to complete their course work. Some courses are mandatory in nature and some are prescribed by the Department Research Committee (DRC on the recommendations of the Student Research Committee (SRC). The Ph.D. course work must be completed within the first two semesters of joining the programme.

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

a) Research Methodology – 3 Credit Course (Credit only course)
b) Research and Publication Ethics - 2 Credit course (Credit or audit course)
c) Quantitative Research Method – minimum 2 Credit course from the list of quantitative methods (See Annexure 1)

The Department may suggest a mandatory course relevant to the research topic. The rest of the credits can be obtained by elective courses at TERI SAS advised by the Supervisor.

***Stage II: Research proposal defense and research work***

- A student will be permitted to appear for defending his/her research proposal only after he/she has completed the Ph.D. course work as decided by the SRC.
- As a part of the research proposal defence, a draft research proposal must be prepared in the prescribed format by the student in consultation with the Supervisor(s).
- The Supervisor will schedule the research proposal defence.
- After a satisfactory defence, the student will submit his/her final research proposal and related documents to the DRC with due approval from the Supervisor. The final research proposal must be submitted to the DRC within a period of 24 months from the date of registration to the Ph.D. programme.
- During the Ph.D. programme, the student shall appear before the SRC at least once in each semester to make a presentation of the progress of his/her work. This process will continue until thesis submission.

***Stage III: Thesis submission:***

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

***Evaluation Process***

At the end of every semester, the SRC evaluates the researcher's progress. The Departmental Research Committee (DRC) evaluates the preparedness of the student for submission of the Thesis to the University as per the norms prescribed by TERI SAS, and in accordance with the UGC recommendation for evaluation by international and national examiners. Student defends his/her thesis before a committee of external examiner and internal supervisor in an open forum.

**Annexure 1**

**University wide list of Available Courses Under Quantitative Methods**

- Environmental Statistics (3 credits)
- Probability and Statistics (4 credits)
- Statistical Methods for Management (3 credits)
- Advanced Statistical Methods for Management (2 credits)
- Multivariate Data Analysis (3 credits)
- Econometrics (4 credits)
- Advanced Econometrics (4 credits)
- Time Series and Regression Analysis (4 credits)
- Quantitative Analysis for Development Practice (3 credits)
- Spatiotemporal Data Analysis (3 credits)
- Optimization techniques for energy management and planning (3 credits)
- Applied Numerical Methods (3 credits)
- Stochastic Modelling (4 credits)

## Department of Business & Sustainability

### PhD Programme- DBS

*Programme Overview:*

The PhD programme at the Department of Business Sustainability aims to promote interdisciplinary research and scholarship on sustainability studies pertaining to businesses. It provides an opportunity to scholars to enhance their professional competence and expertise through continuing education and learning demonstrating individual intellectual potential. The entire learning process spanning across diverse issues of sustainability will equip them to learn how to manage and evaluate a scientific research work from its designing to the successful completion of the work. At the same time, this programme also caters to the need of capacity building both in industry and academics. Industry people with experience get the chance of honing their understanding the emerging perspectives in the corporate world. Academic aspirants get the chance to strengthen their knowledge base to meet the increasing demand of good teachers.

*Programme USP:*

The Programme fosters knowledge creation by enabling one's intellectual skills through innovative research work and contribute to the discourse on sustainability issues in business activities. It advances impactful and cutting-edge interdisciplinary research demonstrating with opportunities for broader research excellence framework. The basic objective is to prepare students to play a remarkable role in the world academic circle and to develop significant unique contributions to their selected area of research.

*Programme Specific Outcome:*
At the end of their PhD course, students should be able to:

- Explore newer frontiers of interdisciplinary teaching & research;
- Make significant contribution to the corporate world;
- Comprehend scientific methods and techniques of doctoral research;
- Develop effective collaboration with allied research partners & industries;
- Carry out individual research work with wider societal impact;
- Integrate ethical values in original scientific research;
- Independent planning and implementation of research;

***Programmes Structure***

Ph.D. Programme are divided into three stages. These are as follows: -

*Stage I - Ph.D. Course work:*

The Ph.D. course work at TERI SAS is designed to develop rigorous research and analytical skills among the students. It is intended to equip them with the necessary research and analytical skill sets. The Ph.D. Course work is governed by the 'TERI School of Advanced Studies Ph.D. Regulations-2019' (and subsequent amendments) and UGC (Minimum Standards and Procedure for Award of M.Phil./Ph.D. Degrees) Regulations, 2016 (and subsequent amendments).

*Ph.D. Course work structure and requirement:*

A minimum of 8 credits and a maximum of 16 credits will have to completed by the Ph.D. students in order to complete their course work. Some courses are mandatory in nature, and some are prescribed by the Department Research Committee (DRC)/ Centre Research Committee (CRC) on the recommendations of the Student Research Committee (SRC). The Ph.D. course work must be completed within the first two semesters of joining the programme.

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

a) Research Methodology – 3 Credit Course (Credit only course)
b) Research and Publication Ethics - 2 Credit course (Credit or audit course)
c) Quantitative Research Method – minimum 2 Credit course from the list of quantitative methods course as prepared by the respective DRC/CRC

There are additional mandatory courses for students registering in some of the departments. Ph.D. students may also opt for 'Communication Skills', a non-mandatory course. Other advanced level courses from the list of courses offered for Master's Programmes may also be prescribed by SRC after considering the student's background in relation to the proposed topic of research.

*Stage II - Research proposal defense and research work:*

- A student will be permitted to appear for defending his/her research proposal only after he/she has completed the Ph.D. course work as decided by the SRC.
- As a part of the research proposal defence, a draft research proposal must be prepared in the prescribed format by the student in consultation with the Supervisor(s).
- The Supervisor will schedule the research proposal defence.
- After a 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 to the Ph.D. programme.
- During the Ph.D. programme, the student shall appear before the SRC at least once in each semester to make a presentation of the progress of his/her work. This process will continue until thesis submission.

*Stage III- Thesis submission:*

A Ph.D. student may submit his/her thesis, in the prescribed format, at any time provided that he/she has completed the minimum period of registration and complied with all the necessary requirements as specified in "TERI School of Advanced Studies Ph.D. Regulations-2019" (and subsequent amendments). Prior to the thesis submission, the student shall make a

presentation in the Department. A Ph.D. student must submit his/her thesis within the stipulated period, failing which his/her registration will be considered null and void.

**University Wide List of Available Courses Under Quantitative Method Category**

- Environmental Statistics (3 credits)
- Probability and Statistics (4 credits)
- Statistical Methods for Management (3 credits)
- Advanced Statistical Methods for Management (2 credits)
- Multivariate Data Analysis (3 credits)
- Econometrics (4 credits)
- Advanced Econometrics (4 credits)
- Time Series and Regression Analysis (4 credits)
- Quantitative Analysis for Development Practice (3 credits)
- Spatiotemporal Data Analysis (3 credits)

**Department of Policy Studies**

**Outline of Ph.D programme**

**Programme Overview**

The Department of Policy Studies embraces the philosophy that policy level recommendations for sustainable development can follow only from rigorous research that engages with alternative strands/schools of thought across disciplines. The research agenda at the Department is advanced by its multi-disciplinary team of faculty members with specializations in anthropology, economics, management, development studies, sociology and demography. Their research interests, under the core theme of public policy, cuts across various aspects of ecology-economy-society interface.

The PhD programme at the Department of Policy Studies aims to build the capacities of next generation academicians/thought leaders in critical thinking, research and analytical skills, and effective communication of research. The programme prepares scholars for career in university-level teaching, research, policy analysis.

The mode of operation and key features of these programmes are governed by the provisions laid down '***TERI School of Advanced Studies Ph.D. Regulations-2019***" (and its subsequent amendments).

**Programme USP**

Ph.D. Programme at the Department of Policy Studies fosters new knowledge creation by enabling individual intellectual potential through critical thinking and research; thus, contributing to the discourses on sustainability and policy level impacts. It promotes interdisciplinary research demonstrating opportunities for broader research excellence framework. Research at the Department is carried out with the understanding that policies, whose primary goal is to improve well-being of people and planet, cannot successfully achieve their objectives with just a top-down approach. Thus, scholars are encouraged to participate in field studies, appreciating the organic link between theoretical understanding and field-based realities. Exposure to such dialectic will enhance their capacity to question the accepted, explore the possibilities and verify the impossibilities.

## Programmes Outcomes

At the completion of the PhD programme, the scholar should be able to:

- Explore frontiers of fundamental, applied and interdisciplinary research and teaching under the broad domain of policy and sustainability studies.
- Understand and apply scientific methods and techniques to carry out high quality/rigorous research work.
- Independently plan, implement original research with high ethical standards.
- Develop critical thinking and analytical skills.
- Develop effective interpersonal and research communication skills with the ability to communicate to different stakeholders within their fields.

## Programme Structure

Ph.D. Programme at the Department are divided into three stages. These are as follows: -

**Stage I: Ph.D. Course work**

Ph.D. course work at the Department of Policy Studies aims to equip scholars with the necessary research and analytical skill sets. Ph.D. Course work is governed by the ***'TERI School of Advanced Studies Ph.D. Regulations-2019'*** (and its subsequent amendments) and ***UGC (Minimum Standards and Procedure for Awards of M.Phil./Ph.D. Degree) Regulations, 2016*** (and its subsequent amendments).

### *Ph.D. Course work structure and requirement*

A minimum of 8 credits and a maximum of 16 credits will have to be earned by the Ph.D. students in order to complete their course work. This includes mandatory courses (prescribed as per the UGC Regulations and TERI School of Advanced Studies PhD Regulations, 2019) and courses recommended by the Student Research Committee (SRC). The course requirement for every student will be prescribed by the Department Research Committee (DRC) on the recommendation of the SRC. The Ph.D. course work must be completed within the first two semesters of joining the programme.

Every Ph.D. student at the Department must complete the following mandatory courses.

a) Research Methodology – 3 Credits (Credit only course)
b) Research and Publication Ethics - 2 Credits (Credit or audit course)
c) Philosophy of Social Science- 3 Credits (Credit or Audit course—based on the recommendations of SRCs)

d) Quantitative Research Method – minimum of 2 Credit course from the list of quantitative methods course as prepared by the DRC [1]

Ph.D. students can opt for 'Communication Skills', as a non-mandatory course. Students can also opt for other courses related to their area of research, based on the recommendation of the SRC and approval of DRC.

***Stage II: Research proposal defence and research work***

- A student will be permitted to appear for defending his/her research proposal only after he/she has completed the Ph.D. course work as decided by the SRC.
- As a part of the research proposal defence, a draft research proposal must be prepared in the prescribed format by the student in consultation with the Supervisor(s).[2]♦
- The Supervisor will schedule the research proposal defence.
- After a satisfactory defence, the student will submit his/her final research proposal and related documents to the DRC with due approval from the Supervisor. The final research proposal must be submitted to the DRC within a period of 24 months from the date of registration to the Ph.D. programme.
- During the Ph.D. programme, the student shall appear before the SRC at least once in each semester to make a presentation of the progress of his/her work. This process will continue until thesis submission.

***Stage III: Thesis submission***

A Ph.D. student may submit his/her thesis, in the prescribed format, at any time provided that he/she has completed the minimum period of registration and he/she has completed the course work requirement as prescribed by the DRC on the recommendations of the SRC with a requisite CGPA and has also successfully defended his/her research proposal.♦ Prior to the thesis submission, the student should submit a synopsis document, duly approved by the SRC, and should make a presentation in the Department (to the DRC). He/she should also have the requisite publication/s, as specified in the ***'TERI School of Advanced Studies Ph.D. Regulations-2019'*** (and its subsequent amendments).

[1] University wide list of available courses under this category are provided in Annexure 1.

♦ University formats for all submissions, once prepared, will be reviewed by the DRC, which shall suggest changes, if needed.

**Annexure 1**

**List of Courses Under Quantitative Methods**

- Environmental Statistics (3 credits)
- Probability and Statistics (4 credits)
- Statistical Methods for Management (3 credits)
- Advanced Statistical Methods for Management (2 credits)
- Multivariate Data Analysis (3 credits)
- Econometrics (4 credits)
- Advanced Econometrics (4 credits)
- Time Series and Regression Analysis (4 credits)
- Quantitative Analysis for Development Practice (3 credits)
- Spatiotemporal Data Analysis (3 credits)

**Enclosure 7**

**New programme structure of the M.Sc. (Biotechnology) Programme offered by**

**Department of Biotechnology**

Department of Biotechnology

TERI School of Advanced Studies

New Delhi

# MASTER OF SCIENCE (M.Sc.) BIOTECHNOLOGY PROGRAMME

Available specialisations

Specialisation 1: Plant Biotechnology

Specialisation 2: Microbial Biotechnology

**Definitions**

'Programme' means an entire course of study designed to be taught and evaluated in a teaching Department/Centre or jointly under more than one such Department/ Centre

'Course' means a segment of a subject that is part of a Programme

'Programme Structure' means a list of courses (Core, Elective, Specialisation specific electives) that makes up a Programme, specifying the syllabus, credits, hours of teaching, evaluation and examination criteria, minimum number of credits required for successful completion of the programme etc., prepared in conformity to University Rules

'Core Course' means a course that a student admitted to a particular programme must successfully complete to receive the degree and which cannot be substituted by any other course

'Elective Course' means an optional course to be selected by a student out of such courses offered in the same or any other Department/Centre

'Specialisation specific elective' means a course to be selected by a student for as specialization

**About the Programme**

From July 2021, a Programme in M.Sc. in Biotechnology will be offered by the Department of Biotechnology, TERI SAS. The restructured programme, M.Sc. Biotechnology, aims to meet the growing requirement of qualified scholars supporting R&D in Research, Academia and Industries related to Biotechnology. The programme aims towards contributing to the objectives of several National Missions such as National Mission for Sustainable Agriculture, National Mission for Sustaining the Himalayan Ecosystem and National Water Mission and toward meeting the Sustainable Developmental Goals such as zero hunger, good health and well-being and quality education among several others. This programme, with a significantly broadened scope, compared to earlier M.Sc. Plant Biotechnology Programme will provide options to specialize either in Plant Biotechnology or Microbial Biotechnology. A multidisciplinary outlook will be inculcated in the students by encouraging students to take up courses from Social Sciences, Environment and Engineering streams of the University. Further, the restructured programme is futuristic in scope and in alignment with Choice Based Credit System (CBCS) mandated in UGC-NAAC guidelines and NEP 2020 framework.

**Programme Overview**

The M.Sc. Biotechnology Programme offers conceptual understanding by imparting cutting-edge disciplines of science along with an exposure to regulatory issues, IPRs and ethical concerns related to biotechnology. Emphasis is laid on training in applied mathematics, statistics, and computational skills in view of the projected demand for a trained cadre adept at approaching biological problems in truly interdisciplinary and integrative manner. Courses have been specifically structured to impart concepts pertaining to advanced areas of research

in genomics and contemporary approaches employed by molecular biologists. Therefore, a graduate of this Programme can be expected to have both specialized knowledge and practical experience required to address contemporary problems in both academic and industrial settings.

**Programme Objectives**

The objective of the programme is to highlight the role played by biotechnology in modern society and its relevance to sustainable development. The M.Sc. programme in Biotechnology seeks to provide education and training, empower students with technical skill-set, create capacities and build career opportunities in three key domains of biotechnology namely:

(i) Research and development in industry and academia
(ii) Science education
(iii)Policy, regulations and management

This is achieved through a combination of interdisciplinary curricula comprised of both theory as well as intensive laboratory work. Through its unique pedagogical methods, the academic programme allows transferability of acquired skills in domains unrelated to biotech sectors.

**Programme Outcomes (POs)**

| | |
|---|---|
| PO1 | A research-oriented learning that develops analytical and integrative problem-solving approaches. |
| PO2 | Specialized knowledge and practical training to address contemporary problems in academia and industry. |
| PO3 | Awareness of ethical issues and regulatory considerations while addressing societal needs for sustainability. |
| PO4 | To advance education and research in biotechnology and explore sustainable solutions for agriculture, environment and energy sectors. |
| PO5 | Promote an understanding of interdisciplinary approaches and technologies used in the analysis of complex biological information. |
| PO6 | Impart rigorous hands-on training in both laboratory-based methods and bio-informatics tools for biological research. |
| PO7 | Sensitize students about multifaceted regulatory issues and ethical concerns related to biotechnology. |

**Programme Specific Outcome (PSOs)**

| | |
|---|---|
| PSO1 | Molecular biology tools and experimental strategies, theoretical understanding of OMICS approaches. |
| PSO2 | DNA profiling and barcoding techniques, generation of transgenics, marker assisted breeding and selection, testing of hybrid purity. |
| PSO3 | Computational skills such as modelling, simulation analysis of data. |
| PSO4 | Structural and functional characterization of biological macromolecules. |
| PSO5 | IPRs, ethics and regulations in the field of biotechnology |
| PSO6 | Theoretical and applied knowledge and practical skills in Plant biotechnology for a better food, nutrition and environment for the mankind. |

| | |
|---|---|
| PSO7 | Microbial diversity, Molecular pathogenesis, host-microbe interactions, bioprocess engineering and environmental biotechnology. |

**Programme USPs**

- Research-led teaching
- Two full days of practical classes every week with hands-on-training
- Exposure to real-world problems during Major Project
- Options for specialization
- Additional focus on Intellectual Property Rights and Bioethics

**Eligibility Criteria**

A Bachelor's degree in Sciences/Engineering/Technology

**Selection Procedure**

Applications are invited from candidates through advertisements published on TERI SAS website (www.terisas.ac.in) and also in leading national newspapers and social media platforms. Admission to the M.Sc. Biotechnology Programme is made on the basis of a combined entrance examination followed by an interview conducted by a faculty panel from the Department of Biotechnology, TERI SAS.

**Pedagogical Tools**

The classroom/online lectures are complemented with extensive laboratory practical, case studies, classroom discussions, and guest lectures by experts. During the fourth semester, students are involved in full-time research for their major project.

**Programme Structure**

- The M.Sc. Biotechnology programme is a two-year programme divided into four semesters. A student is required to complete 75 credits for the completion of the programme and the award of degree.
- The M.Sc. Biotechnology programme provides options for specialization by completing a set of specialisation specific courses. Currently, two specialisations are being offered under the Programme: i) Plant Biotechnology and ii) Microbial Biotechnology.
- The entire M.Sc. Biotechnology Programme is comprised of core courses (51 credits), elective courses (audit only but equivalent to minimum 4 credits), Specialisation specific courses (8 credits) and a Major Project (16 credits). In addition, two courses, i) Technical Writing and Communication Skills and ii) Applied mathematics have been added as compulsory audit courses.
- The specialisation specific courses will be offered during second and third semesters. A student can opt for specialisation specific courses related to only one of the available specialisations.
- The elective courses are to be taken only as **audit course** only and the grades in those courses will not be considered while calculating the CGPA. A minimum 4 credits equivalent of elective courses need to be completed during the Programme. There is no upper limit for the number and credit equivalent for Elective courses. The Elective

courses may be taken in any semester when offered by the concerned Department and provided it doesn't conflict with any other course taken by the student.

- At the start of Semester 2, the students will be required to choose any one of the two specialisations. Maximum of 60% of the total number of students can be allotted a particular specialisation. Allotment of specialisation will be done based on a combination of merit (as per the Semester 1 grades) and preference.
- A strong component of Bioinformatics in the form of hands-on practical equivalent to 3 credits has been included in Semesters 2 and 3. This is in addition to the theoretical orientation on Bioinformatics of 2 credits that will be provided in Semester 1.

**Programme outline***

| Year | Courses | Credits | Duration |
|---|---|---|---|
| **First Year** | | | |
| 1st Semester | 7 core courses of 2-7 credits each, and 2 core audit courses | 21 | 15 weeks |
| 2nd Semester | 7 core courses of 2-7 credits and 1 course of 2 credits in the area of specialisation** | 22 | 15 weeks |
| | | | |
| **Second Year** | | | |
| 3rd Semester | 4 core courses of 2-7 credits and 1 course of 2 credits in the area of specialisation** | 16 | 15 weeks |
| 4th Semester | Major project | 16 | 15 weeks |

*In addition to above, a minimum 4 credits equivalent of elective courses (audit only) listed below need to be completed during the Programme which may be taken in any semester when offered by the concerned Department and provided it doesn't conflict with any other course taken by the student. There is no upper limit for the number and credit equivalent for Elective courses.

**Specialisation specific practical component equivalent to 2 credits will carried out under Biotechnology Laboratory- Part 2 ($2^{nd}$ Semester) and Biotechnology Laboratory- Part 3 ($3^{rd}$ Semester) each

| **Semester 1** | | | | | | |
|---|---|---|---|---|---|---|
| **Course No.** | **Course title** | **Type** | **Number of Credits** | **No. of L-T-P** | **Course Coordinator** | **Course Offered** |
| BBP 101 | Biotechnology Laboratory - Part 1 | Core | 7 | 7-0-182 | Dr. Udit Soni | Yes |
| NRE 101 | Communication Skills and Technical Writing | Audit | 2* | 16-12-0 | Dr. Suneel Deambi | Yes |
| BBP 155 | Principles of Genetic Engineering and Recombinant DNA Technology | Core | 3 | 28-14-0 | Dr. Anandita Singh | Yes |
| NRE 113 | Applied Mathematics | Audit and bridge course | 0* | 31-11-0 | Dr. Akash Sondhi | Yes |
| BBP 158 | Conceptual Foundations of Molecular Biology | Core | 2 | 28-0-0 | Dr. Ramakrishnan Sitaraman | Yes |
| BBP 154 | Principles of Biochemistry and Biophysics | Core | 2 | 28-0-0 | Dr. Chaithanya Madhurantakam | Yes |
| BBP 111 | Bioanalytical Techniques | Core | 3 | 36-6-0 | Dr. Udit Soni | Yes |
| BBP 121 | Plant and Animal Biotechnology | Core | 2 | 28-0-0 | Dr. Shashi Bhushan Tripathi | Yes |
| BBP 174 | Bioinformatics and Computational Biology | Core | 2 | | | Yes |

| **Semester 2** | | | | | | |
|---|---|---|---|---|---|---|
| **Course No.** | **Course title** | **Type** | **Number of Credits** | **No. of L-T-P** | **Course Coordinator** | **Course Offered** |
| TBA | Conservation Genetics and Genomics | Core | 2 | | Dr. Shashi Bhushan Tripathi | T |
| BBP 102 | Biotechnology Laboratory - Part 2 | Core* | 7 | | Dr. Anandita Singh | P |
| TBA | Introduction to Nanobiotechnology | Core | 2 | | Dr. Udit Soni | T |
| BBP 130 | Molecular Microbiology and Immunology | Core | 2 | | Dr. Chaithanya Madhurantakam | T |
| BBP 112 | Statistics for The Life Sciences | Core | 3 | 28-14-0 | Dr. Prateek Sharma | T |
| BBP 114 | Molecular Cell Biology - From Genes to Communities | Core | 2 | | Dr. Ramakrishnan Sitaraman | T |
| TBA | Genome Organisation and Molecular Marker Techniques | Core | 2 | | Dr. Anandita Singh | T |
| BBP 156 | Molecular Plant Physiology and Metabolism | Specialisation (Plant Biotechnology) | 2 | | Dr. Shashi Bhushan Tripathi | |
| TBA | Microbial Pathogenesis | Specialisation (Microbial Biotechnolog | 2 | | Dr. Ramakrishnan Sitaraman | |

| Semester 2 | | | | | | |
|---|---|---|---|---|---|---|
| **Course No.** | **Course title** | **Type** | **Number of Credits** | **No. of L-T-P** | **Course Coordinator** | **Course Offered** |
| | | y) | | | | |

*Specialisation specific practical component equivalent to 2 credits will carried out under Biotechnology Laboratory- Part 2

| Semester 3 | | | | | | |
|---|---|---|---|---|---|---|
| **Course No.** | **Course title** | **Type** | **Number of Credits** | **No. of L-T-P** | **Course Coordinator** | **Course Offered** |
| BBP 103 | Biotechnology Laboratory - Part 3 | Core* | 7 | | | P |
| BBP 141 | Bioethics, IPR and Regulations in Biotechnology | Core | 3 | | | T |
| TBA | Gene Expression Analysis and Transcriptomics | Core | 2 | | Dr. Ramakrishnan Sitaraman | T |
| TBA | Proteomics and Protein Engineering | Core | 2 | | Dr. Chaithanya Madhurantakam | T |
| TBA | Functional Genomics in Plants | Specialisation (Plant | 2 | | Dr. Anandita Singh | |

| Semester 3 | | | | | | |
|---|---|---|---|---|---|---|
| **Course No.** | **Course title** | **Type** | **Number of Credits** | **No. of L-T-P** | **Course Coordinator** | **Course Offered** |
| | | Biotechnology) | | | | |
| TBA | Bioprocess Engineering and Environmental Biotechnology | Specialisation (Microbial Biotechnology) | 2 | | Dr. Chaithanya Madhurantakam | |

*Specialisation specific practical component equivalent to 2 credits will carried out under Biotechnology Laboratory- Part 3

| Elective courses (Audit only) | | | | | | |
|---|---|---|---|---|---|---|
| **Course No.** | **Course title** | **Type** | **Number of Credits** | **No. of L-T-P** | **Course Coordinator** | **Course Offered** |
| NRE 131 | Environmental Chemistry and Microbiology | Elective | 3 | 35-7-0 | Dr. Udit Soni | |
| NRE 165 | Introduction to Sustainable Development | Elective | 1 | 14-0-0 | D. Akash Sondhi | |
| TBA | Nanomaterials: Introduction and Applications | Elective | 2 | | Dr. Udit Soni | |
| NRE 123 | Biodiversity Assessment and | Elective | 3 | 17-15- | Dr. Sudipta | |

| **Elective courses (Audit only)** | | | | | | |
|---|---|---|---|---|---|---|
| **Course No.** | **Course title** | **Type** | **Number of Credits** | **No. of L-T-P** | **Course Coordinator** | **Course Offered** |
| | Conservation | | | 20 | Chatterjee | |
| NRE 168 | Food Security and Agriculture | Elective | 3 | 23-16-6 | Dr. Chubamenla Jamir | |
| NRE 112 | Multivariate Data Analysis | Elective | 3 | 28-14-0 | Dr. Neeti | |
| NRE 151 | Wildlife Conservation and Management | Elective | 3 | 35-7-0 | Dr. Sudipta Chatterjee | |

| | | | | | |
|---|---|---|---|---|---|
| **Course title:** Biotechnology laboratory – Part 1 | | | | | |
| **Course code:** | | **No. of credits:** 7 | **L-T-P:** (7-0-182) | **Learning hours:** 189 | |
| **Pre-requisite course code and title (if any):** None | | | | | |
| **Department:** Department of Biotechnology | | | | | |
| **Course coordinator:** | **Course instructor:** | | | | |
| **Contact details:** | | | | | |
| **Course type: Core** | | | **Course offered in:** Semester1 | | |
| **Course description:** The objective of this laboratory course is to introduce students to experiments related to biotechnology. The course is designed to teach students the utility of set of experimental methods in biotechnology in a problem-oriented manner. | | | | | |
| **Course objectives:**<br>1. To introduce the students to standard techniques of molecular biology and GLPs (good laboratory practices).<br>2. To impart intensive hands-on-training using molecular tools in a research project mode.<br>3. To train the students in designing experiments with appropriate controls. | | | | | |
| **Course contents** | | | | | |
| **Module** | **Topic** | | **L** | **T** | **P** |
| **Suggested practical** | | | | | |
| **1** | Introduction to laboratory safety and safe practices in biotechnology laboratory. Introduction to Good Lab Practices (GLP) | | 7 | 0 | 0 |
| **2** | **Analytical Techniques and Biochemistry-**<br>1. Preparing various stock solutions, working solutions, buffers solution.<br>2. To prepare an $CH_3COOH$-$CH_3COONa$ buffer system and validate the Henderson-Hasselbach equation.<br>3. Quantitative analysis by UV-Vis spectrophotometer- determination of unknown concentration of KMnO4 or BSA Solution.by plotting a standard graph and validating Beer-Lambert's Law.<br>4. Glucose assay by dinitro salicylic- determination of concentration of given unknown glucose solution by DNS/glucose assay by dinitro salicylic acid.<br>5. To determine concentration of unknown protein by Bradford protein assay method.<br>6. To determine concentration of unknown protein by Lowry method/Lowry assay method.<br>7. Enzyme kinetic analysis of catechol oxidation by catechol oxidases from apple/potatoes/etc. | | 0 | 0 | 84 |

| | | | | |
|---|---|---|---|---|
| | 8. Effect of temperature and enzyme inhibitor on enzyme activity.<br>9. To perform catalase assay on given plant tissue<br>10. To Perform Lysozyme crystallization using vapor diffusion methods.<br>11. Overexpression of the target gene in a heterologous system<br>12. To purify a histidine tagged protein using Ni-NTA (Nitrilo -triacetic acid) affinity chromatography<br>13. To perform Ion exchange chromatography for purification of target protein<br>14. To perform gel exclusion chromatography for purification of target protein till homogeneity<br>15. To perform SDS- PAGE for the protein sample | | | |
| **3** | **Essential techniques in microbiology and molecular biology-**<br>1. Estimation of bacterial titre using colony counts from serial dilutions<br>2. Growth of bacterial culture and preparation of growth curve<br>3. Isolation of pure bacterial cultures from mixed cultures.<br>4. Qualitative and quantitative analysis of DNA.<br>5. Isolation and restriction enzyme analysis of DNA from soil samples.<br>6. Methylation analysis DNA using restriction enzymes.<br>7. Gel purification of DNA by silica binding.<br>8. Preparation of electrocompetent bacteria and estimating their transformation frequency. | 0 | 0 | 28 |
| **4** | **Isolation of nucleic acids and manipulation-**<br>1. PCR and optimization of factors affecting PCR<br>2. PCR based genotyping for confirmation of transgene insertion in plants<br>3. Isolation, qualitative and quantitative analysis of total cellular RNA from eukaryotic cell systems<br>4. 1st strand c-DNA synthesis and RT-PCRs<br>5. Restriction digestion of plant gDNA with rare and frequent cutters (restriction enzymes)<br>6. Purification of plasmids from E. *coli* cells (Alkaline Lysis method and spin-column based methods)<br>7. Linearization of plasmid vectors<br>8. Screening of recombinant plasmid vectors by PCR based genotyping of inserts and restriction enzyme based release of inserts | 0 | 0 | 28 |

| | | | | |
|---|---|---|---|---|
| **5** | **Plant and Animal Biotechnology-**<br>1. Preparation of stock solutions for plant tissue culture media, vitamins and hormones<br>2. Sterilisation of explants and initiation of cultures for micropropagation<br>3. Initiation of various explants for direct and indirect organogenesis<br>4. Embryo culture<br>5. Control of phenolics under tissue culture conditions<br>6. In vitro and ex vitro hardening<br>7. Isolation of genomic DNA from plants<br>8. ISSR/RAPD for clonal uniformity testing<br>9. Cell viability assay<br>10. Sub-culturing and maintenance of cell lines<br>11. Genomic DNA isolation from blood/ cell cultures | 0 | 0 | 42 |

**Evaluation criteria:**

1. Attendance: 5%
2. Preparation of lab record(s) throughout the semester :25%
3. End semester evaluation: 70% (Following components would be included)
   a) Spotting – 15 %
   b) Viva-voce– 15 %
   c) Experiment(s) assigned on the day of the exam- 40%

**Learning outcomes:**

1. Ability to conduct experiments with adequate safety precautions.
2. Capacity to compare and evaluate various approaches in solving a given experimental problem.
3. Ability to design and interpret molecular biology experiments.
4. Proficiency in defining a research problem, drawing logical inferences from results and documenting outcomes in systematic manner.

**Pedagogical Approach:** Laboratory experiments, demonstration, writing and experiments result analysis.

**Skill Set:**

1. Able to work in biotechnology lab and perform experiments
2. Able to analyses experimental data and critical thinking.

**Employability:**

1. Academic and industrial research
2. Industries based on biotechnology, pharmacy, and agriculture.

**Materials-**


1. Study material and laboratory protocol will be provided by course instructor.
2. “Biochemistry Laboratory: Modern Theory and Techniques” Rodney Boyer, second Edition, Pearson Education, 2012.
3. “Analytical Techniques in Biochemistry and Molecular Biology” Rajan Katoch, Springer, 2011.
4. “Molecular cloning: A laboratory manual” Sambrook, Joseph. & Russell, David W. & Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y : Cold Spring Harbor Laboratory, 2001.

5. "DNA and protein sequence analysis. A Practical approach" Bishop M.J., Rawlings C.J. (Eds.)1997.

Website

1. https://nptel.ac.in/

Journals

**1.** Peer reviewed relevant scientific journals.

**Advanced Reading Material**

Will be provided by instructor if require.

**Additional information (if any)**

List of experiments given in each module are representative, instructor may choose any of them for student's laboratory training as per requirements.

**Student responsibilities**

1. Class attendance.
2. Study of course materials as specified by the instructor.
3. Regular submission of given class assignments.

**Reviewers**

1. Dr. Manoj Shrivastava, Principal Scientist, Centre for Environment Science and Climate Resilient Agriculture (CESCRA), Nuclear Research Laboratory (NRL), Indian Agricultural Research Institute, New Delhi-110012
2. Dr. Rakesh Singh, M. Tech. (IIT, BHU) Ph.D. (NIPB, IARI) Principal Scientist (Plant Biotechnology) Division of Genomic Resources ICAR-NBPGR, New Delhi-110012

| | | | |
|---|---|---|---|
| **Course title:** Plant and Animal Biotechnology | | | |
| **Course code:** BBP 121 | **No. of credits: 2** | **L-T-P: 28**-0-0 | **Learning hours: 28** |
| **Pre-requisite course code and title (if any):** Science graduate | | | |
| **Department:** Department of Biotechnology | | | |
| **Course coordinator:** | | **Course instructor:** | |
| **Contact details:** | | | |
| **Course type:** Core | | **Course offered in:** Semester 1 | |

**Course description:**

The broad objective of the present core course is to provide an overview of plant and animal biotechnology. In this respect, students will be acquainted with principles and applications of different techniques of plant and animal cell/tissue culture and genetic transformation. In case of cell and tissue culture, the focus shall be on media composition and preparation, methods of *in vitro* regeneration, their applications and limitations. With respect to genetic transformation, the focus will be on detection and characterization of transformants. Further, the global status of GMOs, various case studies illustrating the application of biotechnology in developing crop varieties resistant to various biotic and abiotic stresses, enhancing nutritional quality and knock-out animal technology would be dealt in detail.

**Course objectives:**

1. To introduce the students to the principles and applications of plant tissue culture and animal cell culture
2. Development of plant transformation vectors specifically designed to facilitate transfer of improved/unique genetic traits to plants, and to provide knowledge on diverse genetic transformation technologies available for the production of transgenic plants in crop improvement programs.
3. Familiarization with knock-out and transgenic animals to model disease and study gene function.

**Course contents**

| Module | Topic | L | T | P |
|---|---|---|---|---|
| **1** | **Principles of Plant Tissue Culture** | **7** | 0 | 0 |
| | • History of plant tissue culture<br>• Set up of a plant tissue culture laboratory<br>• Media constituents and preparation<br>• Micropropagation and clonal fidelity testing<br>• Meristem culture for production of virus free plants<br>• Somatic Embryogenesis<br>• Organogenesis<br>• Micrografting<br>• Hardening and acclimatization | | | |
| **2** | **Applications of plant tissue culture** | 6 | 0 | 0 |
| | • Anther, pollen and ovary culture for production of doubled haploids<br>• Production of Triploids<br>• Embryo culture and embryo rescue<br>• Protoplast isolation, culture and fusion<br>• Cell culture and production of secondary metabolites<br>• Cryopreservation<br>• Synthetic seed technology | | | |

| | | | | |
|---|---|---|---|---|
| **3** | **Animal cell culture and biotechnology** | 8 | 0 | 0 |
| | • Brief history of animal cell culture; cell culture media and reagents (buffer and pH; blood buffering system)<br>• Basic techniques of mammalian cell culture<br>• Organotypic and histotypic cultures<br>• Primary culture, secondary culture, continuous cell lines (cancer cell line), suspension cultures<br>• Cell synchronization and transformation<br>• Clonal selection, cell fusion and monoclonal antibody production<br>• Application of animal cell culture for virus isolation and production of human and animal viral vaccines<br>• Application of animal cell culture for disease modelling and high throughput drug screening<br>• Application of animal cell culture for isolation of pharmaceutical proteins and recombinant anti-bodies<br>• Development of iPSC and human specific disease modelling<br>• Multiple Ovulation and Embryo Transfer Technology | | | |
| **4** | **Applications of transgenic technology** | 7 | 0 | 0 |
| | • Introduction to Agrobacterium tumefaciens and Ti Plasmids<br>• In-planta transformation methods<br>• Chloroplast Transformation<br>• Detection, characterization and expression of transformants (Genetic markers, reporter genes and transgene stability)<br>• Conferring resistance to biotic stresses (pests, viruses, fungi) and abiotic stresses (salt, drought, heat)<br>• Enhancing nutritional quality of crops<br>• Transgenics for male sterility<br>• Marker free transgenics<br>• Knock-out/in animal development using embryonic stem cells technology<br>• Transgenic animal development to model disease and study gene function. | | | |
| | **Total** | **28** | **0** | **0** |

**Evaluation criteria:**

1. Test 1- (Module 1) 30%
2. Test 2- (Module 2) 30%
3. Test 3- (Modules 3 and 4) 40%

**Learning outcomes:**

1. An understanding of principles of various plant and animal cell/tissue culture techniques (Test 1-3)
2. An understanding of commercial applications of various cell and tissue culture-based technologies in plants and animals (Test 1-2)
3. Ability to rationalize and develop strategies for incorporating novel traits in plants and animals through genetic engineering (Test 3)

**Pedagogical Approach:**

1. Online/classroom lectures and discussions
2. Case studies and examples from original research articles

**Skill Set:**

1. Formulation of media preparation for plant and animal cell cultures
2. Initiation and maintenance of plant and animal cell cultures
3. Genetic transformation of plants

**Employabilty:**

1. Academic organisations
2. Tissue culture facilities and horticulture companies
3. Agri-biotechnology and seed companies
4. Pharmaceutical and drug research companies
5. IPR consultancy firms

**Materials:**

**Suggested Readings**


1. George E. F., Hall A H, and De Klerk G J (2008) Plant propagation by tissue culture. Springer.
2. Bhojwani SS and Razdan M K (1996) Plant Tissue Culture : Theory and Practice. Elsevier.
3. Herman, Edwin B., (Ed.) (2009) Genetic modification of plants: methods and applications 2005-2009, USA: Agritech Consultants.
4. Herman, Edwin B., (Ed.) (2007) Microbial contaminants in plant tissue culture, Vol. III : 2003 – 2007. Agritech Consultants, Inc. Shrub Oak.
5. Neumann, K H, Kumar, A, Imani, J (2009) Plant Cell and Tissue Culture – A tool in biotechnology : Basics and applications.
6. Halford,Nigel G. (Ed.) (2006) Plant Biotechnology: Current and Future Applications of genetically modified crops. John Wiley and Sons Ltd.
7. Chrispeels MJ; Sadava DE (2003) Plant, Genes and Crop Biotechnology. Jones and Bartlett Publishers, Inc.
8. Pörtner, R. (2007) Animal Cell Biotechnology: Methods and Protocols. Totowa, NJ: Humana Press.
9. Freshney R.I. (2010) Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley, John & Sons, Inc; New Jersey


**Additional information (if any):**

**Student responsibilities:**

1. Class attendance.
2. Study of reading materials as specified by course instructor
3. Self-study

**Course reviewers:**

1. Prof. Ranjit Kumar Giri, National Brain Research Centre, Manesar, Haryana
2. Dr. Modhumita Ghosh, Scientist G, Institute of Forest Genetics and Tree Breeding, Coimbatore, Tamil Nadu

| | | | |
|---|---|---|---|
| **Course title:** Bioanalytical Techniques | | | |
| **Course code:** | **No. of credits:** 3 | **L-T-P:** 36-06-0 | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** | | | |
| **Department:** Department of Biotechnology | | | |
| **Course coordinator:** | **Course instructor** | | |
| **Contact details:** | | | |
| **Course type:** core | **Course offered in:** Semester 1 | | |

**Course description:**

This course is introduced to bridge the gap between academics, research and industry. This course begins with a review of basic bio analytical technique and an introduction to general terminologies. This course contains bio analytical techniques along with their theory, working principal, common instrumentation and possible applications. This course will be equally beneficial to various scientific areas including, life science, chemical science, material science and environmental science.

**Course objectives:**

1. The primary objectives of this course are to develop the skills to understand the theory and practice of bio analytical techniques.
2. To provide scientific understanding of analytical techniques and detail interpretation of results.

**Course contents**

| S. No | Topic | L | T | P |
|---|---|---|---|---|
| 1. | **Spectroscopy study of chemical compounds and bio-molecules**<br>**Electromagnetic radiations and interactions with matters:** Electromagnetic spectrum. Quantization of energy, Electronic, vibrational and rotational spectroscopy. Franck–Condon principle, Jablonski diagram, radiative, nonradiative pathways, fluorescence and phosphorescence. Absorption of radiation, Beer-Lambert's law, deviation of Beer-Lambert's equation and its limitations.<br><br>**Principals, instrumentation, sampling and application of few spectroscopic techniques:**<br>UV-Visible spectroscopy, Fluorescence spectroscopy, IR/Raman spectroscopy,<br>NMR Spectroscopy and Mass spectroscopy. | 7 | 3 | 0 |
| 2. | **Microscopy:** Principals, instrumentation and applications of imaging techniques: Dark-field, Phase contrast, Fluorescence, Confocal microscopy, Atomic | 7 | 2 | 0 |

| | | | | |
|---|---|---|---|---|
| | force microscopy, and Transmission and Scanning electron microscopy. | | | |
| 3. | **Diffraction Technique:**<br>**Crystal geometry and structure**: Introduction to lattice and lattice systems, Bragg's plane, miller indices<br>**Principle of diffraction and X-ray diffraction:** X-rays production, X- ray spectra, Bragg's law and intensity of X- rays, Mosley's law, powdered XRD, percentage crystallinity, single crystal XRD, macromolecular XRD (protein crystallization, data collection and structure solution). | 7 | 0 | 0 |
| 4. | **Chromatography:** Classification of chromatographic techniques and their principles, Theory of chromatography, band broadening, rate and plate theory factors responsible for separation. Column chromatography, TLC, Paper chromatography.<br>**Liquid Chromatography and HPLC**:<br>Instrumentation, pumps, solvent delivery system, isocratic and gradient programming modes, sample introduction system, columns, detectors, reversed phase and normal phase chromatography.<br>**Gas Chromatography**: Instrumentation, carrier gas supply, injectors, columns, packed and capillary columns, column oven and temperature programming, different detectors.<br>Introduction to hyphenated techniques in chromatography, GC-MS and LC-MS. | 6 | 1 | 0 |
| 5. | **Electrophoretic Techniques:** Principle, equipment and process, Agarose gel electrophoresis, horizontal and vertical gel electrophoresis, electrophoresis techniques, Isoelectric focusing, capillary electrophoresis and application of electrophoresis in analyzing macromolecules. | 6 | 0 | 0 |
| 6. | **Automation**: Interdisciplinary association, Automation in analysis, sample collection, sample process, High Throughput Process, High throughput screening | 3 | 0 | 0 |
| | **Total** | **36** | **6** | **0** |

**Evaluation criteria:**

1. Test 1: 30%
2. Test 2: 30%
3. Test 3: 30%
4. Assignment/Presentation: 10%

**Learning outcomes:**

1. Students will be able to use selected analytical techniques. (Test 1-3)
2. Students become familiar with working principals, tools and techniques of

analytical techniques. (Test 1-3)
3. Students will understand the strengths, limitations and creative use of techniques for problem-solving. (Test 1-3 and Assignment/Presentation)

**Pedagogical Approach:**
Classroom/online lectures, tutorials, and demonstration of analytical techniques. Case studies based on peer reviewed research articles.

**Skill Set:**
1. Able to select analytical technique for case study.
2. Able to design experiments and understand the instrumentation.

**Employability:**
1. Academic and industrial research organization.
**2.** Industries based on biotechnology, pharmacy, agriculture, and chemical.

**Materials:**

**Suggested readings:**


1. I. D. Campbell, *Biological spectroscopy* (Benjamin/Cummings Pub. Co, Menlo Park, Calif, 1984), *Biophysical techniques series*.
2. K. Wilson, J. M. Walker, Eds., *Principles and techniques of biochemistry and molecular biology* (Cambridge University Press, Cambridge, UK : New York, 7th ed., 2009).
3. R. F. Boyer, *Biochemistry laboratory: modern theory and techniques* (Prentice Hall, Boston, 2nd ed., 2012).
4. R. Katoch, *Analytical techniques in biochemistry and molecular biology* (Springer, New York, 2011).
5. D. L. Spector, R. D. Goldman, Eds., *Basic methods in microscopy: protocols and concepts from cells: a laboratory manual* (Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y, 2006).
6. R. L. Switzer, *Experimental biochemistry* (W. H. Freeman and Co, New York, 3rd ed., 1999).
7. R. F. Boyer, *Modern experimental biochemistry* (Benjamin Cummings, San Francisco, 3rd ed., 2000).
8. J. R. Lakowicz, *Principles of fluorescence spectroscopy* (Springer, New York, 2006; http://site.ebrary.com/id/10229235).
9. B. Fultz, *Transmission electron microscopy and diffractometry of materials* (Springer, Berlin ; New York, 2nd ed., 2002).
10. D. B. Williams, C. B. Carter, *Transmission electron microscopy a textbook for materials science* (Springer, New York, 2009; http://dx.doi.org/10.1007/978-0-387-76501-3).
11. R. M. Silverstein, *Spectrometric identification of organic compounds* (John Wiley & Sons, Hoboken, NJ, 7th ed., 2005).
12. D. Harvey, *Modern analytical chemistry* (McGraw-Hill, Boston, 2000).


**Additional information (if any):**
Please keep in mind that this course, require hands on experience to strengthen the concepts; however, this course provides supplemental material in order to communicate this information.

**Student responsibilities:**

1. Class attendance.
2. Study of course materials as specified by the instructor.
3. Regular submission of given class assignments**.**

**Reviewers-**

1. Dr Narendra Tuteja, Visiting Scientist and Former Group Leader/Senior Scientist, PMB Group, International Centre for Genetic Engineering & Biotechnology, Aruna Asaf Ali Marg, New Delhi.
2. Dr. Anil K. Malik, Professor, Department of Physics, Ch. Charan Singh University, Meerut, India, Teachers' Fellow UGC, Govt. of India.

| | | | |
|---|---|---|---|
| **Course title:** Principles of genetic engineering and recombinant DNA technology | | | |
| **Course code:** BBP 155 | **No. of credits:** 3 | **L-T-P:** 28-14-0 | **Learning hours:** 42 |
| **Pre-requisite course code and title (if any):** | | | |
| **Faculty:** Anandita Singh | **Department:** Department of Biotechnology | | |
| **Course coordinator(s):** | **Course instructor(s):** | | |
| **Contact details:** | | | |
| **Course type:** Core | **Course offered in:** Semester 1 | | |

**Course description:**

The ability to genetically manipulate and engineer genomic sequences by precise recombination of genetic elements across organismal boundaries lies at the core of biotechnology. This foundation level core course is designed for students interested in developing a conceptual framework and technical know-how on genetic engineering methodologies. Upon successful completion of the course, students will gain an in-depth knowledge in principles of genetic manipulation and will develop an appreciation on centrality of genetic engineering in driving R&D across multiple branches of biotechnology. Students will gain proficiency in creative deployment of techniques for isolation, manipulation, novel design of genomic sequences. An introduction to properties of general DNA modifying enzymes will be given along with their applications. For example, the conceptualization, innovation, evolution and application aspects of PCR will be discussed in context to thermo-stable polymerases. An introduction to versatile and atypical modifying enzymes including non-specific endonucleases implied in new-age mutation technologies and genome engineering research will be provided. Cloning strategies with be contextualized to vector categories and applications such as plant transformation, protein expression, genomic and cDNA library construction to name a few. Host specificities and design of selection and screening strategies will be illustrated. Approaches for site-directed mutagenesis of cloned genomic fragments will be taught. Basic and advanced analytical techniques of molecular biology will not be covered in this course. To ensure coverage and sufficient depth on contemporary tools, outmoded methods no longer used has been intentionally avoided. However, students will be oriented to historical information for illustrating evolution of procedures used in contemporary biological research. Finally, an exposure will be provided to software used for *in-silico* annotation and manipulation of DNA sequences for efficient design, tracking, and management of cloning experiments in the laboratory.

**Course objectives:**

1. To develop an appreciation for importance of fundamental knowledge in discovery and innovation of modern day tools and techniques of genetic engineering
2. To provide a theoretical and practical framework underlying recombinant DNA technology
3. To train and provide technical skills to students for devising broad research methodologies by creative deployment of genetic engineering techniques

**Course contents**

| | | L | T | P |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **1** | **Properties and applications of DNA Modifying Enzymes:** Host controlled restriction modification system (Type I-IV restriction endonucleases, Isoschizomers and Neoschizomers, Homing Endonucleases); DNA Methyltransferases; Methylation Dependent Restriction Endonucleases; Exonucleases and non-specific endonucleases (Cas9 endonuclease, Structure and mis-match specific endonucleases: Fok I, FEN, Endo, Cel I and other site directed nucleases); Genome Editing with Engineered Nucleases (GEEN), Ligases; site-specific Recombinases used in cloning technologies; DNA polymerases: Special case of thermo-stable DNA polymerases in context to PCR (History, concept, invention, enzymology, applications); Reverse transcriptases and expression analysis (semi-quantitative and quantitative RT-PCRs); Phosphatases and Kinases | 7 | 7 | |
| **2** | **Generalised cloning strategies**<br>Host genotype specificities; classical and contemporary strategies for selection and screening; Marker and reporter genes; positive and negative selection; insertional inactivation; α-complementation; TA-cloning vectors; TOPO-TA and GATEWAY cloning vectors | 3 | 1 | |
| **3** | **Vector categories and selection schemes**<br>History and evolution of plasmid and Lambda phase based vectors and their derivatives (Insertional vectors, replacement vectors, cosmids, phasmids, phagemids, *in-vitro* packaging); High-cloning capacity vectors (Virus based single stranded DNA vectors: M13, fd, f1; YACs, BACs, PACs, BIBACs); Plant transformation vectors (Binary and Conjugate), Components of Gene expression Cassettes; Protein Expression Vectors (expression systems for high level protein expression in *E. coli* and yeast, transcriptional control, inducible promoters, translational efficiency, translational initiation, elongation, codon usage), protein extraction and purification (protein purification tags, Histidine and GST tags, IMAC) | 8 | 2 | |
| **4** | **DNA modifying enzymes and labelling of nucleic acid sequences**<br>End-Labelling (3'- and 5'-), Random priming and Nick translation using radioactive non-radioactive labelling techniques. | 2 | | |
| **5** | **Construction of genomic DNA libraries** Procedures for partial, representative, enriched, large-insert DNA libraries in context to medium and high-capacity cloning vectors; cDNA libraries (Self-priming methods, replacement synthesis, Okayama and Berg strategy, use of Adapters/Linkers and methylation for directional cloning) | 2 | | |
| **6** | **Site Directed Mutagenesis**<br>PCR based methods for site-directed mutagenesis (Single primer methods viz. Mis-incorporation of mismatched oligos, Over-lap extension), whole plasmid single round PCR), mis-repair of mutant oligonucleotides, selection of mutant (dut/ung E. coli strains for SDM through uracil replacement), Ligase chain reaction | 2 | | |
| **7** | **Sequence verification**: Reading electropherograms, *in-silico* analysis, plasmid mapping software for cloning designs; annotation of DNA sequence features | | 4 | |
| **8** | **Genetic manipulation to Genome Modification and Engineering:** | 4 | | |

| | | | | |
|---|---|---|---|---|
| | Impact of Genetic engineering on Transgenic Technology, Genome Editing: Case Studies from Biomedical research and crop biotechnology in Research and Development | | | |
| | **Total** | **28** | **14** | |
| | | | | |

**Evaluation criteria:**

1. Test 1: 30%
2. Test 2: 30%
3. Test 3: 30%
4. Assignments/Presentations: 10%

**Learning outcomes:**

1. Technical know-how on versatile techniques in recombinant DNA technology **(Test 1-3, Assignments)**
2. Understanding in application of genetic engineering techniques in basic and applied biological research **(Test 1-3, Assignments)**
3. Proficiency in designing and conducting experiments involving genetic manipulation **(Test 1-3, Assignments)**

**Pedagogical Approach:**

Lectures and tutorials in online or offline mode with a major emphasis on the detailed discussion of original research articles

**Skill Set:**

1. Isolation, manipulating, design and analysis of DNA sequences using DNA modifying enzymes
2. Designing cloning experiments using routine and specialized vectors for such applications as plant transformation, protein expression and genomic DNA library construction
3. Editing genomic sequences using site-directed mutagenesis

**Employability:**

1. Science Education, Research and Development, Management and Bio-services
2. Bio-pharma and Agri-biotechnology companies
3. Law firms and knowledge processing organizations (IP management consultancy)
4. Regulatory bodies and funding agencies

**Materials:**

**Books**


1. M. R. Green, J. Sambrook. Molecular Cloning: A Laboratory Manual (Cold Spring Harbor, ed. 4, 2012).
2. M. Wink. An Introduction to Molecular Biotechnology: Molecular Fundamentals, Methods and Applications in Modern Biotechnology (Wiley, ed. 2, 2011).
3. K. Wilson, J. Walker. Principles and Techniques of Biochemistry and Molecular Biology (Cambridge University Press, ed. 7, 2010).
4. B. R. Glick, J.J. Pasternak and C.L .Pattern. Molecular Biotechnology: Principles and Applications of Recombinant DNA (ASM Press, ed. 4, 2010).
5. S. B. Primrose, R. Twyman. Principles of Gene Manipulation and Genomics (Wiley-Blackwell, ed. 7, 2006)
6. M. M. Burell. Enzymes of Molecular Biology (Humana Press, 1993)
7. H. M. Eun. Enzymology Primer for Recombinant DNA Technology (Academic Press, 2008)


**Additional information (if any):** The list of books suggested in the readings will only provide basic knowledge on the concepts. The actual readings will involve comprehension of prescribed Journal articles and Reviews across topics.

**Representative Software (Source):**

1. Gene Construction Kit® **(GCK)** (http://www.textco.com/gene-construction-kit.php): DNA manipulation and analysis tool, useful in plasmid mapping and restriction based cloning operations.
2. Gene Inspector® **(GI)** (http://www.textco.com/gene-construction-kit.php): DNA and protein sequence analysis package.
3. Vector NTI® Software (http://www.lifetechnologies.com/in/en/home/life-science/cloning/vector-nti-software.html): Integrated suite for sequence analysis

**Student responsibilities:**

1. Class attendance
2. Study of course materials as specified by the instructor
3. Self-study

**Course reviewers:**

The course was previously reviewed and commented on by the following experts:

1. Prof. Anil Grover
Head, Department of Plant Molecular Biology
University of Delhi, South Campus, New Delhi- 110021, India

2. Dr. Neeti Sanan Mishra
Group Leader: Plant RNAi,
International Centre for Genetic Engineering and Biotechnology
Aruna Asaf Ali Marg
New Delhi-110 067, India

| | | | |
|---|---|---|---|
| **Course title:** Conceptual Foundations of Molecular Biology | | | |
| **Course code:** | **No. of credits:** 2 | **L-T-P:** 28-0-0 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** None | | | |
| **Department:** Department of Biotechnology | | | |
| **Course coordinator(s):** | | **Course instructor(s):** | |
| **Contact details:** | | | |
| **Course type:** Core | | **Course offered in:** Semester 1 | |

**Course description:** The objective of this foundational course is to familiarize students of varied academic backgrounds (including non-biology degree holders) with the interdisciplinary knowledge that underlies molecular biology. The approach will not only ensure the transmission of this knowledge, but also emphasize the scientific method, creative thought processes, fortuitous discoveries and elegant experimental approaches that led to classic insights and discoveries in this field. The course will be taught with a special focus on the overarching framework of evolutionary theory that underlies all of biology. Original research articles, book excerpts and reviews highlighting seminal insights in the field will be discussed in detail. Finally, the value of this information will be underscored by a detailed description of instances of gene regulation.

**Course objectives:**

1. To provide students of varied backgrounds the history of ideas in, and the theoretical bases of molecular biology.
2. To highlight the interdisciplinary nature of major advances in molecular biology.
3. To present an overview of gene regulation.
4. To emphasize the importance of evolutionary theory in the understanding of biological phenomena.

**Course contents**

| S.No | Topic | L | T | P |
|---|---|---|---|---|
| **Module 1** | **The Importance of Evolutionary Theory to all Biology** | | | |
| | Early evolutionary ideas; Darwin, Mendel and the modern synthesis; symbiosis and evolution; natural selection across scales – from molecules to complex systems | 3 | | |
| | Beyond dichotomies – evolution and molecular phylogeny, formulation of the three-domain system of classification by Woese and Fox, gene transfer and role of viruses in evolution. | 3 | | |
| **Module 2** | **The Development of Molecular Biology** | | | |
| 1 | Historical background<br>The scientific method, vital force theory, classic experiments related to vital force theory and spontaneous generation | 3 | | |
| 2 | Physico-chemical approach to biology<br>The influence of *What is life* by Schrodinger on molecular biology | 3 | | |
| 3 | The nature and mutability of the genetic material<br>The chromosomal location of genes, DNA as the genetic material, DNA structure, semi-conservative replication of DNA, the Luria-Delbruck fluctuation test. | 4 | | |
| 4 | The flow of genetic information<br>The central dogma and its continuing relevance, sequence hypothesis, adaptor hypothesis, messenger RNA | 4 | | |

| | | | | |
|---|---|---|---|---|
| 5 | The physical nature and universality of Mendel's 'genes'<br>Benzer's experiments on phage T4, the existence and nature of the triplet code | 4 | | |
| 6 | Gene expression and control<br>Positive and negative control of gene expression, considerations in the global regulation of gene expression | 4 | | |
| | **Total** | **28** | **0** | **0** |

**Evaluation criteria:**
Test 1 – 30% weightage
Test 2 – 30% weightage
Test 3 – 40% weightage

**Learning outcomes:**
1. Understanding of essential evolutionary concepts and their application to molecular biology (Tests 1-3).
2. Recognition of crucial advances in molecular biology based on model systems. (Tests 2-3).
3. Knowledge of different modes and levels of the regulation of gene regulation (Test 3).
4. Critical analysis of primary scientific literature (Tests 1-3).
5. Problem-solving skills (Tests 1-3).

**Pedagogical Approach:**
Online/offline lectures emphasizing the detailed discussion of research/review articles from scientific journals in class.

**Skill Set:**
1. Design of molecular biology/genetic engineering experiments.
2. Critical analysis of molecular biology/genetic engineering experimental results.
3. Formulation of experimental strategies for molecular genetic studies of simple model organisms.

**Employability:**
1. Academic and industrial research involving molecular biology approaches.
2. Intellectual property firms.
3. Life science teaching at school and undergraduate levels.

**Materials:**

**Required texts**

1. E. Schrödinger. What Is Life? : The Physical Aspect of the Living Cell with Mind and Matter and
Autobiographical Sketches (Cambridge University Press, Canto series, Cambridge, 11th reprint, 2004).
2. J.C. Herron, S. Freeman. Evolutionary Analysis. Pearson Education, India. ed. 5, 2013.
3. J. D. Watson, F. H. C. Crick. *Nature*, 3, 737-738 (1953).
4. M. Messelson, F. W. Stahl. *Proc. Natl. Acad. Sci. USA*, 44, 671-682 (1958).
5. F. H. C. Crick. *Nature*, 227,561-563 (1970).
6. F. H. C. Crick *et al. Nature*, 192, 1227-1232 (1961).
7. S. Benzer. *Proc. Natl. Acad. Sci. USA*, 45, 1607-1620 (1959).
8. S. Benzer. *Proc. Natl. Acad. Sci. USA*, 47, 403-415 (1961).
9. S. Brenner. *Proc. Natl. Acad. Sci. USA*, 43, 687-693 (1957).
10. S. Brenner *et al. Nature*, 190, 576-581 (1961).
11.G. W. Beadle, E. L. Tatum. *Proc. Natl. Acad. Sci. USA*, 27, 499-506 (1941).
12.O. T. Avery *et al. J. Exp. Biol.*, 79, 137-158 (1944).
13.S. E. Luria, M. Delbrück. *Genetics*, 28, 491-511 (1943).

14.B. Magasanik. *Proc. Natl. Acad. Sci. USA*, 97, 14044-14045 (2000).
15.C. R. Woese, G. E. Fox. *Proc. Natl. Acad. Sci. USA*, 74, 5088-5090 (1977).
16. T.H. Morgan. Sex-limited inheritance in Drosophila, *Science*, 32, 120-122 (1910).

**Suggested readings**

1. J. D. Watson., *et al.* Molecular Biology of the Gene. Pearson, Cold Spring Harbor, ed. 7, 2014.
2. B. Alberts, *et al.* Molecular Biology of the Cell. Garland Science, New York, ed. 5, 2008.
3. J. E. Krebs *et al.* Lewin's GENES XII. Jones and Bartlett Publishers, Inc., Burlington, ed. 12, 2017
4. T. H. Morgan *et al.* The Mechanism of Mendelian Heredity. Henry Holt and Company, New York, 1915.

**Case studies**

**Websites**

**Journals**

**Other readings**

**Additional information (if any):**

**Student responsibilities:**

1. Class attendance (online/offline).
2. Study/self-study of course materials as specified by the instructor.
3. Ensuring functionality of essential IT hardware & software at their preferred location(s).

**Course reviewers:**

1. Dr. Neel Sarovar Bhavesh, Group leader (equivalent to Professor), International Centre for Genetic Engineering and Biotechnology, Aruna Asaf Ali Marg, New Delhi – 110067, India.

2. Prof. Vijaya Satchidanandam, Department of Microbiology and Cell Biology, Indian Institute of Science, Bengaluru (superannuated) and Adjunct Professor, St. John's Medical College, Sarjapur Road, Bengaluru – 560034

| | | | |
|---|---|---|---|
| **Course title:** Principles of Biochemistry and Biophysics | | | |
| **Course code:** BBP ___ | **No. of credits: 2** | **L-T-P:** 28-0-0 | **Learning hours:** 28 |
| **Pre-requisite course code and title (if any):** Science graduate | | | |
| **Department:** Department of Biotechnology | | | |
| **Course coordinator:** | | **Course instructor** | |
| **Contact details:** | | | |
| **Course type:** Core | | **Course offered in:** Semester 1 | |

**Course description:**

The course is designed to provide students with basic concepts, principles and applications of biochemistry and biophysics. This is aimed at providing information on molecular logic of life, supramolecular chemistry, structure and function of macromolecules, molecular circuits/ information processing cellular networks, cell mechanics and dynamics, molecular bioenergetics, and applications. The course will provide inputs on how emerging biochemical and biophysical techniques greatly enhanced our understanding of biological systems and functioning. Furthermore, the course is focused on recent developments and evolving scenarios in biochemistry and biophysics and will be a good platform for students to further pursue their careers in sciences.

**Course objectives:**

1. Introduction to the molecular components of a cell, complex chemistry, and their interactions with the environment.
2. Familiarization of students with the macromolecular structural organization and relation to the functional significance of such a conformation through enzyme kinetics.
3. Acquainting the students with concepts of cell mechanics and applications, cellular dynamics and techniques employed.
4. Familiarization with biomolecular interplay involved in signal transduction and ubiquitination, apoptosis, transport mechanisms and metabolic pathways.
5. Providing students with fundamentals of laws of thermodynamics, Non equilibrium thermodynamics and cellular bioenergetics.

**Course contents**

| **Module** | **Topic** | **L** | **T** | **P** |
|---|---|---|---|---|
| **Module 1: Biomolecules and supramolecular chemistry** | | | | |
| 1.1 | Biomolecules, Bioactive compounds and Molecular Environment, Supra-molecular Chemistry of Biomolecules (Specific and Non-specific Molecular, Interactions, Short range Repulsions, Electrostatic Interactions, Dipolar, Interactions, Fluctuating Dipoles, Hydrogen Bonding, Cation-π Interactions, Hydrophobic Effect, Counter-ion Release) | 4 | 0 | 0 |
| **Module 2: Structure and function of macromolecules** | | | | |
| 2.1 | Levels of Structural Organization & Conformation, DNA structure, Protein structure, DSSP Classification, Ramachandran's Plot, Protein Folding & Misfolding, Structural Proteins & Regulatory Proteins, Enzyme catalysis and kinetics | 4 | 0 | 0 |
| **Module 3: Cell mechanics and dynamics** | | | | |
| 3.1 | **Fundamentals in cell mechanics**<br>Bio-membranes (Structure, Activity, Fluidity, Permeability and | 4 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| | Dynamics), Membrane Channels, Ion pumps & Transporters, Membrane Potential, Diffusion coefficient, association and Brownian motion in biological systems | | | |
| 3.2 | **Cytoskeleton dynamics, models, and techniques** Force generation by cellular polymers, Power stroke and Brownian ratchet models of molecular motors, Helix-Coil transition model (DNA and Protein), Reynolds Number, Fluorescence Correlation Spectroscopy, Patch Clamps (electrophysiology), Cytological Optical Tweezers | 6 | 0 | 0 |
| **Module 4: Molecular circuits and signaling** | | | | |
| 4.1 | Signal Transduction Cascades, Primary and Secondary Messengers, EGF Signalling and Receptor Tyrosine Kinases the Ras-MAPK pathway, Wnt Signalling, Apoptosis, Ubiquitin System, Metabolic Pathways of Macromolecules and Cellular Respiration | 4 | 0 | 0 |
| **Module 5: Thermodynamics in biosystems** | | | | |
| 5.1 | The Laws of Thermodynamics, Gibbs free energy and Free energy changes, Redox Potentials and energy currency, The Three Levels of Bioenergetics in Eukaryotes/ Energy Transfer within Biosphere, Non-Equilibrium Thermodynamics (NET) | 3 | 0 | 0 |
| 5.2 | Thermogenesis, Uncoupling Protein Thermogenin and Mitochondrial Thermogenesis, Chloroplast Bioenergetics | 3 | 0 | 0 |
| | **Total** | **28** | **0** | **0** |

**Evaluation criteria:**

4. Test 1 30%
5. Test 2 30%
6. Test 3 (end semester) 40%

**Learning outcomes:**

1. An understanding of the basic components and chemistry involved in cell survival (Tests 1, 2 & 3)
2. An insight into macromolecular organization and its structural as well as functional importance (Test 1 & 2).
3. The ability to apprehend the concepts of cell dynamics and techniques employed to study cell mechanics (Test 2).
4. A detailed analysis of various signalling mechanisms vital for living systems. Grasp of molecular networks and their interplay (Test 3).
5. The ability to understand molecular bioenergetics and apply the energy transformation mechanisms and laws governing the transformations (Test 3).

**Pedagogical Approach:**

1. Online/Offline teaching.
2. Providing case studies to support the concepts.
3. Peer-reviewed research articles to discuss various modules in the course.

**Skill Set:**

4. Analytical skills based on case studies provided.
5. Knowledge of macromolecular applications in various sectors.
6. Knowledge of techniques employed to understand cellular systems.

**Employability:**
The course will provide skillsets and knowledge that may play key role to get employed in Universities, R & D industry, Medical centres/Colleges, Research Institutes and Diagnostic centres apart from specialized units like pharma, breweries, dairy and agri sectors.

**Materials:**
**Suggested Readings**


1. Delbianco M, Bharate P, Varela-Aramburu S, Seeberger PH. Carbohydrates in Supramolecular Chemistry. Chem Rev. 2016 Feb 24;116(4):1693-752. doi: 10.1021/acs.chemrev.5b00516. Epub 2015 Dec 24. PMID: 26702928.
2. RAMACHANDRAN GN, RAMAKRISHNAN C, SASISEKHARAN V. Stereochemistry of polypeptide chain configurations. J Mol Biol. 1963 Jul;7:95-9. doi: 10.1016/s0022-2836(63)80023-6. PMID: 13990617.
3. Dobson CM. Protein folding and misfolding. Nature. 2003 Dec 18;426(6968):884-90. doi: 10.1038/nature02261. PMID: 14685248.
4. Chiti F, Dobson CM. Protein Misfolding, Amyloid Formation, and Human Disease: A Summary of Progress Over the Last Decade. Annu Rev Biochem. 2017 Jun 20;86:27-68. doi: 10.1146/annurev-biochem-061516-045115. Epub 2017 May 12. PMID: 28498720.
5. Kabsch W, Sander C. Dictionary of protein secondary structure: pattern recognition of hydrogen-bonded and geometrical features. Biopolymers. 1983 Dec;22(12):2577-637. doi: 10.1002/bip.360221211. PMID: 6667333.
6. Michaelis L, Menten ML, Johnson KA, Goody RS. The original Michaelis constant: translation of the 1913 Michaelis-Menten paper. Biochemistry. 2011 Oct 4;50(39):8264-9. doi: 10.1021/bi201284u. Epub 2011 Sep 9. PMID: 21888353; PMCID: PMC3381512.
7. Ait-Haddou R, Herzog W. Brownian ratchet models of molecular motors. Cell Biochem Biophys. 2003;38(2):191-214. doi: 10.1385/CBB:38:2:191. PMID: 12777714.
8. Mereghetti, P., Kokh, D., McCammon, J.A. *et al*. Diffusion and association processes in biological systems: theory, computation and experiment. *BMC Biophys* **4,** 2 (2011). https://doi.org/10.1186/2046-1682-4-2
9. Lamparter L, Galic M. Cellular Membranes, a Versatile Adaptive Composite Material. Front Cell Dev Biol. 2020 Aug 5;8:684. doi: 10.3389/fcell.2020.00684. PMID: 32850810; PMCID: PMC7419611.
10. Strasser A, O'Connor L, Dixit VM. Apoptosis signaling. Annu Rev Biochem. 2000;69:217-45. doi: 10.1146/annurev.biochem.69.1.217. PMID: 10966458.
11. Wallace DC. Colloquium paper: bioenergetics, the origins of complexity, and the ascent of man. *Proc Natl Acad Sci U S A*. 2010;107 Suppl 2(Suppl 2):8947-8953. doi:10.1073/pnas.0914635107
12. Biochemistry, 4th Edition, Donald Voet, Judith G. Voet, ISBN: 978-0-470-57095-1.
13. Biophysical Chemistry, Vol I, II & III by Charles R. Canter and Paul R. Shimmel. (A classic textbook)
14. The Biophysical Chemistry of Nucleic Acids and Proteins: Thomas E. Creighton;,Helvetian Press; 2010.


**Additional information (if any): Not Applicable**

**Student responsibilities:**

| |
|---|
| Study of course material as specified by the instructor. |

**Course reviewers:**

1. Prof. Gourinath Samudrala, School of Life Sciences, Jawaharlal Nehru University (JNU), New Delhi- 110067

E-mail: sgourinath@mail.jnu.ac.in

2. Dr. Vivekanad V, Ramalingaswami Fellow, Malaviya National Institute of Technology (MNIT), Jaipur, Rajasthan - 302017

E-mail: vivekanand.cee@mnit.ac.in

**Enclosure 8**

**Change in the structure of the M.Sc. (Economics) Programme offered by Department of Policy Studies**

<table>
<tr><th>Semester</th><th>Current Structure</th><th colspan="2">Proposed Structure</th></tr>
<tr><td>Semester 1</td><td>4 Core Courses (Total 16 credits)<br>Probability and Statistics (4 credits)<br>Mathematical Methods for Economics (4 credits)<br>Macroeconomics (4 credits)<br>Microeconomics (4 credits)</td><td colspan="2">4 Core Courses (Total 16 credits)<br>Probability and Statistics (4 credits)<br>Mathematical Methods for Economics (4 credits)<br>Macroeconomics (4 credits)<br>Microeconomics (4 credits</td></tr>
<tr><td>Semester 2</td><td>4 Core Courses (Total 16 credits):<br>Econometrics (4 credits)<br>Environment and Economic Development (4 credits)<br>Growth Economics (4 credits)<br>Development Economics (4 credits)</td><td colspan="2">4 Core Courses (Total 16 credits)<br>Econometrics (4 credits)<br>Environment and Economic Development (4 credits)<br>Growth Economics (4 credits)<br>Development Economics(4 credits)</td></tr>
<tr><td>Semester 3</td><td>3 Core Courses+ Elective Courses worth 8 credits (Total 20 credits)<br>Methods of Research in Economics (Core; 4 credits)<br>Environmental Economics(Core; 4 credits)<br>Natural Resource Economics(Core;4 credits)<br>Elective Courses worth 8 credits (see list below)</td><td colspan="2">3 Core Courses+ Elective Course worth 4credits (Total 16 credits)<br>Methods of Research in Economics(Core;4 credits)<br>Environmental Economics (Core;4 credits)<br>Natural Resource Economics (Core; 4 credits)<br>Elective Course (see list below)</td></tr>
<tr><td rowspan="2">Semester 4</td><td rowspan="2">Master’s Thesis (20 credits)</td><td colspan="2">Option between Thesis Track and Course work Track (16 credits)</td></tr>
<tr><td>Master’s Thesis(16credits)</td><td>Elective Courses worth 16 credits(see list below)</td></tr>
<tr><td>Total</td><td>72 credits</td><td colspan="2">64 credits</td></tr>
</table>

The list of courses approved for offering as elective in the M.Sc. Economics programme is given below:

Indian agricultural development: Contemporary Issues
Economics of health and environment
Trade, Development and Environment
Time series and regression analysis
Advanced Econometrics
Microeconomics-II
Labour Economics
Ecological Economics
Energy Economics
Advanced Macroeconomics
Industrial Organisation
Theory of Contracts Law and Economics
Theory of Finance Public Economics
Collective action and environmental management

It is proposed that if this structure is approved, the assessment criteria of electives offered by the programme in its fourth semester will place higher weightage on term papers/literature survey, presentations etc. This will enable the students to apply their learning to problems of current interest and in turn, improve their job market prospects.

The students of the programme can also fulfill their elective credit requirements from courses offered in other programmes in the institute, subject to approval from the Programme Coordinator.

**Background for the proposed change:**

A similar programme structure, conceived by the MPEC of M.Sc Economics programme on the basis of student feedback, was placed and approved at the Board of Studies meeting on 25$^{th}$ April 2018.This structure was shared with stakeholders including recruiters, academicians, current and past students to obtain their feedback. The Academic Council suggested further changes that led to the current programme structure as approved in its 43$^{rd}$ meeting dated 12$^{th}$ June 2018. The Academic Council further recommended that" the structured feedback from various stakeholders be obtained in order to take inputs on the programme structure and analysis of the same be presented in the next Academic Council".

The current programme structure was implemented from the July-December semester of 2018.Since students are the most important constituent of stakeholders, the MPEC Economics collected structured feedback from two batches of students, viz., the 2018-20 batch and the 2019-21batch.The salient features of the feedback (Annexure D )are presented in the Table below.

| **Salient Features of Student Feedback on Programme Structure (Total 51 respondents from two batches)** | |
|---|---|
| Major Shortcomings of current structure (60% respondents listed at least one) | (a)Less number of subjects/electiveson offer<br>(b)To much focus on research<br>(c)Busy schedule of assessments<br>(d)The courses are less practical innature |
| Comparison to previous structure | About 60% respondents preferred thecurrent structure over the previous one |
| Distribution of credits | About 60% respondents felt that the current distribution is appropriate |
| Electives in third semester | About 80% respondents felt that there shouldbe more electives to choose from in third semester |
| Electives in fourth semester | About 55% respondents did not feel need of electives in fourth semester, while rest felt the need of electives in the fourth semester, but either as an option to be exercised, or to make up for lost credits |
| Electives in the second semester | Almost 80% respondents wanted electivesto be introduced in the second semester Itself |
| Master's Thesis be made non-compulsory | About 40% respondents wanted master'sthesis to be made non-compulsory, whileabout 60% wanted master's thesis to remain Compulsory |

It follows from the student feedback that while a section of the students value the research orientation of the programme, another section wanted to exercise freedom in terms of choosing more electives. This necessitated that the course structure approved by the Board of Studies in its April 2018 meeting be revisited.

Feedback was collected from academicians, employers and alumni (Annexure A-C) seeking their opinion on a programme revision in the lines of the course structure approved by the Board of Studies in its April 2018 meeting. The salient features of this feedback, which reaffirm the justification of the proposed change in programme structure, are presented below.

| **Salient Features of Stakeholder Feedback on Programme Structure** | |
|---|---|
| **Stakeholder type** | **Feedback** |
| Academicians (16 respondents) | Most respondents felt that<br>(a) The proposed changes in the programme structure satisfy the objectives better than the old one.<br>(b) Exercising the course track option may affect the future career prospects of the students positively.<br>(c) The programme with proposed changes will continue to imbibe research aptitude among the students, as it will allow the interested students to commit to producing quality dissertations. |
| Recruiters (5 respondents) | Recruiters mostly agreed that proposed changes can help in imbibing most of the qualities that they would like a future employee to possess. |
| Alumni (4 respondents) | Alumni members found that less number of electives offered is a shortcoming of the current structure. The responses were equally divided on offering master's thesis as an optional track. |

**Enclosure 9**

**Revised academic calendar for AY 2020-21 from May 2021 onwards**

(All on-line classes, examinations and all other academic activities at the TERI School of Advanced Studies were suspended for a period 4 weeks with effect from 22 April 2021)

| **Resumption of remaining Academic activities – 20 May 2021** | | | |
|---|---|---|---|
| **Sl. No.** | **Event** | **previous dates (old)** | **New dates** |
| 1 | Tests II (date by which balance test II examinations to be completed) | 19 – 23 April 2021 | 20-24 May 2021 |
| 2 | Upload/Display of marks – tests II | 26 April 2021 | 26 May 2021 |
| 3 | Finalization of courses by Programme Coordinators for pre-registration | 3 – 4 May 2021 | 2-3 June 2021 |
| 4 | Final feedback and Pre-registration for next semester | 19 – 25 May 2021 | 23-25 June 2021 |
| 5 | Last day of classes | 25 May 2021 | 25 June 2021 |
| 6 | Tests III/Terminal Assessment | 26 May – 11 June 2021 | 28 June – 9 July 2021 |
| 7 | Completion of all assessments | 11 June 2021 | 9 July 2021 |
| 8 | Completion of grading and MPEC meetings | 17 June 2021 | 15 July 2021 |
| 9 | Display of grades | 21 June 2021 | 20 July 2021 |
| 10 | Meetings of SRCs | 14 June – 31 July 2021 | 28 June – 20 August 2021 |
| 11 | Registration for first semester 2021/22 | 2 August 2021 | 31 August 2021 |
| 12 | Commencement of classes | 3 August 2021 | 1 September 2021 |

*This calendar does not include the distance programme schedule.
**Students can do summer internship in their host organization during July 12 – Aug 30 .
*** Dates for submission and evaluation of 4$^{th}$ semester major project/dissertation to be notified by respective departments and they be completed by 13 July, 2021.

**Enclosure 10**

**Program Specific Outcome (MBA Sustainability Management):**

At the end of pursuing the MBA (Sustainability Management) program the students are expected achieve the following -

- Ability to formulate, evaluate and implement crucial business strategies with core facets of Finance, Marketing and Sustainability;
- Competence to make ethical business decisions with social and environmental consciousness;
- Leadership and teamwork mastery of problem solving in a resource-sensitive world amid increasing competition;
- Training in tools, techniques, and frameworks for developing critical thinking & communication skills;
- Develop expertise to recognize the need, challenges and ways to approach for sustainable businesses through resource optimization without compromising on profitability and competitiveness;
- Gain hands-on experience in applying business, economic, management, legal and sustainability concepts & practice along training in quantitative and qualitative methods of research.

**Programme specific outcome (MBA Infrastructure Management):**

At the end of pursuing the MBA (Infrastructure Management) program the students are expected to:

- Gain in-depth knowledge of the functional areas of Infrastructure Management domain;
- Acquire expertise to apply management techniques in the infrastructure sector to lead in a resource-sensitive world amid increasing competition and sustainability concerns;
- Develop key analytical skills in identification and resolution of issues pertaining to the regulation and management of infrastructure regime;

- Evolve sustainable domain perspectives for the purpose of planning, implementation, and control of businesses in the infrastructure sector;
- Develop and apply skills of quantitative and qualitative research for practical evaluation of major policy issues through industry exposures and field visits;
- Accustom to the global perspective towards sustainable business practices in the area of Infrastructure Management;