TERI SAS (Deemed to be University)

10, INSTITUTIONAL AREA, VASANT KUNJ, NEW DELHI

MINUTES

56TH MEETING OF ACADEMIC COUNCIL

Meeting No. : 56th (Fifty Six)

Date : **10 August 2023**

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

Time : **10.30 AM**

TERI SAS (Deemed to be University)
MINUTES FOR THE 56th MEETING OF THE ACADEMIC COUNCIL
10 August (10.30 AM ONWARDS)

ITEMS AT A GLANCE

Item No.	Particulars

Item No.56.1. Welcome and opening remarks by the Vice Chancellor

Confirmation of Minutes

Item No. 56.2. To confirm the minutes of the Fifty Fifth (55th) Meeting of the Academic Council held on 25 May 2023.

Action Taken Report

Item No. 56.3. Action Taken Report on the 55th Academic Council Meeting.

Agenda items for Consideration

Item No. 56.4. Agenda Items

56.4.1 To approve inclusion of SWAYAM courses.
56.4.2 To consider and approve course outlines under offer from the programmes AY 2023-24
56.4.3 Registration of Four MOOCs on "Buddhist Culture and Tourism" for July 2023 Semester on SWAYAM Platform (Open Electives)

Item No. 56.5. Any other item with the permission of the Chair

TERI SAS (Deemed to be University)

MINUTES FOR THE 56th MEETING OF THE ACADEMIC COUNCIL 10 AUGUST 2023 (10.30 AM ONWARDS)

DETAILED AGENDA ITEMS

The Fifty Sixth meeting of the Academic Council was held on 10 August 2023 at 1030 hours. The following were present:-

PRESENT:

Members

Prof. Prateek Sharma, VC, Chairperson
Prof Shaleen Singhal
Prof Ramakrishnan Sitaraman
Prof. T C Kandpal
Prof Sagnik Dey
Mr Manoj Chugh
Mr Shubhashis Dey
Dr Madhusudan Sau
Mr Sudhir Vadehra
Prof Arun Kansal
Prof Anandita Singh
Prof Naqui Anwer
Prof Chander Kumar Singh
Dr Chaithanya Madhurantakam
Dr Sukanya Das
Dr Ranjana Ray Chaudhuri
Dr Gopal Sarangi
Dr Shruti Sharma Rana
Prof Shashi Bhushan Tripathi
Col B Venkat, Registrar

Special invitees

Dr Ayushi Vijhani
Dr Chandrashekhar Azad Vishwakarma
Dr Anand Madhukar
Dr Swarup Dutta
Dr Priyanka Arora
Dr Chandan Kumar

Item No 56.1: Welcome and opening remarks by the Vice Chancellor

Detailed briefing on the activities of the university to include status of admissions for the curent Academic Year and commencement of UG programs was provided. The Academic Council appreciated the efforts taken by the University towards outreach and also commencement of UG programs.

The Academic Council deliberated on the matter and was of the opinion that responsibility towards admissions shall rest with the office of Registrar to ensure single point dissemination of information and collation of data.

Further, with a purpose to align towards NEP 2020 the Academic council expressed satisfaction towards initiation of UG programs.

Confirmation of Minutes

Item No. 56.2: To confirm the minutes of the Fifty Fifth Meeting of the Academic Council held on 25 May 2023.

The minutes of the Fifty Fifth Meeting of the Academic Council, held on 25 May 2023, were circulated to the members and no comments were received.

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

Placed before the Academic Council for confirmation.

Resolution: Minutes of the 55th Meeting of the Academic Council was confirmed.

Action Taken Report on the 55th Academic Council Meeting.

Item No. 56.3: <u>Action Taken Report on the 55 Academic Council Meeting</u>

Sr.No.	Agenda	Action taken
Item No.2	**To consider and approve new 5-year Integrated Post-Graduate Programme Structure in Data Science and Environmental Studies** Prof Vinay S.P. Sinha presented to the Academic Council the programme structure of two new FYIPPs – (i) Data Science and (ii) Environmental Studies as per the National Education Policy (NEP) 2020 and provisions of the new guidelines issued by the UGC. The Members suggested to separately offer these programmes as FYUP and FYIPP for better outreach and understanding of the potential target audience. It was, therefore, suggested by the members to offer these programmes with following format and nomenclature: (a) FYUP in Data Science [BSc (Honours/BSc Honours with Research)] (b) FYUP in Environmental Studies [(BSc (Honours/BSc Honours with Research)] (c) FYIPP in Data Science [BSc (Honours/BSc Honours with Research) & MSc] (d) FYIPP in Environmental Studies [BSc (Honours/BSc Honours with Research) & MSc] The Academic Council after some minor modifications approved the programme structure of the above-mentioned Programmes in (i) Data Science and (ii) Environmental Studies.	**The programme has since been launched for the admission processes in the AY 23 - 24**

	TS/AC/55.2.1 The Academic Council resolved to approve the programme structure of the above Programmes in (i) Data Science and (ii) Environmental Studies.	
Item No.3	**To consider and approve existing programme structure of MSc (Environmental Studies and Resource Management) and MSc (Climate Science and Policy)** Prof Vinay S.P. Sinha presented to the Academic Council existing programme structure of MSc (Environmental Studies and Resource Management) and MSc (Climate Science and Policy) that have been restructured in view of the newly launched FYUP and FYIPP programmes in Environmental Studies**.** The Academic Council suggested to keep the FYUP and FYIPP programmes independent of the existing PG programmes in ESRM and CSP. **TS/AC/55.3.1** The Academic Council resolved to offer the FYUP & FYIPP and existing PG programmes independent of the existing PG programmes – MSc (Environmental Studies and Resource Management) and MSc (Climate Science and Policy) programmes**.**	**The programme has since been launched for the admission processes in the AY 23 - 24**
Item No.4	**To consider and approve introduction of multiple entry/exit option in existing M.Tech programmes of Department of Sustainable Engineering from the academic session 2023-24** Prof. Naqui Anwer presented to the Academic Council's about the introduction of multiple entry/exit option in existing M.Tech programmes of Department of Sustainable Engineering from the academic session 2023-24**.** Prof. Naqui Anwer informed the AC members that the department plans to offer separate admission in Post Graduate Diploma in Renewable Energy Engineering and Management (PGDREEM) and Post Graduate Diploma in Urban Development Management (PGDUDM) programmes. The syllabus of these PG programmes shall remain the same as that of the first two semester of M.Tech (REEM) and M.Tech (UDM) programmes. The PG diploma programmes can be offered in online mode once the first batch (in regular mode) is passed out as per UGC regulations for offering online programmes. The proposal was deliberated by the	**The programme has since been launched for the admission processes in the AY 23 - 24**

	members. The AC members suggested to start the PG Diploma programme as a separate programme instead of as an exit option in M.Tech programmes in order to make it a distinct academic programme. Since the PG Diploma programmes have been suggested to be offered as new programmes, this would provide the flexibility to drop some of the courses [from programme structure of M.Tech (REEM) and M.Tech. (UDM)] to make the PG Diploma programmes accessible to non-engineering students and therefore will provide the flexibility to expand the eligibility criteria with inclusion of graduates from different disciplines. Prof. Anwer also informed that the Department would like to commence M.Tech (REEM) and M.Tech (UDM) in weekend mode without any change in the overall sanction intake capacity. The overall credits requirement and syllabus will remain the same for these weekend programmes as well. This was done in order to attract working professionals for whom it is not possible to join the programme during the weekdays. The Academic Council therefore suggested following titles of the proposed programmes from the academic session 2023-24: 1. Post Graduate Diploma in Renewable Energy Management (PGDREM) The programme structure of PGDREM has been carved out from the programme structure of 1st and 2nd semesters of M.Tech (REEM). The draft structure is attached as 'Annexure – 1 (PGDREM)' for your perusal. **Eligibility:** Bachelor's degree in Science/ Technology/Engineering/Management or equivalent or B.Voc in similar streams. 2. Post Graduate Diploma in Urban Development Management (PGDUDM) The programme structure of PGDUDM has carved out from the programme structure of 1st and 2nd semesters of M.Tech (UDM). The draft structure is attached as 'Annexure – 2 (PGDUDM)' for your perusal. **Eligibility:** B.Sc/B.Tech/B.Arch/B.Plan/BBA or B.A in Geography, Sociology, Economics,	

	Political Science, Public Administration, Social Anthropology or Environmental Studies or B.Voc in similar streams. **TS/AC/55.4.1** The Academic Council resolved to approved the introduction of one year Post Graduate Diploma in Renewable Energy Management (PGDREM) and Post Graduate Diploma in Urban Development Management (PGDUDM) programmes in the format described above and commencement of M.Tech (REEM) and M.Tech (UDM) in weekend mode in the Department of Sustainable Engineering from the academic session 2023-24.	
Item No.5	**To consider and approve programme outline and structure for Four Year Under-Graduate Programme in Business Administration (BBA Honours/BBA Honours with research)** Dr Shruti Sharma Rana presented to the Academic Council programme outline and structure for FYUP in Business Administration (BBA Honours/BBA Honours with research). The Academic Council after deliberation approved the programme outline and structure for the above programme. **TS/AC/55.5.1** The Academic Council resolved to approve programme outline and structure for FYUP in Business Administration (BBA Honours/BBA Honours with research).	**The programme has since been launched for the admission processes in the AY 23 - 24**
Item No.6	**Presentation on FYUP in Economics (BSc Honors /BSc Honors with research)** The Department of Policy and Management Studies made a presentation on the FYUP in Economics [(BSc (Honors /BSc Honors with research)]. Dr Sukanya Das presented to the Academic Council for approval of the programme structure of the new FYUP in Economics [(BSc Honors/BSc Honors with research)] as per NEP 2020. The Academic Council after deliberation approved the programme structure of the programme **TS/AC/55.6.1** The Academic Council resolved to approve the programme structure of the new FYUP in Economics [(BSc Honors /BSc Honors with research)].	**The programme has since been launched for the admission processes in the AY 23 - 24**

Resolution: The action taken report was noted.

Agenda Items for Consideration

Item No. 56.4 Agenda items

For consideration of the Academic Council please.

56.4.1 To approve inclusion of SWAYAM courses.

In accordance with the University Grants Commission (Credit Framework for Online Learning Courses through Study Webs of Active Learning for Young Aspiring Minds) Regulations, 2021 (Gazette notification No. No. F. 1-100/2016(MOOCs/e-content) dated March 25, 2021, TERI SAS shall recognize credits earned by students through the SWAYAM portal.

Guidelines:

1. The authority to approve inclusion of SWAYAM courses in a given program (for core or degree/discipline-specific elective courses) will be vested with the respective Chairpersons of the Departmental Boards of Studies in accordance with section 4(9) of the UGC gazette notification No. No. F. 1-100/2016(MOOCs/e-content) dated March 25, 2021. The same shall be subsequently approved by the Academic Council.
2. The decision to incorporate a SWAYAM course into a particular program (UG/PG/doctoral) shall be initiated by the program coordinator with a view to act as an enabler to the offered courses.
3. Laboratory- /field work-based courses **shall not be delivered through SWAYAM**.
4. The program coordinator will seek approval for the inclusion of chosen SWAYAM courses through the Departmental Board of Studies. The BoS will compare the coverage, level of the selected SWAYAM courses and the means of assessment with the published course outlines to evaluate their suitability for inclusion.
5. The decision of the BoS will be approved by the Academic Council.
6. Notwithstanding the above guidelines, SWAYAM materials may be freely employed as learning aids to enhance the quality of teaching based on the course-coordinator's judgement in any course of any type without requiring statutory approval. However, **such sessions shall not be counted towards credit or attendance requirements**.

It is proposed that SWAYAM courses be adopted in TERI SAS as follows from the forthcoming Academic Session 23 – 24 :

1. All program coordinators to identify the courses available on SWAYAM or from online platforms offered by IITs that can be presented as substitute to the offered courses.
2. Matching parameters be identified and suggestions / recommendations (if any) be provided.
3. The activity shall not be offered for core and laboratory courses.
4. Methodology for offering the courses be identified with assessment and other requirements leading to availing the credits.

Placed before the Academic Council for confirmation.

Resolution: Academic Council recommended that the courses proposed to be offered be scrutinised in detail for content mapping, duration of the course and assessment parameters.

Item No.56.4.2 To consider and approve course outlines under offer from the programmes AY 2023-24

Department of Biotechnology

No changes to the existing courses.

Department of Natural and Applied Sciences

56.4.2.1 To consider and approve first semester courses of the new 5-year Integrated Master Programmes in Data Science and Environmental Studies.

The Academic Council is requested to discuss and approve first semester courses of the new 5-year Integrated Master Programme Structure in Data Science and Environmental Studies programme placed at **Enclosure 1.**

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

Department of Sustainable Engineering

56.4.2.2. To consider the proposed changes in programme structure and course outlines of the MTech Urban Development Management (UDM) programme for approval.

In MTech (UDM) programme, the course "Urban systems and modelling (Course code: MEU 183)" shall be offered in 3rd semester as 2-credit course without any change in course outline thereby total number of credits to award degree will be 74. In the last meeting of AC, it was proposed by the programme coordinator of M.Tech (UDM) that the course "Urban systems and modelling" shall be changed to a 3-credit course and be offered in 2nd semester.

Seeking approval to revoke the changes proposed in last meeting of AC and re-instate the previous status quo of the course "Urban systems and modelling (Course code: MEU 183)" and approved that it shall be offered in 3rd semester as 2-credit course with overall credit requirement for the award of the degree would now be 74. The revised programme structure is attached as **Enclosure 2.**

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

56.4.2.3 To consider the proposed changes in course names and course outlines for the already approved programme structure of the MTech Renewable Energy Engineering and Management (REEM) programme for approval.

The new programme structure of M.Tech (REEM) has already been approved by the members of AC in the last meeting (attached as **Enclosure 3**). A new course titled "Applications of Machine Learning in Renewable Energy" has been introduced in 3rd semester.

Seeking approval for the course outline of the new course titled "Applications of Machine Learning in Renewable Energy" (attached as **Enclosure 4**) and acknowledge the change in name of following three courses (No change in syllabus/course outline):

(i) Course "Field Visits to RE plants/sites" offered in 2nd semester to be renamed as "Seminar on Field visits to RE plants/sites".
(ii) Course "Summer Internship" offered in 3rd semester to be renamed as "Dissertation - I/Industrial Project".
(iii) Course "Major Project" offered in 4th semester to be renamed as "Dissertation - II/Major Project".

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

56.4.2.4 To consider the course outline of the course "Independent Study" to be offered to second semester students of PG Diploma in Renewable Energy Management (PGDREM) for approval.

The course "Independent Study" is proposed to be offered to second semester students of PG Diploma in Renewable Energy Management (PGDREM). This course was part of the programme M.Tech (Renewable Energy Engineering and Management) with 3 credits. For PGDREM the proposed credit for the course is 4 with more emphasis given to literature review and/or experimental work and more tutorial hours. The course outline is attached as **Enclosure 5**.

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

Department of Policy and Management Studies

56.4.2.5 To consider and approve first semester course outline of FYUP Economics and third semester course outline of MSc (Economics) programme.

The Academic Council is requested to discuss and approve first semester course outline of FYUP Economics and third semester course outline of MSc (Economics) programme placed at **Enclosure 6.**

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

56.4.2.6 To consider and approve third semester course outline MA (Sustainable Development Practice) programme

The Academic Council is requested to discuss and approve third semester course outline of MA (Sustainable Development Practice) programme placed at **Enclosure 7.**

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

56.4.2.7 To consider and approve first semester course outlines of FYUP programme of BBA and third semester course outline of MBA (Sustainability Management) programme

The Academic Council is requested to consider and approve the first semester course outlines of FYUP programme of BBA and third semester course outline of MBA (Sustainability Management) programme placed at **Enclosure 8.**

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

For consideration of the Academic Council please.

Item No.56.4.3 Registration of Four MOOCs on "Buddhist Culture and Tourism" for July 2023 Semester on SWAYAM Platform

UGC has opened registration of its four MOOCs on "Buddhist Culture and Tourism" for July 2023 Semester on the SWAYAM Platform (www.swavam.qov.in/UGC). Out of these four courses, the first three are being re-run on the SWAYAM Portal, due to a huge response from the learners. These MOOCs are developed for the revival of India as a Global Centre of Buddhist Culture and Tourism.
The details of the MOOCs are as below:-

1. The History of lndian Buddhism
2. BuddhistPhilosophy.
3. Abhidhamma (Pali) .
4. Buddhist Tourism.

Higher Education Institutions (HEls) are requested to get these MOOCS approved and adopted through their statutory bodies as per the University Grants Commission (Credit Framework for Online Learning Courses through Study Webs of Active Learning for

Young Aspiring Minds) Regulations, 2021. The HEls may also use these MOOCs in a Blended mode of learning in their concerned Institutions.

These four courses may be added to the list of available open elective courses in the coming semester for both continuing and incoming students, including doctoral students.

Placed before the Academic Council for confirmation.

Resolution: Academic Council noted the same.

Item No.56.5 Any other item with the permission of the Chair

Nil

Enclosures:

1. First semester courses of the new 5-year Integrated Master Programmes in Data Science and Environmental Studies
2. Revised programme structure and course outlines of the MTech Urban Development Management (UDM) programme
3. Approved Programme Structure of MTech (REEM)
4. Course outline of the new course titled "Applications of Machine Learning in Renewable Energy"
5. Course outline of the course "Independent Study"
6. First semester course outline of FYUP Economics and third semester course outline of MSc (Economics) programme
7. Third semester course outline MA (Sustainable Development Practice) programme
8. First semester course outlines of FYUP programme of BBA and third semester course outline of MBA (Sustainability Management) programme

Enclosure 1

Year 1: Semester 1 (Data Science)

S.No.	Course	Type	Review	Credit	Credits
1.	Data Science Fundamentals	Major 1	✓	2	10
2.	Mathematics for Data Science	Major 2	✓	4	
3.	Statistics for Data Science	Major 3	✓	4	
4.	Minor from Data Science /Economics/ Management	Minor (Elective)	107	4	4
5.	Environment and Society	Multidisciplinary 1	109	2	2
6.	Communication Skills and Technical Writing	AEC 1	#	2	2
7.	Fundamentals of Computers and Programming	SEC 1	#	2	2
8.	Principles and Concepts of Sustainability	VAC 1	✓	2	2
Credits earned				**22**	**22**

Already approved by AC

Year 1: Semester 1 (Environmental Studies)

S.No.	Course	Type	Review	Credit	Credits
1.	Ecology and Ecosystems	Major 1	✓	4	10
2.	Earth and Earth Surface Processes	Major 2	✓	4	
3.	Environment and Society	Major 3	✓	2	
4.	Minor from Data Science /Economics/ Management	Minor (Elective)		4	4
5.	Data Science Fundamentals	Multidisciplinary	✓	2	2
6.	Communication Skills and Technical Writing	AEC 1	#	2	2
7.	Fundamentals of Computers and Programming	SEC 1	#	2	2
8.	Principles and Concepts of Sustainability (SD)	VAC 1	✓	2	2
Credits earned				**22**	**22**

Already approved by AC

Course Title: Data Science Fundamentals			
Course code:	**No. of credits:** 2	**L-T-P: 20-10-0**	**Learning hours: 30**
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

The course introduces the multidisciplinary nature of data science and develops a conceptual understanding on what constitutes data science. The course gives premise of not only the composites of *data analysis with data processing methods and domain expertise,* cultivates data science but also deals with data transformation leading to understandable and actionable knowledge for informed decision making. The course develops an understanding to overcome data complexity and the limitations of classical statistics through data science. It develops a wider understanding on how data science is different from statistics, machine learning, computer science, data analytics despite all of them being interrelated. The course introduces the students on how Data Science develops the ability to overcome data complexity and the limitations of classical statistics and machine learning techniques where a data scientist deals simultaneously with heterogeneous data sources coping with non-independencies, non-normalities, and hypothesis on variable's distributions. The students get a complete understanding of Data Sciences broader scope and arena and its associated elements.

Course objectives

- To develop broader lens of data science and its fundamentals.
- To understand how data science is different from several data based conventional disciplines.
- To understand the basic components of Data Science what essentials cultivate a data scientist with introductory functions of data science and data scientists

Course content

Module	Topic	L	T	P
1	**Data Science Concepts**			
	The objective of this module is to gain familiarity with the phrases, terms and jargons used in Data Science. The module introduces data science concepts, its development and future scope. The module further strengthens the on what data specialization makes a data scientist different from data specialists in classical data based disciplines. What is data science, what is included in data science in its broader context, what are current challenges and its futuristic scope of data science. The thematics in this module are: What is data science, what is included in data science in its broader context, what are current challenges and its futuristic scope of data science. Data Science: Definition, benefits and uses, issues and challenges, big data and future of data science; Data scientist's role and responsibility.	5		
2	**Data Science Process Life Cycle**			
	The purpose of this module is to showcase the centrality of data science process life cycle, discovering the answers for basic questions including requirements, priorities of data science projects, collecting structured or	5		

	unstructured data, processing and fine tuning the raw data, factors influencing data life cycle and ultimately leading to model development and deployment. Various expertise and components required to build a data scientist. It also discusses attributes and qualities of data and data scientists. This module addresses the concepts of: Data Science Process: identify research goals, data retrieving and preparation, statistical inference, exploratory data analysis and model building and deployment, Datafication, Data scientist, Data science profile, Meta-definition, Data warehousing.			
3	**Data modelling and Data mining**			
	This module connects various themes of 'data modelling'. The previous two modules are building blocks for this module. The goal is to illustrate the types of data used and stored within the system, the relationships among these data types, the ways the data can be grouped and organized and its formats and attributes. data modelling employs standardized syllogistic figures and techniques. The module also introduces the concept of sorting the data to find a patterns within the datasets leading to a logical conclusion. The following topics are introduced in this module: Modelling of data and pattern recognition from data mining; case study involving data modelling and data mining.	5	5	
4	**Data Munging**			
	After making the students familiar with the theoretic basis of the components of data science in the previous modules, this module touches upon the transforming the erroneous data or unusable data into useful and usable data. The module discusses the stages of data munging from data discovery, data structuring, data cleansing, data enrichment to data validation along with benefits and challenges with data munging. The module also introduces the concepts of data collection via internet, the crowdsourcing. Following topics are addressed in this module: Properties, Languages; Data collections and cleaning, crowdsourcing and its application.	5	5	
	Total	20	10	0

Evaluation criteria

- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 25%
- Minor Test 2: Written test [at the end of teaching of module 3] -- 25%
- Major Test: Written test [at the end of the semester, full syllabus] -- 50%

Learning outcomes

By the end of the course, students will:

- command a critical understanding of the key concepts of data science, attributes of data scientist and understand the components of data science and data science life cycle. [Module 1 and 2; Minor Test 1]
- develop knowhow of data modelling and its requirement. Understanding the foundation of pattern recognition through data mining [Module3; Minor Test 2]
- understand the conceptual, theoretical, methodical, requirements of data collection, cleaning and analysis of data collected through multiple platforms [Module 1, 2, 3, 4; Major Test]

Pedagogical approach

- The course critically evaluates the concepts of data sciences and develops discussion in classroom through lectures, case studies and tutorials.
- The course doesn't dwell into the hardware or software based analysis rather analyzes case studies to develop understanding of data science components

Reading Resources (* = compulsory readings)

*Cielen, D., Meysman, D.B.A., Ali, M. (2016). *Introducing data science: big data, machine learning, and more, using Python tools*. Simon and Schuster.

Grus, J. (2019). *Data science from scratch: first principles with python*. O'Reilly Media.

O'Neil, C., Schutt, R. (2013). *Doing data science: Straight talk from the frontline*. O'Reilly Media, Inc.

Peng, R.D. (2016). *R programming for data science* (pp. 86-181). Victoria, BC, Canada: Leanpub.

*Pierson, L. (2021). *Data science for dummies*. John Wiley & Son.

Skiena, S.S. (2017). *The data science design manual*. Springer.

VanderPlas, J. (2016). *Python data science handbook: Essential tools for working with data*. O'Reilly Media, Inc.

Student Responsibilities

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

Course Reviewers

1. **Dr Om Prakash Rishi**, Associate Professor, Department of Computer Science & Informatics, University of Kota, Rajasthan
2. **Dr Varun Gupta**, Professor (CSE) & Head (AS), Chandigarh College of Engineering & Technology, Chandigarh

Course Title: Mathematics for Data Science			
Course code:	**No. of credits:** 4	**L-T-P: 45-15-0**	**Learning hours: 60**
			L: Lectures; **T:** Tutorials**; P:** Practicals
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

The course is intended to act as a foundational course for other courses that are offered as part of the bachelor's degree in data science that require a strong mathematical background. It will give an overview of the fundamental mathematical methods used for investigating environmental data.

Course objectives

The course aims to build conceptual understanding and applied skills in said mathematical domains of linear algebra – matrices, determinants and vector spaces; calculus – differential and integral calculas; and differential equations.

Course content

	Topic	L	T	P
	Module 1: Introduction to mathematics for data science			
1	Introduction: Quantitative aspects in data driven decision making, tools available–deterministic (analytical and numerical), stochastic processes; mathematical modelling.	3		
2	Review of relations and functions, trigonometry, logarithms, quadratic equations.	5	1	
	Module 2: Linear algebra – matrices and determinants			
3	Matrices: Types of matrices, algebra of matrices, rank, transpose, and inverse of a matrix, symmetric, skew symmetric, and invertible matrices, square matrices, diagonal matrix, scalar matrix, orthogonal matrix.	5	2	
4	Determinants: Properties of determinants, singular and non-singular matrices, examples, finding an adjoint and inverse matrix, applications of determinants and matrices, definition of left/right eigenvalues and eigenvectors, Caley – Hamilton theorem, singular value decomposition, interpretation of eigenvalues/vectors, characteristic polynomial, diagonalization of a matrix, matrix factorization: Gauss elimination, row canonical form, Gauss-Jordan-LU decomposition.	5	2	
	Module 3: Linear algebra – vector spaces			
5	Introduction of vector spaces, subspaces, linear dependence, and independence of vectors, spanning set, basis and dimension, finite dimensional vector spaces and examples, linear transformation, kernel, range, matrix representation of a linear transformation, rank-nullity.	6	3	
6	Theorem, eigenvalues and eigenvectors, system of linear equations, consistency of a system of linear equations.	3		
	Module 4: Differential and integral calculus			

7	Differential calculus: Limits and continuity, derivatives and differentiation, logarithmic differentiation, successive differentiation, infinite series, applications of differential calculus, increasing and decreasing functions, the role of the Hessian maxima and minima and related extreme conditions, multivariable calculus.	7	3	
8	Integral calculus: Indefinite integrals, methods of integration – integration by substitution, by parts, decomposition into sums, applications. Definite integrals, theorems of definite integrals and evaluation of definite integrals, double integrals, applications of integrals and area under curves.	7	3	
	Module 5: Differential equations			
9	Linear and non-linear differential equations, solutions of differential equations, differential equations of first order and first degree, ordinary differential equations.	4	1	
	Total	**45**	**15**	

Evaluation criteria

- Minor 1: Written test [at the end of teaching of modules 1 and 2] -- 15%
- Minor 2: Written test [at the end of teaching of module 3] -- 15%
- Assignment: 20%
- Major Test: Written test [at the end of the semester, full syllabus] -- 50%

Learning outcomes

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

- understand deterministic and stochastic methods for analyzing data; and comprehend the basic mathematical concepts like relations and functions. [Module 1; Minor1]
- interpret the concepts of matrices and determinants in data science. [Module 2; Minor 1]
- apply linear and non-linear equations in real world problems. [Module 3; Minor 2]
- acquire the necessary background for advanced courses in Data Science such as coding theory, artificial intelligence, numerical computation. [Modules 1, 2, 3, 4 and 5; Major Test]

Pedagogical approach

- The course will be delivered through lectures and tutorials that will focus on developing necessary mathematical foundations for Data Science.
- The course will also focus on classroom discussions and assignments to improve the analytical and problem-solving capabilities of the students.

Reading Resources

Kreyszig, E. (2010). *Advanced Engineering Mathematics*. John Wiley.

Nield, T. (2022). *Essential Math for Data Science*. O'Reilly Media, Inc.

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

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

Ren, J., Wang, H. (2023). *Mathematical Methods in Data Science*. Elsevier.

Spivak, M. (2006). Calculus. Cambridge University Press.

Strang, G. (2006). *Linear Algebra and its Applications*. Belmont, CA: Thomson, Brooks/Cole.

Thomas, G.B., Fineey, R.L, Weir, M.D., Giordano, F.R. (203). *Thomas's Calculus*. Addison-Wesley.

Student Responsibilities

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

Course Reviewers:

1. **Reviewer 1 – Dr Gurminder Singh,** Associate Professor, Department of Mathematics, Birla Institute of Technology (Mesra) Jaipur Campus
2. **Reviewer 2 – Prof. Shakir Ali**, Professor, Department of Mathematics, Aligarh Muslim University

Course title: Statistics for Data Science			
Course code:	**No. of credits:** 4	**L-T-P: 30-15-00**	**Learning hours: 60**
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

The course has been designed and intended to help students to understand the fundamentals of statistics for data analysis. Students will be learning about data collection and how to extract information from data. The course introduces the concepts of correlation, regression, and hypothesis testing.

Course objectives

- Become familiar with the basic concepts in statistics and exploratory data analysis.
- Introduce descriptive statistics and tools of data visualization.
- Differentiate between descriptive and inferential statistics.
- Understand the concept of data sampling, parameter estimation and hypothesis testing.
- Become aware of a wide range of applications of statistics and data analysis in decision making.
- Develop technical skills to use statistical tools and software in data analysis.

Course content

	Topic	L	T	P
	Module 1: Introduction			
1	Mathematical models – deterministic and stochastic; generation of environmental data; stochastic processes in environment; the nature of random variables; populations and samples; parameters and statistics.	1		
	Module 2: Review of Basic Concepts			
2	Measurement theory, levels of measurement; statistical descriptors of data – numerical and graphical; Chebyshev's theorem; measurement uncertainty – accuracy, precision, and bias. Probability theory: probability concepts; probability distribution functions and their applications – discrete and continuous distributions.	8	2	
	Module 3: Data sampling			
3	Types of sampling designs –probability and non-probability sampling; sampling theory, sampling distributions; parameter estimation, point and interval estimates; confidence interval estimation of – means, differences of means, proportions, difference of proportions, variances, ratio of variances sample size determination for different sampling designs	12	6	
	Module 4: Tests of hypothesis			
4	Hypothesis testing – parametric and non-parametric tests (concerning means, differences of means, proportions, difference of proportions, variances, ratio of variances)	12	5	
	Module 5: Correlation and simple regression analysis			

5	Correlation analysis: graphical analysis, bivariate correlation, covariance, correlation coefficient, distribution of correlation coefficient and its statistical significance. Simple regression analysis: assumptions and definitions, principle of least squares, regression parameters their distribution and statistical significance, applications in process description and prediction	12	2	
	Total	45	15	

Evaluation criteria

- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 15%
- Minor Test 2: Written test [at the end of teaching of module 3 and 4] -- 15%
- Major Test: Written test [at the end of the semester, full syllabus] -- 50%
- Assignment: 20%

Learning outcomes

After completing this course, the students will be able to

- explain how data is collected, organized, and stored. [Module 1 and 2; Minor Test 1]
- build, and prepare data for use with a variety of statistical methods and models. [Module 3; Minor Test 1]
- analyse the relation between variables by using correlation and regression methods and illustrate significance of hypothesis testing [Module 3 and 4; Minor Test 2]
- extract information and draw scientific inference from data to solve real world problems. [All Modules; Major Test]

Pedagogical approach

- The course will be delivered through lectures that will focus on developing a clear foundation of various statistical tools and techniques.
- The course will also focus on classroom discussions and practical to give students the analytical knowledge to work with data and understand the problems.

Reading resources

Ayyub, B.M., McCuen, R.H. (2016). *Probability, Statistics, and Reliability for Engineers and Scientists*. CRC press.

Bruce, P., Bruce, A., Gedeck, P. (2020). *Practical Statistics for Data Science*. O'Reilly Media, Inc.

Chan, S.H. (2021). *Introduction to Probability for Data Science*. Michigan Publishing.

Johnson, R.A. (2009). *Miller & Freund's Probability and Statistics for Engineers*. PHI Learning Pvt Ltd., New Delhi.

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

Matloff, N. (2019). *Probability and Statistics for Data Science*. Chapman and Hall/CRC.

Miller, J.D. (2017). *Statistics for Data Science*. Packt Publishing.

Moore, D.S., McCabe, G.P. and Craig, B.A. (2009). *Introduction to the Practice of Statistics*. W.H. Freeman and Co., New York.

Montgomery, D., Runger, G.C. (2003). *Applied Statistics and Probability for Engineers*. John Wiley.

Walpole, R.E., Myers, S.L., Myers, R.H. and Ye, K.E. (2011). *Probability and Statistics for Engineers and Scientists*. Pearson Education, Prentice Hall.

Suggested Readings

Gupta, S.C., Kapoor, V.K. (2014). *Fundamentals of Mathematical Statistics*. Khanna Publications.

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

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

Ross, S.M. (2014). *Probability and Statistics for Engineers and Scientists*. Academic Press.

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

Soong, T.T. (2004). *Fundamentals of Probability and Statistics for Engineers.* John Wiley & Sons Ltd.

Wilks, D.S (1995). *Statistical Methods in Atmospheric Sciences: An Introduction*. Academic Press, Inc.

Student responsibilities

The students are required to come prepared with readings that are suggested during the class. They are also expected to participate and further strengthen their understanding of concepts through the practical.

- **Reviewer 1 – Dr. Sumanth Chinthala,** Assistant Professor, Department of Civil Engineering, National Institute of Technology, Warangal
- **Reviewer 2 – Dr. Krishan Kumar,** Professor, School of Environmental Sciences, JNU

Course title: Basic Concepts of Sustainable Development			
Course code:	**No. of credits: 2**	**L-T-P: 15-15-0**	**Learning hours: 30**
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: VAC		**Course offered in:** Semester 1	

Course description

The course seeks to develop a basic understanding of sustainable development while building a holistic view of the associated concerns and challenges. This course familiarizes students with complex relationships between social, economic and environmental processes for sustainable development.

The course topics will be grounded in a practical, multi-disciplinary approach that will essentially focus on the inter-relationship of agriculture and food security, economics, environment and climate science, management, policy, anthropology and social studies, public health and nutrition, technology and engineering; thereby exposing students to current debates, inter-disciplinary perspectives in analysing constraints and opportunities as well as various approaches and responses to key developmental challenges.

Course objectives

- To build an inter-disciplinary perspective on understanding sustainable development concerns.
- To empower students to critically analyse different, often competing, definitions of sustainability driven by the perspectives and interests of societal stakeholders.
- To provide students with a general introduction to approaches and responses towards mitigating the challenges associated with sustainability.

Course content

Module	Topic	L	T	P
1	**Sustainable Development – Evolution, Approaches, Interpretations**			
	This is an introductory module in developing a basic understanding of the meaning, history, and efforts towards achieving sustainable development. The module also introduces the linkage between economic growth and human development while detailing all international and national efforts towards achieving sustainability. The focus areas covered under this module are: Industrial revolution, economic growth and development, environmental movement, our common future, weak vs strong sustainability, Earth summit and outcomes, human development, Millennium development goals: status (global and Indian), sustainable development goals: status (global and Indian), measuring sustainability	5	5	
2	**Challenges to Sustainable Development**			
	The purpose of this module is to gain familiarity with various challenges in the path to sustainable development. It discusses these challenges to deliver a clear understanding of how each of these domain-specific challenges need to be addressed differently. The specific domains covered under this module are:	6	6	

	Extreme poverty and inequalities, agriculture, population & food security, public health and nutrition, education, natural resources (forests, biodiversity, energy, water), climate change, disaster – vulnerability and risks			
3	**Responses to Sustainable Development Challenges**			
	After gaining familiarity with the basic concepts and various challenges in the path to sustainable development, this module discusses the various approaches and specific responses that have been adopted to address and mitigate the sustainable development challenges. The strategies to be discussed under this module include: Participatory approaches, decentralized approaches, gender and human rights, technology and engineering, policy coherence, inclusive growth, role of business - Corporate Social Responsibility, in the circular economy and ESG reporting	4	4	
	Total	15	15	

Evaluation criteria

- Assignments -- 20%
- Minor Test 1: Written test [at the end of teaching of module 1] -- 15%
- Minor Test 2: Written test [at the end of teaching of module 2] -- 15%
- Major Test: Written test [at the end of the semester, full syllabus] -- 50%

Learning outcomes

Upon successful completion of the course, the students would be able to:

- understand and internalize the concept of sustainability and become familiar with sustainable development goals, targets, and approaches. [Module 1; Minor Test 1]
- become familiar with current debates and perspectives in analyzing constraints and opportunities for sustainable development. [Module 1 and 2; Minor Test 2]
- develop a practitioner's perspective towards environmental management. [Module 3; Major Test]

Pedagogical approach

- The course will be delivered through lectures and tutorials that focus on developing a clear foundation of the core concepts of sustainable development and associated international and national efforts.
- The course will also focus on classroom discussions and assignments to discuss current approaches and to develop student's perspective towards addressing the domain-specific challenges.

Reading resources

At kinson, G., Dietz, S., Neumayer, E. (2007). *Handbook of sustainable development*. Edward Elgar Publishing Limited, UK.

Blewitt, J. (2008). *Understanding sustainable development*. Earthscan Publications Ltd, The UK.

Dresner, S. (2002). *The principles of sustainability.* Earthscan, London.

Elliott, J.A. (2006). *An introduction to sustainable development*. Routledge, UK.

Mulligan, M. (2010). *An introduction to sustainability, environmental, social, and personal perspectives*. Routledge.

Robertson, M. (2017). *Sustainability principles and practice*. Routledge, London & NY.

Sachs, J. (2006). *The end of poverty: economic possibilities for our time*. Penguin.

Sachs, J. (2015). *The age of sustainable development*. Columbia University Press.

World Commission on Environment and Development. (1987) Our common future. Oxford, OUP.

Student responsibilities

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

Course Reviewers

1. Dr. Swati Sharma (Kwatra), Assistant Professor, Department of Development Communication and Extension, Lady Irwin College, University of Delhi, New Delhi
2. Dr. Manisha Choudhary, National Coordinator, Partnership for Action on Green Economy (PAGE) India, UN Environment Programme India Office, New Delhi

Year 1: Semester 1 (Environmental Studies)

S.No.	Course	Type	Review	Credit	Credits
1.	Ecology and Ecosystems	Major 1	✓	4	10
2.	Earth and Earth Surface Processes	Major 2	✓	4	
3.	Environment and Society	Major 3	✓	2	
4.	Minor from Data Science/Economics/ Management	Minor (Elective) 1		4	4
5.	Data Science Fundamentals	Multidisciplinary		2	2
6.	Communication Skills and Technical Writing	AEC 1	#	2	2
7.	Fundamentals of Computers and Programming	SEC 1	#	2	2
8.	Principles and Concepts of Sustainability (SD)	VAC 1	✓	2	2
Credits earned				**22**	**22**

Already approved courses by AC

Course Title: Ecology and Ecosystems			
Course code:	**No. of credits:** 4	**L-T-P: 45-0-30**	**Learning hours: 60**
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

This course aims to introduce the basic concepts of ecology and ecosystems. The course will essentially be helpful in developing an understanding of various processes and interactions between the biotic components and their physical environment. It includes providing an understanding of the structure and functions of the different ecosystems as well as dynamics and nutrient cycling at different levels. The fundamentals acquired through this course will not only be helpful in developing a deeper appreciation of complexity in natural systems but also help in understanding the core basis of any practical interventions aimed at conservation or rejuvenation of ecosystems.

Course objectives

- To build the basic concepts regarding the interactions of the biotic components with the abiotic components.
- To develop an understanding of structure, functions, and ecological efficiency within different ecosystems.
- To provide fundamental knowledge of nutrients uptake and biogeochemical cycling in the environment.

Course content

	Topic	L	T	P
1	**Module 1: Introduction to Ecology**			
	This is an introductory module to gain familiarity and build a foundation of some core concepts and their definitions in ecology: Basic concepts and definitions: ecology, landscape, habitat, ecozones, biosphere, ecosystems, trophic organization in ecosystem, ecosystem stability, resistance and resilience; autecology; synecology; major terrestrial biomes.	5		
2	**Module 2: Ecology of Individual, Population and Communities**			
	This module focuses on delivering in-depth knowledge of principles of ecology operational at different levels of aggregation i.e., individual, population and community-level. It discusses these principles in a manner to deliver a very dynamic outlook of all the processes operating simultaneously at different levels (or scales) giving rise to transformations within ecosystems. The focus areas covered under this module are: Ecological amplitude; Liebig's law of the minimum; Shelford's law of tolerance; phenotypic plasticity; ecotypes; ecoclines; acclimation; ecological niche and types;	5		
	Characteristics of population: density, dispersion, natality, mortality, life tables, survivorship curves, age structure; population growth: geometric, exponential and logistic.	4		
	Community characteristics, keystone species, ecotone and edge effect; species interactions: mutualism, symbiosis, commensalism, amensalism,	4		

	proto-cooperation, predation, competition, parasitism, mimicry, herbivory. Ecological adaptations and factors affecting plant communities (soil, water, wind, fire, temperature)			
	Ecological succession: Primary and secondary successions, models/process and types of successions, climax community concepts, examples of succession	4		
3	**Module 3: Ecological System**			
	After gaining familiarity with the basic concepts and terminologies in ecology, this module follows a systems approach to introduce various ecosystems and the processes within that make these unique entities functional as efficient natural units. The concepts to be discussed under this module include: Concept and types of ecosystems: forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands.	4		
	Structure and functions of ecosystem; Ecosystem boundary, ecosystem function; ecosystem metabolism; primary and secondary production, GPP, NPP and trophic efficiency.	4		
	Ecosystem connections: food chain, food web; models of energy flow, decomposition processes and detritus pathway of energy flow, ecological efficiencies, ecological pyramids: number, biomass, and energy.	3		
4	**Module 4: Biogeochemical Cycle and Nutrient Cycling**			
	The processes that sustain the biosphere through cycling of essential nutrients are to be discussed as part of this module. The module will be essentially connecting the geochemical cycling in nature with the biotic systems that accumulate and propagate the flow of these materials as well as aid in their decomposition, releasing them back into the environment. The contents of this module are as follows: Carbon cycle; nitrogen cycle; phosphorus cycle; sulphur cycle; hydrological cycle; nutrient cycle models; biotic accumulation; ecosystem losses.	4		
	Nutrient supply and their uptake, decomposition, and nutrient release; nutrient use efficiency; nutrient budget; nutrient conservation strategies.	4		
5	**Module 5: Species Invasion**			
	This module covers an introduction to the concepts associated with invasion of species within ecosystems and the associated changes, as discussed under following topics: Concept of exotics and invasive; invaders: characteristics, stages, and mechanisms of invasions; impacts of invasion on ecosystem and communities.	4		
	Practical			
	Determination of minimal quadrat size for the study of herbaceous vegetation in the campus, by species area curve method (species to be listed). [Module 2]			5
	Quantitative analysis of herbaceous vegetation in the campus for frequency and comparison with Raunkiaer's frequency distribution law. [Module 2]			5
	Quantitative analysis of herbaceous vegetation for density and abundance in the campus [Module 2]			5
	To study pyramids of numbers, biomass, and energy. [Module 3]			5
	Study of morphological adaptations of hydrophytes and xerophytes. [Module 3]			5
	Field visit: invasive species identification, terrestrial and aquatic ecosystems			5

	(forests, grasslands, wetlands, biodiversity parks/to develop a working model of any ecosystem [Module 3, 5]			
	Total	45		30

Evaluation criteria

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

Learning outcomes

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

- Understand the structure of various ecosystems and the role of individual, population and communities within these ecosystems [Module 1 and 2; Minor Test 1]
- Become familiar with the connections and interactions between various components of the ecosystems [Modules 3; Minor Test 2]
- Understand energy flow, nutrient uptake and recycling in the ecosystems [Module 4; Major Test]
- Develop a general understanding of the impact of invasive species on ecosystems and communities [Module 5; Major Test]

Pedagogical approach

- The course will be delivered through lectures and tutorials that focus on developing a clear foundation of the core concepts of ecology, ecosystems, and associated processes.
- The course will also focus on classroom discussions, practical and assignments aimed at appreciating the complexities within natural systems and the need to preserve this delicate balance.

Reading resources

Ambasht, R.S., Ambasht, N.K. (2015). A textbook of plant ecology. CBS; 15th edition.

Daubenmire, R.F. (1974). Plants and environment. A textbook of plant autecology, John Wiley & Sons; 3rd edition.

Groom. B., Jenkins. M. (2000). Global biodiversity: Earth's living resources in the 21st century. World Conservation Press, Cambridge, UK.

Gurevitch, J., Scheiner, S.M., Fox, G.A. (2002). The ecology of plants. Sinauer Associates Inc.

Kormondy, E. J. (1996). Stability and change in communities. Concepts of ecology. Cuarta edición, Prentice Hall, New Jersey.

Loreau, M. & Inchausti, P. (2002). Biodiversity and ecosystem functioning: Synthesis and perspectives. Oxford University Press, Oxford, UK.

Odum, E.P. (1971). Fundamentals of ecology. W.B. Sounders.

Singh, J.S., Singh, S.P., Gupta, S.R. (2015). Ecology, environment and resource conservation. Anamaya Publications.

Wilson, E.O. (1985). The biological diversity crisis. Bio Science.

Student Responsibilities

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

Course Reviewers

The course is reviewed by following reviewers:

1. Dr. Saloni Bahri, Associate Professor, Department of Botany, Miranda House
2. Dr. Madhu Bajaj, Associate Professor, Department of Botany, Miranda House
3. Dr. Devayani Muley, Associate Professor, Department of Botany, Zakir Hussain College

Course Title: Earth and Earth Surface Processes			
Course code:	**No. of credits:** 4	**L-T-P: 60-0-0**	**Learning hours: 60**
			L: Lectures**; T:** Tutorials**; P:** Practicals
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

This course provides introductory knowledge of the earth and its surface processes. Due to their dynamic nature, these processes affect the environment. Therefore, any environmental change due to these earth surface process needs to be studied carefully before making any policy decisions or targeted interventions. The course content describes the origin of the Earth, its structure, and terrestrial processes, surrounding atmospheric phenomena and oceanic environment. Combined knowledge of all these processes provides the students with a basic understanding of the earth and its environment. It will also be helpful in developing basics for any environmental or earth system modeling studies later.

Course Objectives

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

- Understanding of the Earth's structure, composition, and surface processes.
- Understanding of the atmospheric environment and associated interactions
- Understanding the oceanic environment and land-atmosphere-ocean interactions.

Course content

	Topic	L	T	P
1	**Module 1: Origin and Structure of Earth**			
	Being an introductory module in earth sciences, this module familiarizes students with the following concepts regarding the origin, history and structure of the Earth: Origin of the solar system and formation of the Earth: internal structure of Earth; formation and composition of core, mantle and crust, concept of geological time scale	4		
2	**Module 2: Geology and Geomorphology**			
	This module is focused on developing fundamentals of internal structure, composition and surface-subsurface processes associated with the Earth's land masses. The contents of this module are as follows: Plate-tectonics: concept of plate tectonics, seafloor spreading and continental drift. Earthquake and earthquake belts; volcanoes- types, products, and distribution of volcanic belts.	6		
	Materials of the solid Earth. Types of rocks – igneous, sedimentary and metamorphic; Rock cycle. Rock and ore forming minerals, weathering and soils, soil formation and their types	6		
	Terrestrial forces: endogenic and exogenic, continental drift, mountain building, earthquake, fold, and fracture; Plate-tectonic theory, seafloor spreading.	6		
	Slope development theory (Penk and Davis), biological, chemical and physical process of erosion, deposition and transportation, agents of erosion and their cycle	6		

3	**Module 3: Atmosphere**			
	This module introduces students to the composition and various phenomena associated with the Earth's atmosphere. Its focus is primarily to impart a basic understanding of how the Earth's atmosphere impacts the land through various interactions and processes as covered under following topics: Atmosphere: evolution of earth's atmosphere, composition and structure of the atmosphere, stratospheric ozone, significance, atmospheric temperature: maximum, minimum, mean temperature, temperature range, factors regulating atmospheric temperature/ temperature controls, lapse rate and types, temperature inversion & atmospheric stability	8		
	Atmospheric pressure on Earth, factors affecting the atmospheric pressure, atmospheric pressure winds, factors affecting winds, types of wind, fronts - frontogenesis and frontolysis	8		
	Cloud, cloud formation, types of cloud, precipitation, relative humidity, precipitation lapse rate, adiabatic cooling effect	4		
4	**Module 4: Oceanography**			
	This module introduces students to the various phenomena associated with the Earth's oceanic environment. Its focus is primarily to impart a basic understanding of how land-atmosphere-ocean interactions give rise to the entire system for supporting life on the Earth. The contents of this module are as follows: Oceans and their distribution, ocean topography, ocean temperature, salinity effect, density of seawater; dynamics of seawater: tides and waves, current; Indian tropical monsoon and Indian ocean; marine resources: red mud, coral reef, flora and fauna, atmosphere-ocean-land interaction	12		
	Total	60		

Evaluation criteria

- Assignment: 20%
- Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 15%
- Minor Test 2: Written test [at the end of teaching of module 3] -- 15%
- Major Test: Written test [at the end of the semester, full syllabus] -- 50%

Learning outcomes

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

- understand the various processes operating on the Earth's surface [Module 1; Minor Test 1]
- understand the interactions between the Earth surface processes, atmosphere and oceans [Modules 2, 3 and 4; Minor Test 2 and Major Test]
- develop a general understanding of how various abiotic processes and associated interactions support life on the Earth. [Modules 2, 3 and 4; Major Test]

Pedagogical approach

- The course will be delivered through lectures that focus on developing a clear foundation of the core concepts of the Earth processes and associated interactions.
- The course will also focus on classroom discussions and assignments to further develop the student's fundamental knowledge of the Earth processes.

Reading resources

Bridge, J., Demicco, R. (2008) *Earth surface processes, landforms, and sediment deposits*. Cambridge University Press.

Cronin, V.S. (2018). *Laboratory manual in physical geology*. Pearson.

Garrison, T.S. (2012). *Oceanography: an invitation to marine science*. Cengage Learning.

Grotzinger, J., Jordan, T.H. (2010). *Understanding earth*. Macmillan.

Keller, E.A. (2011). *Introduction to environmental geology*. 5th Edition. Pearson Prentice Hall.

Leeder, M., Arlucea, M.P. (2005). *Physical processes in earth and environmental sciences*. Blackwell Publishing.

Ludman, A., Marshak, S. (2010). *Laboratory manual for introductory geology*. WW Norton & Company.

McCann, T. (2021). *Pocket guide geology in the field.* Springer, Bonn, Germany.

Pelletier, J.D. (2008). *Quantitative modeling of earth surface processes (Vol. 304)*. Cambridge University Press. Chicago.

Rutford, R.H., Carter, J.L. (2018). *Zumberge's laboratory manual for physical geology.* 16th Edition. McGraw-Hill Education, New York, USA.

Strahler, A.H., Strahler, A. (2013). *Introducing physical geography*. Wiley, Hoboken, NJ, USA.

Vatal, M., Sharma, R.C. (2017). *Oceanography for geographers*. Surjeet Publications.

Student Responsibilities

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

Course Reviewers

The course is reviewed by following reviewers:

1. Dr. Ram Avtar, Associate Professor, Hokkaido University, Sapporo, Hokkaido 060-0808, Japan
2. Dr. Ashima Saikia, Associate Professor, Department of Geology, University of Delhi

Course Title: Environment and Society			
Course code:	**No. of credits: 2**	**L-T-P: 30-0-0**	**Learning hours: 30**
Pre-requisite course code and title (if any): None			
Department: Natural and Applied Sciences			
Course coordinator:		**Course instructor:**	
Contact details:			
Course type: Core		**Course offered in:** Semester 1	

Course Description

The course is designed to understand the association between the environment and society to understand the role played by society and its interface over the environment. It focuses on the interplay between humans and their environment including complex issues such as climate change, population growth, pollution, and management of natural resources faced by our modern society. Further, the course aims to understand community participation towards sustainable practices and environmental protection.

Course objectives

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

- To develop critical thinking on global environmental challenges, conflicts between development and environment, and environmental impacts on society.
- To understand the importance of community participation for sustainable practices and environmental protection.

Course content

	Topic	L	T	P
1	**Module 1: Social Perspectives of Environment**			
	This module focuses on introducing social perspectives, thought processes and ethics to the students through the following topics: Social and cultural construction of 'environment'; environmental thought from historical and contemporary perspective in light of the concepts of environmental wellbeing and Aldo Leopold's land ethics.	4		
2	**Module 2: Global Environmental Issues**			
	This module focuses on discusses the contemporary environmental issues being faced globally and their historical context. It will be highly relevant from learning point to view to develop a broader perspective of these issues. The topics covered under this module are as follows: Significant global environmental issues such as climate change and resource depletion; historical developments in cultural, social and economic issues related to land, forest, and water management including land reclamation in a global context; interface between environment and society, environmental ethics	10		
3	**Module 3: Development and Environment Conflict**			
	It is essential to understand the linkages between the issues related to development, how these have been leading to conflicts within societies and impacting the environment as well. Under the following topics, this module discusses in detail such issues and the efforts being carried out to minimize these conflicts: Developmental issues and related impacts such as ecological degradation;	10		

	impact of industry and technology on environment, environmental pollution; development-induced displacement, resettlement and rehabilitation: problems, concerns and compensative mechanisms; climate change at global level (North-South Divide); efforts and commitments made by India.			
4	**Module 4: Environment and Community Participation**			
	This module emphasizes on studying, through case studies, the importance of community-level initiatives in management of environmental issues and achieving sustainability. The module contents are as follows: Ecosystem services; state, corporate, civil society, community, and individual-level initiatives to ensure sustainable development; ecosystem management along with sustainable development; case studies of environmental movements-global and local; environmental education and awareness.	6		
	Total	30		

Evaluation criteria

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

Learning outcomes

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

- gain the understanding of complex relations between society and the environment. [Modules 1, 2 and 3; Minor Tests 1 and 2]
- enhance knowledge of traditional community practices for sustainability and resource conservation. [Module 4; Major Test]

Pedagogical approach

- The course will be delivered through lectures that will focus on developing critical thinking and a clear foundation of the linkages between development and society.
- The course will also focus on classroom discussions and assignments to discuss current approaches and to develop student's perspective towards improving community participation and addressing the domain-specific challenges.

Reading resources

Carson, R. (2015). *Silent spring. In thinking about the environment*. Routledge.

Chokkan, K.B., Pandya, H., Raghunathan, H. (2004). *Understanding environment*. Sagar Publication India Pvt. Ltd., New Delhi.

Elliot, D. (2003). *Energy, society and environment, technology for a sustainable future.* Routledge Press.

Guha, R. (2000). *The unquiet woods: ecological change and peasant resistance in the Himalaya*. University of California Press.

Leopold, A. (1949). *The land ethic*. Chicago, USA.

National Research Council (NRC). (1996). *Linking science and technology to society's environmental goals*. National Academy Press.

Pandit, M.K. 2013. *Chipko: Failure of a Successful Conservation Movement*. In: Sodhi, NS, Gibson, L & Raven PH. Conservation Biology: Voices from the Tropics. pp. 126-127. Wiley-Blackwell, Oxford, UK.

Sodhi, N.S., Gibson, L.G., Raven, P.H. (2013). *Conservation biology: voices from the tropics*. Wiley Blackwell.

World Commission on Environment and Development. (1987). Our common future. Oxford, OUP.

Student Responsibilities

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

Course Reviewers

The course is reviewed by following reviewers:

1. Prof. Anupam Pandey, Head, Department of Geography, University of Allahabad
2. Dr. Madhu Bajaj, Associate Professor, Department of Botany, Miranda House

Enclosure 2

MTech UDM: Revised Programme Structure and Total Credits with List of All Courses (74 Credits)

Semester	Courses	Credits	Duration (Weeks)
1	8 Core Courses + 1 Compulsory Audit	23	15
2	6 Core Courses	17	15
3	12 Credits from Major Project Part 1+ 2 Credits from 1 Core course + 4 Credits from 2 Elective Courses + 1 Compulsory Audit	18	15
4	16 Credits from Major Project Part 2	16	15
	Total MTech UDM Programme Credits	**74**	

Course Type	No. of Credits
Programme Core	70
Programme Elective	4
Open Elective (Mandatory and Open)	0
Total	74

Semester	Course Code	Course Title	Programme Core (PC)/Programme Elective (PE)/Compulsory Audit (CA)	Credits
1	NRE-165	Introduction to Sustainable Development	CA	(1)
1	MEU-173	Stochastic Modelling	PC	4
1	MEU-172	Geoinformatics for Urban Development	PC	3
1	MEU 123	Urban Finance	PC	3
1	MEU 161	Theories of Urbanisation	PC	3
1	MEU 163	Sustainable Provision and Management of Urban Services	PC	3
1	MEU 143	Urban Governance	PC	3
1	NRE 106	Communication Skills and Technical Writing	PC	2
1	MEU-177	Qualitative Research Methodology for Urban Studies	PC	2
			Total Credits	**23**

2	MEU 167	Urban Development Policies and Programmes	PC	3
2	MEU 121	Urban Ecology and Environment	PC	3
2	MEU 152	City and Regional Planning and Management	PC	3
2	MEU 154	Regeneration and City Competitiveness	PC	2
2	MEU 184	Real Estate Development	PC	3
2	NRG 103	Project Management	PC	3
			Total Credits	**17**
3	MEU 102	Major Project Part 1	PC	12
3	MEU 183	Urban Systems Modelling	PC	2
3	MEU 112	Energy Efficient Buildings	PE	2
3	MEU 178	Urban Water Supply and Wastewater	PE	2
3	MEU 144	Sustainable Urban Transport	PE	2
3	PPM-179	Design Thinking	CA	(2)
3	MEU 162	Urban Disaster Management and Climate Resilient Cities	PE	2
3	MEU-168	Urban Housing Policy and Practice	PE	2
			Total Credits (2 Electives)	**18**
4	MEU-104	Major Project Part -2	PC	16
			Total Credits	**16**

Enclosure 3

MTech REEM: Revised Programme Structure and Total Credits with List of All Courses (70 Credits)

Semester	Courses	Credits	Duration(Weeks)
1	7 Core Courses + 3 Compulsory Audit	17	15
2	8 Core Courses	19	15
3	6 Credits from Dissertation - I + 6 Credits from 2 Elective Courses	18	15
4	16 Credits from Dissertation - II	16	15
	Total MTech REEM Programme Credits	**70**	

Course Type	No. of Credits
Programme Core	64
Programme Elective	6
Open Elective (Mandatory and Open)	0
Total	70

Semester	Course Code	Course Title	Course Type	Credits
1	NRE-106	Communication skills and technical writing	Compulsory Audit(CA)	(2)
1	ENR 101	Energy lab - I (Power system lab and heattransfer lab)	Programme Core(PC)	2
1	ENR 148	Energy and environmental implications	Programme Core(PC)	2
1	ENR 119	Fundamentals of thermal and electricalengineering	Bridge CourseAudit	(2)
1	ENR 146	Renewable energy resource characteristics	Programme Core(PC)	3
1	ENR 135	Power system engineering	Programme Core (PC)	3
1	ENR 185	Introduction to management techniques	Programme Core(PC)	1
1	ENR 192	Heat transfer	Programme Core (PC)	3
1	NRE 165	Introduction to sustainable development	Compulsory Audit(CA)	(1)
1	ENR 154	Renewable energy policy and regulations	Programme Core (PC)	3
			Total CreditsSem-1	**17**

2	ENR 162	Solar technologies	Programme Core (PC)	3
2	ENR 164	Wind, Biomass and other renewabletechnologies	Programme Core(PC)	3
2	ENR 156	Renewable energy project management	Programme Core (PC)	3
2	ENR 157	Energy lab - II	Programme Core(PC)	3
2	ENR 103	Field visits to RE plants/sites	Programme Core(PC)	1
2	ENR 111	Energy conservation and management	Programme Core (PC)	2
2	ENR 166	Electric Vehicle, Energy Storage System and Hydrogen technologies	Programme Core (PC)	3
2	ENR 167	Energy and Carbon Markets	Programme Core (PC)	1
			Total CreditsSem-2	**19**
3	ENR 107	Energy simulation laboratory	Programme Core(PC)	3
3	ENR 165	Energy economics	Programme Core(PC)	3
3	ENR xxx	Dissertation - I/ Minor Project	Programme Core(PC)	6
	A	**Technical Electives**		
3	ENR 163	Biofuels and Decentralized Energy Systems	Programme Elective (PE)	3
3	ENR 113	Wind power generation	Programme Elective (PE)	3
3	ENR 145	Solar photovoltaic power generation	Programme Elective (PE)	3
3	ENR 115	Building energy and green building	Programme Elective (PE)	3
	B	**Management Electives**		
3	ENR xxx	Applications of Machine Learning in Alternate Energy	Programme Elective (PE)	3
3	ENR 116	Energy audit and management	Programme Elective (PE)	3
3	ENR 143	Grid Integration of Renewable Energy	Programme Elective (PE)	3
3	BSI 125	Accounting and Finance for Sustainability	Programme Elective (PE)	3
		3 PC + 1 PE from A and 1 PE from B) = 5courses	**Total CreditsSem-3**	**18**
4	ENR xxx	Dissertation - II/ Major Project	Programme Core(PC)	16
			Total CreditsSem-4	**16**

Enclosure 4

Course title: Applications of Machine Learning in Alternate Energy			
Course code: ENR xxx	**No. of credits:** 3	**L-T-P:** 30-10-10	**Learning hours:** 50
Pre-requisite course code and title (if any):			
Department: Department of Sustainable Engineering			
Course coordinator: Dr Sapan Thapar		**Course instructor:**	
Contact details: sapan.thapar@terisas.ac.in			
Course type: Elective		**Course offered in:** Semester 3	

Course Description

The course aims to provide a broad introduction to machine learning (ML) techniques that have become essential technology solutions in the industry. The renewable energy industry is constantly looking for advanced technologies to analyze the past, optimize the present, and predict the future. The course starts with the introduction of ML methods and its applicability in renewable technologies with an introduction to basic computation using Python in module 1. In module 2, 3 and 4, both supervised and unsupervised learning methods are covered. Module 5 covers optimization techniques. The last module discusses the application of machine learning to solve problems in the renewable energy industry.

Course objectives

The objective of the course is to prepare students with knowledge of machine learning techniques methods which may be applied to solve problems in the renewable energy field.

Course content

Module	Topic	L	T	P
1.	**Fundamentals of AI/ML** Introduction to Machine Learning. Basic concepts of Python Programming.	4	0	0
2.	**Supervised Learning - Regression** Linear regression, Gradient descent, Weighted Least Squares, Logistic Regression.	4	2	2
3.	**Supervised Learning - Classification** k Nearest Neighbour (kNN), Discriminant function analysis, Bayesian decision theory, Decision Trees.	6	2	2
4.	**Unsupervised Learning – Clustering** The k-Means algorithm, Hierarchical clustering, Density-Based Spatial Clustering of Applications with Noise (DBSCAN), Gaussian Mixture Models (GMM).	6	2	2
5.	**Optimisation Techniques** Problem formulation: decision variables, objective function, maxima, minima, constraints. Solving optimization problems.	6	2	2
6.	**Applications of ML in Alternate Energy** Weather data forecasting, Estimation of energy generation from RE sources, Estimation of building energy demand, System fault detection and diagnostics.	4	2	2
	Total	30	10	10

Evaluation criteria

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

Learning outcomes

Learning outcomes include:

- Understanding machine learning and its use for the alternate energy to address the challenges and mathematical complexities.
- Understanding of supervised learning algorithms, preparation of data for analysis.
- Understanding issues in alternate energy with simple case studies.
- Understanding of classification and clustering algorithms.
- Enhancing ability to use ML algorithms and write small scripts in a programming language.
- Implementation and providing a complete solution to a problem given in project work with comprehensive knowledge about the fundamental principles, methodologies and industry practices.

Pedagogical approach

Lectures, tutorials, labs, assessment, project.

Course Reading Materials

Andrew Ng. 2018. *Machine Learning Yearning*, deeplearning.ai.

Bishop M. Christopher. 2006. *Pattern Recognition and Machine Learning*, Springer.

Richard O. Duda, Peter E. Hart, and Stork G. Devid. 2014. *Pattern Classification*, WILEY.

T. Agami Reddy. 2011. *Applied Data Analysis and Modeling for Energy Engineers and Scientists.* Boston, MA: Springer US.

Additional information (if any)

Student responsibilities

Attendance, discipline, feedback as per TERI SAS rules

Course reviewer

Dr Vishal Garg, Professor, International Institute of Information Technology, Hyderabad
Dr Amarjeet Singh, Assistant Professor, Indraprastha Institute of Information Technology, Delhi

Enclosure 5

Course title: Independent Study			
Course code: ENR xxx	**No. of credits: 4**	**L-T-P: 0-16-88**	**Learning hours: 104**
Pre-requisite course code and title (if any):			
Department: Department of Sustainable Engineering			
Course coordinator: Naqui Anwer		**Course Instructor:** assigned faculty	
Contact: naqui.anwer@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 2	

Course description

The independent study is a 4-credit course offered to the students registered for the PG Diploma in Renewable Energy and Management (PGDREM). The student will conduct a study independently under the supervision of a faculty member. The supervisor can be any faculty member from TERI School of Advanced Studies. Students are expected to get consent from the supervisor before they register for the course. The course will be conducted through submission and presentation of synopsis by August 2nd week, mid-term presentation by October 4th week and final report submission and presentation by November 4th week.

Course objective(s)

- To enable students carry out research studies independently under supervised self-learning approach
- To help students obtain advanced understanding on specific system/process/scenarios inrenewable energy, energy systems, policy & regulation and allied areas.
- To enable students to study the contemporary developments in the field of renewable energy and allied areas.

Course contents

Module	Topic	L	T	P
1	Preparation of a synopsis document and a presentation having the following: • Title of the study • Rationale for the study and Research objectives (Maximum 3) • Literature review • Methodology • Expected Outcome • Timeline • References	0	8	18
2	Work focused on the approved synopsis leading to mid-term presentation of work comprising of the progress made and understanding developed by the student on the specific topic. It includes literature survey or experimental work to be conducted to achieve the expected outcomes.	0	4	48
3	Completion of remaining work and preparation of Independent Study Reportcontaining the following and final presentation: • Abstract • Introduction • Study Area • Aim and Objectives • Methodology • Results and Discussions • Conclusions and Limitations	0	4	22

	• Future Scope of Work • References Discussion and presentation of research work before the faculty panel			
	Total	**0**	**16**	**88**

Evaluation criteria

Test 1: Synopsis document and presentation:	15%	(August 2nd week)
Test 2: Mid-term presentation:	15%	(October 4th week)
Test 3: Final evaluation		(November 4th week)
Presentation:	30%	
Report:	30%	
Test 4: Review paper	10%	(at the end of semester)

- Synopsis will be evaluated by the supervisor and/or panel of faculty members.
- Mid-term test will be evaluated by the supervisor and/or panel of faculty members.
- Presentation made to supervisor and/or panel of faculty members
- Report submission at the end of the term evaluated by supervisor and/or panel of faculty members

Learning outcomes

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

- Provide comprehensive knowledge about the topics of the study (Test 1)
- Design and implement the concepts related to the study (Test 2 and 3)
- Test the systems (if any) with wholistic approach (Test 2 and 3)

Pedagogical approach

Self-learning; interaction with supervisor; literature review; interaction with experts

Materials

Peer-reviewed journal articles, Reputed conference proceedings, Reports related to the specific project. Learning materials provided by supervisor

Additional information (if any)

1. The final report should be around 40 pages
2. A guideline along with important dates and format will be notified by the supervisor or course/programme coordinator.
3. Student needs to check plagiarism using software (e.g. Turnitin) and submit the report to supervisor before final submission

Student responsibilities

Self learning, attendance; Discipline; Research Ethics, etc.
Regular discussion with supervisor and adhering to the timeline

Course Reviewers

Dr. Milap Punia, Associate Professor, Jawaharlal Nehru University, New Delhi
Dr. P.P. Pani, Assistant Professor, Jawaharlal Nehru University, New Delhi
Dr. R.D. Garg, Associate Professor, Indian Institute of Technology, Roorkee
Dr. T.P. Singh, Assistant Professor, Symbiosis Institute of Geoinformatics, Pune

Enclosure 6

Course title: Auctions and Mechanism Design			
Course code: TBD	No. of credits: 4	L-T-P: 54-6-0	Learning hours: 60
Pre-requisite course code and title: MPE 137 Microeconomics II; MPE 113 Mathematical Methodsfor Economics			
Department: Department of Policy and Management Studies			
Course coordinator:	Course instructor:		
Contact details:			
Course type: Elective	Course offered in: 3rd Semester		

Course description:

The course is divided into two parts. In the first part, we will study the positive theory of auctions. In the second part, we will study the normative aspects of auction theory. The entire course revolves around a situation wherein a seller wishes to allocate an object to one of the many buyers participating in an auction. Given an allocation and a payment rule, the first part addresses an important question that how the buyers interact strategically under incomplete information. We will use game-theoretic approach to develop important theoretical models in auctions addressing the above question.

In the second part, we will study how to design the allocation and payment rules of an auction so that certain objectives of the designer (seller) are achieved.

Furthermore, we will study some real-world applications on online auctions such as eBay and Amazon auctions, spectrum auctions, provision of public goods, etc.

Although the course is technical in nature, the techniques will be developed throughout the course. Lecture notes will be provided.

Course objective:

1. To understand core results in the theory of auctions and mechanism design.
2. To learn techniques involved in the theory of auctions and mechanism design.

Course contents

Module	Topic	L	T	P
1	Introduction to auction theory; real-world applications on spectrum auctions, online auctions, etc. Symmetric and independent private valuations model: Revenue equivalence principle; reserve prices. In this module, we will derive the bid functions and the revenue expressions for the first- and second-price auctions whenever bidders' valuations are drawn from a symmetric and statistically independent probability distribution and bidders are risk neutral. We establish an important property which is called "revenue equivalence principle".	7	1	
2	Model with risk averse preferences: Failure of revenue equivalence principle.	4		

	In this module, we relax the assumption that bidders are risk neutral and capture the impact of risk aversion on the bid behaviour and seller's expected revenues.			
3	Asymmetric and independent private valuations model: Revenue rankings; comparison with symmetric model. In this module, we relax the assumption of symmetry and study its impact of the bid behaviour and seller's expected revenues.	8	2	
4	Resale model: Bid symmetrisation property; revenue ranking principle. In this module, we allow for the possibility of resale of the object once the auction ends. We establish a striking property regarding the bid behaviour which is called "bid symmetrisation".	6		
5	Introduction to mechanism design theory; real-world applications on the allocation of public goods. Implementation theory. Revelation principles. In this module, we motivate the theory of mechanism design and study the problem of implementation for different equilibrium concepts. We capture a striking result known as revelation principle.	6		
6	Bayesian incentive compatible mechanisms I: screening with linear utilities; screening with quasilinear utilities; optimal contract design. In this and the next module, we extensively study applications of the following equilibrium concept: Bayesian equilibrium.	8	1	
7	Bayesian incentive compatible mechanisms II: optimal auction design; bilateral trade.	9	2	
8	Dominant strategy incentive compatible mechanisms: Vickrey-Clarke-Groves mechanism; auctions. In this module, we study applications of the following equilibrium concept: Dominant strategy equilibrium.	6		
	Total	54	6	

Evaluation criteria:
Minor 1: Written Examination - 25% [Syllabus: 1, 2, and 3. Learning outcomes: 1 and 2]
Minor 2: Presentation - 25% [Learning outcomes: 1 and 2]
Major: Written Examination (whole course) - 50% [Syllabus: 1-8. Learning outcomes: 1, 2 and 3]

Learning outcomes:

1. The students will learn to formulate auctions as a game of incomplete information. [Modules 1-8]
2. They will understand the impact of relaxing the standard assumptions on the behaviour of buyers and seller. [Modules 2-4]
3. They will learn to design an optimal mechanism that satisfies the seller's objectives. [Modules 6-8]

Core readings:

Lecture notes.

T. Borgers, D. Krahmer. *"An introduction to the theory of mechanism design"*, Oxford university press, USA (2015)

V. Krishna. *"Auction Theory"*, Academic press (2009)

Additional readings:

Roth, A. Ockenfels. *"Last-minute bidding and the rules for ending second-price auctions: Evidence from eBay and Amazon auctions on the internet"*, The American Economic Review (2002).

D. Diamantaras, E. Cardamone, K. Campbell, S. Deacle, L. Delgado. *"A toolbox for economic design"*, Macmillan (2009).

D. Lucking-Reiley. *"Auctions on the internet: What's being auctioned, and how?"*, The Journal of Industrial Economics (2000).

E. Fehr, S. Gächter. *"Cooperation and punishment in public goods experiments"*, The American Economic Review (2000).

E. Maskin, J. Riley. *"Asymmetric auctions"*, The Review of Economic Studies (2000).

I. Hafalir, V. Krishna. *"Asymmetric auctions with resale"*, The American Economic Review (2008).

J. Falkinger, E. Fehr, S. Gächter, R. Winter-Ebmer. *"A simple mechanism for the efficient provision of public goods: Experimental evidence"*, The American Economic Review (2000).

K. Binmore, P. Klemperer. *"The biggest auction ever: The sale of the British 3G telecom licences"*, The Economic Journal (2002).

O. Ashenfelter. *"How auctions work for wine and art"*, Journal of Economic Perspectives (1989).

P. Klemperer. *"What really matters in auction design"*, Journal of Economic Perspectives (2002).

R. Alston, C. Nowell. *"Implementing the voluntary contribution game: A field experiment"*, Journal of Economic Behavior & Organization (1996).

R. McAfee, J. McMillan. *"Analyzing the airwaves auction"*, Journal of Economic Perspectives (1996).

R. Myerson. *"Optimal auction design"*, Mathematics for Operations Research (1981).

Y. Chen, C. Plott. *"The Groves-Ledyard mechanism: An experimental study of institutional design"*, Journal of Public Economics (1996).

Additional information:

Course prepared by: Sanyyam Khurana

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

Course reviewers:

1. Sudhir A. Shah. Professor, Department of Economics, Delhi School of Economics, University of Delhi.
2. Debasis Mishra. Professor, Economics and Planning Unit, Indian Statistical Institute, Delhi.

Course Title: Theory of Contracts			
Course code: MPE 140	No. of credits: 4	L-T-P: 49-11-0	Learning hours: 60
Pre-requisite course code and title: MPE 137 Microeconomics I; MPE 113 Mathematical Methods for Economics			
Department: Department of Policy and Management Studies			
Course coordinator: Prof. Badal Mukhopadhyay		Course instructor:	
Contact details			
Course type: Elective		Course offered in Semester 3	

Course description

The traditional theory of markets does not require buyers and sellers to know one another; indeed, such knowledge is explicitly ruled out. But almost every act of exchange and trade that we engage in works otherwise. Apart from petty purchases and daily groceries, every exchange act involves a contract.

The drafting and implementation of contracts belong to the study of law. In economics, we are concerned with the knowledge and information (or lack thereof) that visits these contracts. The asymmetric information ingrained in these situations makes them more realistic and complex.

We shall apply the concepts of Nash and subgame perfect Nash equilibria and incentive compatibility. We shall also cover various applications in numerous acts of exchange from minimal (buying sugar, one seeking out a reliable shop) to buying a house (one looking for a reputed construction company). The number of examples is legion. Tutorials will cover as many real-life examples as possible.

Course objectives

The objectives are as follows:

1. To expose students to the limitations of the traditional market models.
2. To study the role of information in exchange.
3. To study the role of information in product and labour markets.
4. To analayse the consequence of asymmetric information for the agents.
5. To learn how contracts are designed to handle incomplete information.

Course contents

Module	Topic	L	T	P
1	**General introduction—Adverse selection and Moral Hazard** Traditional economic theory with full information does not address the problems that we study in this course. Amongst the major problems created by lack of full information we study the two main problems, viz., Adverse selection and Moral hazard.	4		
2	**Product selection and quality in a monopoly** There is very good discussion in Tirole where the monopolist knows that there are two types of buyers but does not know who is who.	4	1	
3	**Adverse selection and incentive compatibility** There are two types of workers whose types are invisible and the producers	7	1	

	have to design a contract that enforces truth telling and workers reveal their own types.			
4	**Applications of adverse selection** Problem of the regulatory authority.	10	3	
5	**Moral hazard—Principal –Agent models** Insurance company faces a situation where the agent insured takes unexpected risks after (or, Because of) taking the insurance.	9	1	
6	**Applications of moral hazard** As in 5 above.	10	3	
7	**Contract design for sustaining bio-diversity** How to evaluate eco systems and minimize losses in forestry, fisheries and similar ecosystems.	5	2	
	Total	**49**	**11**	

Evaluation Criteria

There will be at eleven tutorial sessions.
Minor I- 30% [Syllabus: Modules 1-3, Learning outcomes: 1-4]
Minor II- 30% [Syllabus: Modules 4-7, Learning outcomes: 2-4]
Major exam- 40%. [Syllabus: Modules 1-7, Learning outcomes: 1-4]

Learning outcomes

1. Theoretically, students will learn the major concepts like Nash equilibrium, incentive compatibility, revelation principle, etc. [Module 1]
2. They will learn the role of information in exchange. [Modules 2-6]
3. They will be able to analyse the impact of asymmetric information on agents. [Modules 3-4]
4. They will learn to design contracts under complete and incomplete information. [Modules 2-7]

Readings:

B. Salanie, *The Economics of Contracts: A Primer*, 2nd edition (2005).

D. Kreps, *A Course in Microeconomic Theory* (1990).

H. Varian, *Microeconomic Analysis*, 3rd edition (1992).

E. Rasmusen, *Games, and Information: An Introduction to Game Theory* (2006).

J. Tirole, *The Theory of Industrial Organization* (1988).

P. Bolton & M. Dewatripont, *Contract Theory* (2004).

Pedagogical Approach: Classroom teaching and problem-solving.

Module-wise readings.

1. Module 1: H. Varian, Microeconomic Analysis, 3rd edition, Chapter 25 (1992)
2. Module 2: J. Tirole, The Theory of Industrial Organization, Chapters 1-2 (1988)
3. Module 3: B. Salanie, The Economics of Contracts: A Primer, 2nd edition, Chapter 2 (2005)
4. Module 5: B. Salanie, The Economics of Contracts: A Primer, 2nd edition, Chapter 5 (2005)

Additional information (if any):

Course prepared by Badal Mukherji

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

Course reviewers

The course is reviewed and commented on by the following experts.

1. Prof. Anjan Mukherji, Centre for Economic Studies and Planning, School of Social Sciences, Jawaharlal Nehru University, New Delhi.
2. Prof. Tridib Ray, Indian Statistical Institute, New Delhi.

Course title: Introductory Mathematical Methods for Economics			
Course code: TBD	No. of credits: 4	L-T-P: 54-6-0	Learning hours: 60
Pre-requisite course code and title: N/A			
Department: Department of Policy and Management Studies			
Course coordinator:	Course instructor:		
Contact details:			
Course type: Core	Course offered in: 1st Semester		
Course description: This course is an introduction to the mathematical tools that are heavily used in various areas of economics such as microeconomics, macroeconomics, econometrics, etc. The course will cover sets, functions, limits, continuity, differentiability, and static optimisation of one variable.			
Course objective: 1. The primary objective of this course is to familiarise the students with the core concepts and techniques of mathematics that are used in economics. 2. The secondary objective is to teach students how to apply these techniques in economic applications.			

Course contents

S.No	Topics	L	T	P
1	**Introduction to Logic.** Arguments, propositions, deductive and inductive reasoning, necessary and sufficient conditions, proofs techniques.	2		
2	**Introduction to sets and real numbers.** Sets and its operations (union, intersection, complement, difference), Venn diagrams, De Morgan's laws. Real numbers, integers, natural numbers, rational and irrational numbers.	4		
3	**Functions of one variable.** Definitions, domain, range, codomain, graphs. Types of functions. One-to-one, onto, etc. Inverse of a function. Composition of a function. Inverse functions.	6		
4	**Linear and non-linear functions.** Linear functions: Equation of a straight line, slope of a function (intercept formula, two-point formula) Quadratic functions: Parabola, zeros, graphs. Polynomials: General form, fundamental theorem of algebra, roots, remainder theorem.	9		
5	**Limits, sequences, continuity and differentiability.** Limits: Limit of a function, left and right limits, functional limits, algebraic limit	9	1	

	theorem, L'Hopital rule. Sequences: Definition, convergence, divergence. Series. Finite and infinite geometric series, harmonic series. Applications Continuity: Definition of a continuous function, geometric interpretations, properties, left and right continuity, discontinuity. Differentiability: Slope of a curve, Newton quotient, derivatives and its rules (power, product, quotient, chain rules etc.), left and right derivatives, higher-order derivatives, economic interpretations.			
6	**Implications of continuity and differentiability.** Linear approximations, quadratic approximations, differentials, inverse function theorem, rigorous approach to limits Power, exponential and logarithmic functions: General forms, graphs, rules of logarithmics, characterisation of irrational number *e*, Taylor's formula. Applications. Ecology, log-linearity, present discounted values, economic growth.	9	2	
7	**Static optimisation of one-variable.** Optimisation problems, definitions, maxima, minima, interior and boundary points, stationary points, local and global optima, first- and second-derivative tests, necessary and sufficient conditions, applications. Concave and convex functions. Definitions, properties, inflexion points, applications.	9	2	
8	**Matrices and Determinants.** System of linear equations, vectors, matrices and matrix operations, transpose, determinants and its rules, inverse of a matrix, Cramer's rule, rank of a matrix.	6	1	
	Total	54	6	

Pedagogical approach:

Classroom teaching and problem-solving sessions.

Evaluation criteria:

Minor 1: Written Examination - 30% [Syllabus: 1-4, Learning outcomes: 1, 4]
Minor 2: Homework - 30% [Syllabus: 5, Learning outcomes: 1, 2, 3, 4]
Major: Written Examination - 40% [Syllabus: Complete course, Learning outcomes: 1-5]

Learning outcomes:

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

1. Understand the ideas of core mathematical concepts. [Modules 1-8]
2. Apply the techniques learned during the course in economic problems. [Modules 5-8]
3. Provide economic interpretations of some of the key concepts and results. [Modules 5-8]
4. Graphically analyse economic and mathematical problems, wherever possible. [Modules 3-7]

5. Optimise functions of one variable using more than one technique. [Modules 7]

Core reading:

K. Sydsaeter and P. Hammond. *"Mathematics for Economic Analysis"* (2016) (SH).

Additional readings:

A. Chiang. *"Fundamental Methods of Mathematical Economics"* (2017).

M. Hoy, J. Livernois, C. McKenna, R. Rees, T. Stengos. *"Mathematics for Economics"* (2016).

Module-wise chapters from the core reading: K. Sydsaeter and P. Hammond. "Mathematics for Economic Analysis" (2016) (SH).

1. Module 1: SH, Chapter 1, Sections 1.1-1.3, 1.5, 1.6.
2. Module 2: SH, Chapter 1, Sections 1.4, 1.7.
3. Module 3: SH, Chapter 2, Sections 2.1-2.4; Chapter 3, Section 3.6; Chapter 7, Section 7.6.
4. Module 4: SH, Chapter 2, Sections 2.5; Chapter 3, Sections 3.1-3.5.
5. Module 5: SH, Chapter 4; Chapter 5, Sections 5.1, 5.2, 5.4, 5.5; Chapter 6, Sections 6.1-6.7, Chapter 7; Chapter 8.
6. Module 6: SH, Chapter 9.
7. Module 7: SH, Chapter 12; Chapter 13; Chapter 14, Section 14.2.

Additional information:

Course prepared by: Sanyyam Khurana

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

Course reviewers:

1. Naveen Joseph Thomas. Associate Professor, Jindal School of Government and Public Policy, O.P. Jindal Global University
2. Niti Khandelwal Garg. Associate Professor, Kirori Mal College, University of Delhi

Course title: Principles of Economics

Course code: BPE XXX	**No. of credits:** 4	**L-T-P:** 60-0-0	**Learning hours:** 60
Pre-requisite course code and title (if any):			
Department: Department of Policy and Management Studies			
Course coordinator: XXX		**Course instructor:** XXX	
Contact details: XXX			
Course type: Major		**Course offered in:** Semester 1	

Course description:

This is an introductory course of the Four-Year Undergraduate Programme in Economics. The course introduces the students in Economics who are yet to receive a formal training in the discipline. It focusses on certain basic concepts and foundational principles of Microeconomics and Macroeconomics. The course has nine modules with an Introduction that provides exposure to the students to basic features of the discipline of Economics. The initial part of the course mainly deals with the economic analysis of a representative firm and a representative household. In these modules, the economic dimensions of human life through the operations of the market, and nature of participation of its primary stakeholders in a market-based economy—households and firms—is brought into discussion. In the later part of the course, the modules introduce the students with key macroeconomic indicators that determine the levels of living in the society. It also brings into discussion the roles of the government in impacting the real-life and concerns of the society.

Course objectives:

- To introduce students to the discipline of Economics through the basic concepts and key economic principles in Economics.
- To provide the stepping-stone to the students that will enable them to think like an economist.
- To provide exposure to the students regarding the functioning of a market economy and the behaviour of firms and households in such an economy.
- To introduce students to real-life economic issues that society encounters and the role of the institutions—government and market—in addressing and resolving these concerns.

Course contents

Module	Topic	L	T	P
1	Introduction 1.1 What is Economics? • Trade-offs, Incentives, Exchange, Information and Distribution 1.2 The market economy • Economic interactions between the firms and households in the product, labour, and capital markets 1.3 The science of Economics • Basic discussions on theory, models, variables and distinction between correlation and causation 1.4 The core branches of Economics • Microeconomics and Macroeconomics 1.5 Some popular criticisms of Economics and economists • Disagreements among the economists, touch with reality, economic determinism in human behaviour	5		

2	**How Markets Function** 2.1 Theory of demand and theory of supply • Demand and supply curve • Law of supply and demand • Shifts versus movements along the demand and supply curves. • Sources of shifts in the demand and supply curves 2.2 Price formation in the market 2.3 Consumer and producer surplus 2.4 Market failures and externalities	7	2	
3	**Elasticity of Demand and Supply** 3.1 The elasticity of demand and the elasticity of supply • Different concepts of elasticity • Estimation • Determinants 3.2 Applications of supply, demand, and elasticity • Technological innovations • The time dimension: price formation in the world market for oil	4	2	
4	**Consumer Choice and Demand Decisions** 4.1 Utility and preferences • Marginal utility and the law of diminishing marginal utility 4.2 Budget constraint and indifference curve • Slope and determinants of the budget line • Marginal rate of substitution • Using indifference curves to determine choices and derive demand curve	5	3	
5	**Firm Behaviour and Supply Decisions** 5.1 A firm's accounts • Stocks and flows 5.2 What are costs? • Total costs, total revenue, and profit • Opportunity and accounting costs • Economic and accounting profits 5.3 The production process • Production functions: Total product, marginal product and average product • Production functions with two variable factors of production • Isoquants and isocosts 5.4 Cost concepts • Fixed and variable costs, average and marginal cost • Short and long-run average cost, economies, and diseconomies of scale 5.5 Firms in competitive markets • Profit maximization and supply curve in the short run and long run with entry and exit	8	3	
6	**Introduction to Macroeconomics** 6.1 Macroeconomic components • The circular flow • The three markets: goods and services market, labour market, and money market • Role of the government	6		

7	**Estimation of National Output and National Income** 7.1 What is GDP? 7.2 Estimating GDP • Income and expenditure approaches • Nominal and real GDP • GDP deflator 7.3 Limitations of the GDP to measure well-being 7.4 Estimation of GNP, NNP and differences between GDP and GNP	7	2	
8	**Core Macroeconomic Concerns** 8.1 Unemployment • Estimating unemployment • Components of the unemployment rate • Costs of unemployment 8.2 Inflation • Estimation • The costs of inflation 8.3 Economic growth • Basic concepts of growth as measures of welfare: output growth and productivity growth	6		
	Total (in hours)	48	12	

Evaluation criteria

1. Minor 1: Written test [after the completion of Modules 1, 2 and 3] – 30% [learning outcomes 1 and 2]
2. Economics quiz [after the completion of Module 4] – 15% [learning outcomes 1 and 2]
3. Assignment [after the completion of module 5] – 15% [learning outcomes 1 and 2]
4. Major exam: Written test [after the completion of the course; based on Modules 6, 7, 8 and 9] – 40 % [learning outcomes 3 and 4]

Learning outcomes

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

1. Develop basic understanding about the discipline and the core components of a market economy. [Modules 1-3]
2. Develop basic understanding about the behaviour of a representative consumer and a representative firm in a market economy. [Modules 4 and 5]
3. Initial understanding about the key macroeconomic variables, estimation of these variables, role of the government in the economy and key macroeconomic concerns. [Modules 6, 7 and 8]

References

Textbooks

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

Case, K. E, Fair, R. C. and Oster, S. E. (2017). Chapter 5 in *Principles of Economics (12th edition)*, Pearson.

Dornbusch, R. and Fischer, S. **(**2010**).** *Macroeconomics (6th edition)*. McGraw Hill India.

Kurien, C. T. (2012). *Wealth and Illfare: An Expedition Through Real Life Economics*, Books for Change Publishers.

Mankiw, N. G. (2018). *Principles of Microeconomics (8th edition)*, Cengage Learning Publishers.

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

CORE reading materials (module-wise):

Module 1: Introduction
Stiglitz, J. E. and Walsh, C. E. (2005). Chapter 1 in *Economics (4th edition)*, W. W. Norton and Company.
Mankiw, N. G. (2018). Chapter 2 in *Principles of Microeconomics (8th edition)*, Cengage Learning Publishers.
Guha, A. S. (2016). Chapter 1 in *Economics Without Tears: A New Approach to an Old Discipline*, Penguin Books.

Module 2: How Markets Function?
Mankiw, N. G. (2018). Chapter 4 in *Principles of Microeconomics (8th edition)*, Cengage Learning Publishers.
Begg, D., Vernasca, G., Fischer, S., and Dornbusch, R. (2014). Chapter 3 in *Economics (11th edition)*, McGraw Hill Education

Module 3: Elasticity of Demand and Supply
Mankiw, N. G. (2018). Chapter 5 in *Principles of Microeconomics (8th edition)*, Cengage Learning Publishers.
Case, K. E, Fair, R. C. and Oster, S. E. (2017). Chapter 5 in *Principles of Economics (12th edition)*, Pearson
Stiglitz, J. E. and Walsh, C. E. (2005). Chapter 4 in *Economics (4th edition)*, W. W. Norton and Company.

Module 4: Consumer Choice and Demand Decisions
Begg, D., Vernasca, G., Fischer, S., and Dornbusch, R. (2014). Chapter 5 in *Economics (11th edition)*, McGraw Hill Education.
Stiglitz, J. E. and Walsh, C. E. (2005). Chapter 5 in *Economics (4th edition)*, W. W. Norton and Company.
Case, K. E, Fair, R. C. and Oster, S. E. (2017). Chapter 6 in *Principles of Economics (12th edition)*, Pearson.

Module 5: Firm Behaviour and Supply Decisions
Begg, D., Vernasca, G., Fischer, S., and Dornbusch, R. (2014). Chapters 6 and 7 in *Economics (11th edition)*, McGraw Hill Education.
Mankiw, N. G. (2018). Chapters 13 and 14 in *Principles of Microeconomics (8th edition)*, Cengage Learning Publishers.

Module 6: Introduction to Macroeconomics
Case, K. E, Fair, R. C. and Oster, S. E. (2017). Chapter 20 in *Principles of Economics (12th edition)*, Pearson.

Module 7: Estimation of National Output and National Income
Dornbusch, R. and Fischer, S. (2010). Chapter 2 in *Macroeconomics (6th edition)*. McGraw Hill India.

Module 8: Core Macroeconomic Concerns
Case, K. E, Fair, R. C. and Oster, S. E. (2017). Chapter 22 in *Principles of Economics (12th edition)*, Pearson.

Module 9: Macroeconomic policies in India
Kurien, C. T. (2012). Chapter 11 in *Wealth and Illfare: An Expedition Through Real Life Economics*, Books for Change Publishers.

Additional reading materials:

Dasgupta, P. (2007). *Economics: A Very Short Introduction*. OUP.
Mankiw, N. G. (2003). *Principles of Macroeconomics*. South-Western College Publishing House.

Pedagogical Approach:

- Classroom lectures

Additional information (if any):

Course prepared by: Dr. Shantanu De Roy

The course was approved at the 56th Academic Council meeting at the TERI-School of Advanced Studies.
Student responsibilities: Attendance, feedback, discipline: as per university rules.

Course reviewers: Prof. Mausami Das, Delhi School of Economics
Dr. Jyotirmoy Bhattacharya, Associate Professor, Ambedkar University Delhi
Dr. Seema Sangita, Associate Professor, KREA University

Enclosure 7

Course Title: Fundamentals of Environmental, Social, and Governance (ESG) Principles			
Course code: MPD 149	**No. of credits:** 2	**L-T-P:**26-4-0	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy and Management Studies			
Course coordinator: Mr Ranjan Mishra		**Course instructor:** Mr Ranjan Mishra	
Contact details:			
Course type: Core		**Course offered in:** Semester-2	

Course Description:

This course is an introduction to Environmental, Social, and Governance (ESG) principles and their significance in business and investing. It covers the key components of ESG, including environmental sustainability, social responsibility, and corporate governance, as well as tools and methodologies for ESG analysis and valuation. The course also explores the challenges and barriers to implementing ESG practices and provides real-world examples of companies addressing social and environmental issues effectively. Additionally, the course also covers ESG reporting and communication. By the end of the course, participants will have a foundational understanding of ESG principles and their role in creating sustainable business practices.

Course objectives

- To provide fundamentals of Environmental, Social, and Governance (ESG) principles and their significance in business and investing.
- To understand and examine the key components of ESG, including environmental sustainability, social responsibility, and corporate governance, as well as tools and methodologies for ESG analysis and valuation.
- To analyze challenges and barriers to implementing ESG practices, along with real-world examples of companies addressing social and environmental issues effectively.
- To impart a foundational understanding of ESG principles and their role in creating sustainable business practices,
- To be able to integrate ESG factors in investment decision-making processes and effectively communicate ESG performance to stakeholders.

Course contents

Module	**Topic**	**L**	**T**	**P**
1	**Introduction to ESG Principles** Key concepts in ESG and their significance in business and investing; Integrating environmental, social, and governance factors into investment decision-making processes, differentiating ESG from impact investing, socially responsible investing (SRI), and other sustainability frameworks.	2	0	0
2	**Historical development of ESG and its current prominence** Origins and emergence of ESG, key milestones in ESG's development and the establishment of framework, impact of regulations and international agreements on ESG practices, investor demand and corporate responsibility, ESG's shift from niche to mainstream driven by materiality and financial relevance, emerging trends and the needs for continuous improvement in ESG frameworks.	4	0	0
3	**ESG and Sustainable Development** Exploring the relationship of ESG principles with SDGs, de-carbonization goals and concepts of circular economy, overlap and differences between ESG, circular economy, and CSR.	2	0	0
4	**Environmental Factors** Definition and importance of environmental sustainability, Impact of climate change on businesses and society, environmental regulations and their influence on ESG practices, natural resource management and their integration within ESG frameworks, environmental challenges and innovative solutions.	4	0	0

5	**Social Factors** Role of social responsibility in ESG, stakeholder engagement, supply chain management, fair labor practices within ESG frameworks, human rights, diversity, equity and inclusion in ESG.	4	0	0
6	**Governance Factors** Significance of corporate governance in ESG, board structure and composition for effective governance, executive compensation and accountability, business ethics and code of conduct, legal and policy environment for ESG at both national and international levels, effects of mandatory and optional legislative pronouncements on ESG practices; Institutional role played by capital market regulators such as SEBI, SEC in mandating ESG disclosure requirements for listed companies.	4	0	0
7	**ESG in Different Industries** Exploring sector specific ESG considerations, challenges, and best practices in industries such as energy, finance, technology, and consumer goods, real-world case studies and examples showcasing successful ESG integration in different industries, performance and rating.	3	2	0
8	**ESG Mapping, Implementation and Reporting** Frameworks for ESG disclosures (GRI, BRSR, CDP, CSRD and others), various tools and methodologies used for analysing and evaluating ESG performance, mapping techniques and estimation of ESG, influence of ESG on risk management and financial performance.	3	2	0
	Total	**26**	**4**	**0**

Evaluation criteria:

- Assignment submission 20%
- Case Study Analysis and Presentation 30%
- ESG Report Preparation 50%

Learning outcomes:

By the end of the course, the participants will:

1. Have a comprehensive understanding of ESG and its significance in business and investing, including the key components of ESG and their relationship with sustainable development.
2. Understand the impact of environmental factors on businesses and society, including environmental sustainability and related regulations.
3. Appreciate the importance of social responsibility in ESG, including stakeholder engagement, labor practices, diversity, and inclusion.
4. Recognize the significance of corporate governance in ESG, including the board structure, executive compensation, and accountability.
5. Develop proficiency in integrating ESG in investment decision-making processes, using frameworks, reporting standards, and tools for analysis and valuation, as well as effectively communicating ESG performance to stakeholders.

Pedagogical approach:

A combination of class-room interactions, participative group discussion and presentations, tutorials and assignments.

Materials:

Suggested Readings

Bansal, S.; Khanna, M.; Jain, S. (2017) *The Corporate Social Responsibility Act in India: An Early Assessment. South Asian Network for Development and Environmental Economics (SANDEE)* Working Paper No. 120–17.

Boffo, R., and R. Patalano (2020), *"ESG Investing: Practices, Progress and Challenges"*, OECD Paris, www.oecd.org/finance/ESG-Investing-Practices-Progress-and-Challenges.pdf.

Garcia, AS.; Mendes-Da-Silva, W. Orsato Renato J. (2017) *Sensitive industries produce better ESG performance: Evidence from emerging markets*. Journal of Cleaner Production. Vol.150, pp. 135-147 http://dx.doi.org/10.1016/j.jclepro.2017.02.180.

Gupta, A.K. and Gupta, N (2020) *Effect of corporate environmental sustainability on dimensions of firm performance e Towards sustainable development: Evidence from India* Journal of Cleaner Production. Vol.253. https://doi.org/10.1016/j.jclepro.2019.119948.

National Stock Exchange of India (2020). *ESG Analysis on 50 Listed Companies in India*. Jointly published by Stakeholder Stakeholders Empowerment Services (SES) and NSE.

Nemoto N. and Morgan, P.J. (2020) *Environmental, Social, and Governance Investment.*

Nemoto N. and Liu, L. (2020) *Measuring the Effect of Environmental, Social, And Governance on Sovereign Funding Costs*. ADBI Working Paper Series No. 1088. Asian Development Bank Institute.

Opportunities and Risks for Asia. Naoko Nemoto and Peter J. Morgan (eds). Asian Development Bank Institute: Japan.

Required text.

1. ESG Disclosure Handbook (WBSCD)
2. Values at work (Daniel C. Esty, Todd Cort)
3. SA 8000 Guidelines
4. Global Reporting Initiative
5. Report of the Committee on Business Responsibility and Sustainability Reporting
6. BRSR Format
7. Guidance Note for Business Responsibility & Sustainability Reporting Format

Websites and Links:

8. Green House Gas Protocol (www. https://ghgprotocol.org/)
9. FIJI Water and Corporate Social Responsibility - Green Makeover or Greenwashing? https://www.iveypublishing.ca/s/product/fiji-water-and-corporate-social-responsibility-green-makeover-or-greenwashing/01t5c00000Cwr4RAAR
10. ESG Metrics: Reshaping Capitalism? - https://www.hbs.edu/faculty/Pages/item.aspx?num=50871

Case Studies

Shall be recommended during the course of delivery.

Student responsibilities:

Attendance, timely feedback, discipline: as per university rules, adopt peer learning and knowledge sharing within the class.

Course reviewers:

- Prof Harpreet Kaur, National Law University, New Delhi
- Prof. Deva Prasad M., Associate Professor Humanities & Liberal Arts in Management, IIM Kozhikode

Additional information (if any):

This Course outline was prepared by Mr Ranjan Kumar Mishra and Dr Swarup Dutta and approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Course title: Gender in Development Practice			
Course code: MPD 148	**No. of credits:** 2	**L-T-P:** 26-4-0	**Learning hours:** 30
Pre-requisite course code and title (if any):			
Department: Department of Policy and Management Studies			
Course coordinator(s): Dr Swarup Dutta	**Course instructor(s):** Dr Swarup Dutta		
Contact details: swarup.dutta@terisas.ac.in			
Course type: Core	**Course offered in:** Semester 2		

Course description: This course addresses an in-depth understanding of various issues related to gender and development. It starts with the introduction of the basic concepts of gender and gender socialization and provides logical understanding of gender roles, gender-based inequality, intersectionality, etc. Subsequently, the course highlights various approaches of gender and development including welfare approach; WID approach, antipoverty and efficiency approach; WAD and GAD Approach etc. The students will be skilled in using various gender analysis frameworks to address gender development challenges. After that the students will explore various gender-based developmental challenges like access to healthcare, education, employment, etc. by analyzing various case studies. This will help them to critically explore the impact of gender disparities in various development interventions. Further, Lastly, the course highlights gender and policy with special attention on gender mainstreaming and this will unravel the role of mainstreaming gender equality in the transformation of unequal social and institutional structures into equal and just structures for men, women, and others in the society.

Course objectives

The objectives of the course are –

- to provide conceptual understanding of gender, gender socialization, and gender inequality in society
- to enable students to acquire comprehensive knowledge in various theoretical perspectives on gender and development.
- to understand gender-based development challenges in a few specific areas like education, health, employment etc.
- to develop skills in analyzing various gender-related tools and frameworks used commonly in national and international development.

Module	Topic	L	T	P
1	**Understanding Gender:** Concept of gender; Gender Inequality; Gender Roles; Gender socialization (meaning, gender learning, and agents); Theory of Gender Socialization (biological theory, psychoanalytic theory, social learning theory, cognitive theory, and gender schema theory); understanding patriarchy; understanding intersectionality of gender, caste, and class	6	0	0
2	**Various approaches to Gender and Development:** Welfare approach; Women in Development - Equity Approach; Antipoverty Approach; and Efficiency Approach; Women and Development (WAD), Gender and Development (GAD); Empowerment Approach;	6	0	0
3	**Frameworks of Gender analysis:** Harvard Analytical Framework and People-oriented planning; Moser Framework (by Caroline Moser); Gender Analysis Matrix (by Rani Parker); Capacities and Vulnerabilities framework Anderson and Woodrow); Women Empowerment Framework (by Sara Hlufekile Longwe); Social Relations Framework (by Naila Kabeer)	9	0	0
4	**Gender and Development Challenges:** Gender, health and nutrition; Gender and WASH. Gender and education, Gender and work (gender inequality in labour market and informal sector); Gender and Environment; The students will select any topic related to gender and development challenge and will conduct	2	4	0

	an in-depth analysis of various case studies will present the report accordingly.			
5	**Gender, policies, and gender Mainstreaming: experience from India** Concept, definition, and rationale of Gender mainstreaming; Evolution of gender mainstreaming in India; Policies and strategies in relation to gender mainstreaming; Principles of gender mainstreaming; steps of gender mainstreaming	3	0	0
	Total	**26**	**4**	**0**

Evaluation criteria

- Case study presentation **(30%)**
- Assignment submission **(20%)**
- Major exam **(50%)**

Learning outcomes

- From Module-1, the students will be able to understand gender and development interface and intersectionality.
- From Module-2, the students, students will be able to construct productive research questions using various approaches of gender and development.
- From Module-3-5, the students will develop skill to critically conduct gender analysis in various development project.

Pedagogical approach

- Class sessions will entail a lecture component, combined with discussion of assigned readings and the documentaries shown. Students would have to write an assignment which will be evaluated on the basis of empirical understanding as well as the critical review of the subject, which would be evaluated by the instructor.

Course Reading

Suggested books

Buckingham-Hatfield, Susan (2000), *Gender and Environment*. Routledge: UK.
Momsen Janet, (2020) *Gender and Development*. (3rd edition). Routledge Perspective of Development. Routledge: UK.
Spary, Carole. (2019), *Gender, Development, and the State in India*. Routledge: UK.
Tasli, Kaan (2007) *A Conceptual Framework for Gender and Development Studies: From Welfare to Empowerment*, Österreichische Forschungsstiftung für Entwicklungshilfe (ÖFSE).

Suggested readings:

Anderson, Mary. (1990). *"Women on the Agenda: UNIFEM's Experience in Mainstreaming with Women 1985-1990."* Monograph. pp. 27.
Batliwala, Srilatha (1994) *"The Meaning of Women's Empowerment: New Concepts from Action"*, in Gita Sen, Adrienne Germain and Lincoln C. Chen (eds.), Population Policies Reconsidered: Health, Empowerment, and Rights, Boston: Harvard University Press, 127-138.
Boserup, Esther (1970) *Woman's Role in Economic Development*, London: Earthscan Publications.
Buvinic, Mayra (1986) *"Projects for Women in the Third World: Explaining their Misbehavior"*, in World Development 14 (5), 653-664.
El-Bushra, Judy (2000) *"Rethinking Gender and Development Practice for the Twenty-First Century"*, in Gender and Development 8 (1), 55-62.
Friedman, J. (1992) *Empowerment: The Politics of Alternative Development*, Cambridge, MA. and Oxford, UK: Blackwell.
Global Gender Gap Report 2023, World Economic Forum.
Kabeer, Naila (1994) *"Empowerment from Below: Learning from the Grassroots"*, in Naila Kabeer (ed.), Reversed Realities: Gender Hierarchies in Development Thought, London: Verso, 223-263.

Kabeer, Naila (2001) *"Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment"*, in Discussing Women's Empowerment: Theory and Practice (SIDA Studies, No: 3), Stockholm: SIDA, 17-57.
March, C., Smyth, I., & Mukhopadhyay, M. (1999). *A Guide to Gender-Analysis Frameworks*. Oxfam. Retrieved from Oxford. www.ndi.org/files/Guide%20to%20Gender%20Analysis%20Frameworks.pdf.

Moser, Caroline O.N. (1989) *"Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs"*, in World Development 17 (11), 1799-1825.
Moser, Caroline O.N. (1993) *Gender Planning and Development: Theory, Practice and Training*, London and New York: Routledge.

Oxaal, Zoë and Baden, Sally (1997) *Gender and Empowerment: Definitions, Approaches and Implications for Policy (Briefing prepared for the Swedish International Development Office – SIDA)*, SIDA report No. 40.

Rathgeber, Eva (1990) *"WID, WAD, GAD: Trends in Research and Practice", in The Journal of Developing Areas* 24 (July 1990), 498-502.
Rowlands, Jo (1995) *"Empowerment Examined", in Development in Practice* 5 (2), 101-107.

Rowlands, Jo (1997) *Questioning Empowerment: Working with Women in Honduras*, Oxford: Oxfam.

Rowlands, Jo (1998) *"A Word of the Times, but What Does it Mean? Empowerment in the Discourse and Practice of Development"*, in Haleh Afshar (ed.), Women and Empowerment: Illustrations from the Third World, London and New York: St. Martin Press, 11-34.

Sen, Gita and Crown, Caren for DAWN (1988) *Development, Crisis and Alternative Visions: Third World Women's Perspectives*, London: Earthscan Publications.
Shahrashoub Razavi and Carol Miller, (1995) *From WID to GAD Conceptual Shift in the Women and Development Discourse*, UNRISD and UNDP 1995.
Sparr, Pamela (1994a) *"What is Structural Adjustment"*, in Pamela Sparr (ed.), Mortgaging Women's Lives: Feminist Critiques of Structural Adjustment, London and New Jersey: Zed Books, 1-12.
Wierenga, Saskia (1994) *"Women's Interests and Empowerment: Gender Planning Reconsidered"*, in Development and Change 25 (1994), 829-848.
Williams, Suzanne, Seed, Janet and Mwau, Adelina (1994) *The Oxfam Gender Training Manual*, Oxford: Oxfam (UK and Ireland).
Young, Kate (1993) *Planning Development with Women: Making a World of Difference*, London: Macmillan.
Young, Kate (1997) *"Gender and Development", in Nalini Visvanathan et. al. (eds.)*, The Women, Gender and Development Reader, London and New Jersey: Zed Books, 51-54.

Student responsibilities

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

Course Reviewer

- Prof. Bijayalaxmi Nanda, Professor and Principal (Acting), Miranda House, University of Delhi
- Dr Manasi Mishra, Head of Research Division, Centre for Social Research, New Delhi

Additional Information

This Course outline was prepared by Dr Swarup Dutta and approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Course title: Management of Development Organizations			
Course code: MPD 150	**No. of credits**: 3	**L-T-P:** 34-11-00	**Learning hours:** 45
Pre-requisite course code and title (if any): NA			
Department: Policy and Management Studies			
Course coordinator: Dr Swarup Dutta		**Course instructor:** Dr Swarup Dutta	
Contact details: swarup.dutta@terisas.ac.in			
Course type: Compulsory Core		**Course offered in:** Semester 2	

Course description: This course discusses the diverse aspects of Development Organizations. This is based on the interdisciplinary framework to deconstruct the management and administration of development institutions. It revolves around the questions on how the various Organizations play in the notions of Development alongside the global associational revolution in which 'third sector organizations' have come to play increased roles in public policies. A variety of development organizations are an essential constituent of 'third sector'. These include community-based organizations and civil society actors, international non-governmental organizations, state and other national-based actors, global forms of governance, international financial institutions, and transnational corporations. The contemporary role of each of these actors, explains the complex theoretical debates over their existence and activities, and their relevance in a variety of contexts, while at the same time critically assessing their effectiveness.

Course objectives

- To provide insight into the conceptual complexities of development organizations.
- To understand NGOs role in development practice
- To explain relation between NGO and aid system
- To understand the various aspects related to the management of NGOs.

Module	Topic	L	T	P
1	**Understanding development organization – Context, histories, and concept** Understanding development organization (DO) in Historical context; Various forms of development organizations (NGOs, Cooperative societies, farmer producer organizations, NGOs under Section-8 of Companies Act 2013, Self-help groups, etc.); NGOs and terminological upheavals; NGOs and civil society; State and civil society relation; DOs in changing development priorities	6	0	0
2	**Development organizations in the context of changing development theories:** Post-war development and rise of NGOs; Neoliberalism; Institutionalism; Post and Alternative Development; bottom-up development models, (social exclusion, social capital. Civil society and social movement)	4	0	0
3	**Development organizations and its role in development practice** Understanding NGOs role in Implementation, Partnership, and Catalysis (NGOs as service providers; NGOs, advocacy, and structural change; NGO and innovation; NGO Partnership); NGOs and business development; *Case Studies from Various southern NGOs*	4	2	0
4	**Development Organization and Aid system and Funding mechanism** Understanding aid system; Aid flows to NGOs and mechanisms of funding; NGO's roles from development projects to Poverty Reduction Strategies (PRSs) and governance; North-South NGO partnership and capacity building; NGO Funding system in India- some challenges and opportunity; *Case Studies from various north and south NGOs.*	4	3	0
5	**Understanding the Management of Development Organization** The idea of NGO management; Levels and areas of management in the organization; Types of organizational plans (Strategic and operational plans and management policies and processes); Factors influencing effective planning; Organizational design and delegation; development of vision, mission, and goal of an NGO; leadership and skill and Control (nature and process); Challenges for NGO managers; NGO accountability	8	4	0

6	**NGO and Legal framework in India** Different laws for NGOs in India (Societies' Registration Act 1860/ Indian Trusts Act 1882/ Companies Act 2013 (CSR and Section 8 clauses)), NGO rules and Regulation; Tax Deduction and NGO compliances; case of Non-compliance; FCRA; NGOs and Section-8 companies, Mismanagement of funds and its consequences in India	2	0	0
7	**Development Organizations and Development Projects** Project formulation; Steps in project formulation; Values in development projects (Types of values and NGOs development value); Human needs in development projects (Maslow's Hierarchy of Needs; deficiency needs vs growth needs; The original hierarchy of needs five-stage model; Characteristics of Self-Actualizers; Key challenges for development organization in India	6	2	0
	Total	**34**	**11**	**0**

Evaluation Criteria

- Case study presentation **(20%)**
- Assignment Submission: **(30%)**
- Major test**: (50%)**

Learning outcomes

By the end of the course,

- From module-1 and 2, the students will be able to understand the conceptual complexities of development organizations.
- From module-3 and -4, the students will be able to understand the various functional aspects of NGOs and other civil society organizations.
- From the module 5-7, the students will be to understand the development management from the perspective of development organization.

Pedagogical approach:

The course will be taught through discussion-centric lectures moderated through relevant academic readings. In addition, contemporary issues will be conceptualized as Case Studies to deconstruct the complexities of Development Institutions.

Readings:

Suggested Books:

Kilby, Patrick. (2011) NGOs in India: *The challenges of women's empowerment and accountability*. Routledge: UK.

Kilby, Patrick. (2021) *Philanthropic Foundations in International Development* Rockefeller, Ford, and Gates. Routledge: UK.

Schaaf, R. (2013), *Development Organizations*. Routledge: UK.

Lewis, D. and Kanji, N. (2009). *Non-government Organizations and Development*. Routledge: UK.

Lewis, D. (2001). *Management of Non-government Development Organizations*. Routledge: UK.

Key Readings

Banks, Nicola and David Hulme David (2013) *The role of NGOs and civil society in development and poverty reduction*. preparatory paper for the book: M. Turner, W. McCourt and D. Hulme (2013), Governance.

Bliss, Frank and Neumann, Stefan (2008) Participation in International Development Discourse and Practice.

"State of the Art" and Challenges. Duisburg: Institute for Development and Peace, University of Duisburg-Essen (INEF-Report, 94/2008).

Dash, SP. (2001). *The State, Civil Society and Democracy: A Note*. The Indian Journal of Political Science, Vol. 62, No. 2.

Ghosh. B. (2012) *Development through Voluntary Actions: The Paradigm of NGO-isation.* In Biswajit Ghosh (Eds.): Discourses on Development (104-128), Rawat Publication: Jaipur.

Ghosh, B. (2009). *NGOs, Civil Society and Social Reconstruction in Contemporary India*. Journal of Developing Societies, 25(2), 229–252. https://doi.org/10.1177/0169796X0902500205.

Islam, Baharul K.M (2013). *Paradigm shift in engaging civil society for development initiatives: the Indian experience*. United Nations. Economic Commission for Africa (2013).

James, Rick (n.d.) *How to do Strategic Planning?* A Guide for Small and Diaspora NGOs published by INTRAC Peer Learning.

Lavanya LK and Prabhakar, K. (2011) *Non-Government Organizations: Problems & Remedies in India*. Serbian Journal of Management 6 (1) 109 – 121.

Lewis, David (2015) *NGOs and civil society*. In Riaz, Ali and Rahman, Mohammad Sajjadur (eds.) Routledge handbook of contemporary Bangladesh. Routledge, London, UK: Routledge, 2015.

Matthew Eagleton-Pierce (2020) *The rise of managerialism in international NGOs*, Review of International Political Economy, 27:4, 970-994, DOI: 10.1080/09692290.2019.1657478.

Pandey, Omkareshwar (2012) *Under Scanner*. In Governance Watch Issue May-June 2012.

Unerman, Jeffrey and O'Dwyer, Brendan (2006) *Theorising accountability for NGO advocacy. Accounting, Auditing & Accountability* Journal. Vol. 19 No. 3, pp. 349-376.

Wessel, MV; Rajeshwari, B; Naz, F., Mishra, Y., Katyaini, S., Sahoo, S., Syal, R., Deo, N. (2018) *Navigating possibilities of collaboration How representative roles of diverse CSOs take shape. A literature reviews*.

Student responsibilities:

- As the University has the policy of minimum 75% of physical presence, the students are expected to plan their academic activities considering the learning goals and evaluation criterion of the Course [The Course Evaluation will be correlated in terms of all the academic factors including the class participation and punctuality and sincerity in learning.
- We shall follow a closed laptop, no mobile phone policy during the class hours.
- Assignment submissions shall be done one-day before the deadline; Lastly, any sorts of academic dishonesty including cheating, copying, inappropriate collaboration and plagiarism will not acceptable.

Course Reviewers:

- Prof. G. Krishnamurthy, Former Professor, IRMA, Anand, Gujarat
- Prof. Nalini Ranganathan, Professor and Head, Department of Social Work, Pondicherry University

Additional Information

This Course outline was prepared by Dr Swarup Dutta and approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Course title: Major Project (MA SDP)

Course code: MPD 104	**No. of credits:** 16	**L-T-P:** 0-0-480
Department: Department of Policy and Management Studies		
Course coordinator(s): Dr Gopal Sarangi	**Course instructor(s):** Dr Gopal sarangi	
Contact details: gopal.sarangi@terisas.ac.in		
Course type: Core	**Course offered in:** Semester 4	

Course description: The major project is a 16-credit course, designed for the students of MA (SDP)in the fourth semester. The course mandates a research-driven learning approach with an exposure of around 20 weeks of field-enriched research project especially in the development sector. The students are expected to associate with a research project of their interest ina host organization wherein they shall implement their classroom learnings and specialization by formulating research problem, objective, questions through literature review, conducting fieldwork, analyzing data, and finally writing reports. Each student needs to work under one internal supervisor from TERI School of Advanced Studies (exceptions on the number(s) can be granted on a case basis by the major project coordinator and programme coordinator, if required). The internal supervisor will be a part of the presentation panel and will evaluate the final project report, apart from regular mentoring, guiding, and monitoring the student. Besides internal supervisor, the student is mandated to work under external supervisor from her/his host organization (exceptions on the number(s) can be granted on case basis by the major project coordinator and programme coordinator, if required). External supervisor is identified by the organization in which the
students will be working. The external supervisor will guide the student in the entire process and will provide mandatory feedback on student's performance at the end of the project.

Course objectives

- To widen student's perspective by providing them real life exposure to both research and practice-based projects
- To develop students" analytical skills and ability to think logically in addressing issues and challenges in sustainabledevelopment practices.
- To develop technical writing and presentation skills
- To enable students to get practical exposure in project management and execution

Course content

Stages	Milestones	L	T	P
1.	• Identification of research problem • Identifying and reviewing relevant literatures for the formulation of research problem • Identifying gaps and challenges in existing research • Defining overall aim and objectives, relevant research questions and research objectives	0	0	50
2.	• Extensive literature review and analyzing secondary data (if any) • Formulating research methodology and designing tools for conducting fieldwork	0	0	50
3.	• Fieldwork and data collection in the relevant field location • Analysis and interpretation of results and findings • Developing overall conclusion and providing recommendations (if any) • Report writing and presentation	0	0	380
	Total			480

Evaluation criteria

- **Assessment-1: Regularity of the submission of the Reports (10%):** It carries 10% of the total marks and will be assessed on timely submission of the research proposal, progress reports and the final project report. Untimely submission will cause the reduction in marks.
- **Assessment-2: Feedback from the Host Organization (20%):** It carries 20% of the total marks and the external supervisor is expected to provide the evaluation of the student's performance on behalf of the host organization.
- **Assessment-3: Presentation (30%):** The presentation will be assessed in front of a panel of examiners. The students will be evaluated based on:
  - Presentation (organizing skills, timing, clarity, discussion)

- Content (Problem identification, formulation of research questions, methods and tools for data collection, data findings and analysis, conclusions, and recommendation/s)

o The time allotted for the presentation is 30 minutes maximum (of which 20 minutes for presentation and 10 minutes for discussion).

- **Assessment-4: Submission of Research Proposal (10%):** This component will be evaluated by the internal supervisor after the student will submit the research proposal (see Annexure 1)
- **Assessment-5: Submission of Final Report (30%):** The final project report will be evaluated by the internal supervisor. The report structure is given in Annexure-1 in detail. The report should be structured in following chapters:
  - Abstract
  - Keywords
  - Introduction
  - Background and Rationale
  - Objectives and Methodology
  - Results and Discussion
  - Conclusions and Recommendations (where applicable)
  - References
  - Annexure (if any)

Regarding Plagiarism: Cases of plagiarism, of any kind, will be taken seriously and actions will be taken as per TERI SAS rules. The final reports will also be assessed based on similarity index with the use of Turnitin software. Strict disciplinary action will be taken if plagiarism found, including deduction of marks.

Learning outcomes: After the major project, the student should be able to demonstrate the ability.

- to independently frame the research problem in a systematic and structured way
- to conceptualize and formulate research problem, research questions and research objectives **(Assessment-3, 4 and 5)**
- to acquire skillsets in designing of research instruments, conducting fieldwork, and collating the required data **(Assessments- 3, 4 and 5)**
- to analyze qualitative and quantitative data and present results **(Assessment- 3, 4 and 5)**
- to professionally manage and execute the research project **(Assessment-2)**
- to communicate the research through effective oral presentations **(Assessment-3)**
- to write structured research reports **(Assessment -5)**

Pedagogical approach

Self-learning; continuous interaction with external and internal supervisors; interaction with domain experts; interaction withthe communities while conducting field work etc.

Additional information

Step-by-step Process of Major Project

- **Submission of Joining Letter:** The students are expected to submit Joining letter duly signed by the host organization to the Internal Supervisor, Major Project Coordinator & Programme Assistant through mail in specified time- period.
- **Submission of Research Proposal:** The students are required to submit research proposal as per the specified format (**please see Annexure-1)**to the Internal Supervisor, Major Project Coordinator & Programme Assistant through mail within the specified time- period.
- **Submission of Progress Reports:** The students are mandated to submit three progress reports in the portal. The format of the progress report is given in **Annexure 2.**
- **Submission of Draft Project Report:** the students are required to submit a draft report of the project to the Internal and External Supervisor before the final presentation.
- **Presentation of Major Project:** The students need to present their work in front of a panel consisting of an internal supervisor and two examiners from TERI SAS. However, the panel may vary depending upon the topic of the report. It is compulsory for all students to attend all presentations of Major Project of MA (SDP) that are held at TERI SAS. Detailed format of the presentation and evaluation criteria have been given in **Annexure-1**
- **Submission of Final Project Report:** After incorporating necessary comments by the examiners, the students will submit the final report to the university. The students are required to submit the soft copy of the report to the internal supervisor, major project coordinator, and programme assistant. A hard copy needs to be submitted to the

internal supervisor only (If required). Please refer to the **Annexures -1, 3, 4 & 5)** at the end of document for detailed structure.

- **Feedback from the Host Organization**. It is mandatory for the students to get feedback from the external supervisor from the host organization for the final evaluation purpose. The feedback report of the students is confidential, and the format of the assessment will be sent to external supervisor through mail only in specified format.

Regarding Mode of Submission: All submissions in softcopies are also to be done through the University Portal. The students need to submit two CDs (re-writable) during the Final Submission. Without the Submission of the CDs, thesis submission will be deemed incomplete.

Regarding late submission

(a) Joining letter: No monthly progress report will be accepted until the signed joining letter has been submitted.
(b) Research Proposal and Monthly progress report: The research proposal and the progress reports have to be submitted by the deadline. Delay in submission of report(s) will result in negative marking.
(c) Submission of final project report for evaluation: The softcopy for evaluation has to be submitted before the deadline mentioned in the student portal. Reports that are submitted after this date will not be considered for evaluation and marked with "0". Further to this, regulations of the TERI School of Advanced Studies, as laid down in the student's handbook, shall apply. These guidelines are also available on the university website
(d) Grade „F" will be awarded if the student is not able to complete the project work within the timeline.

Additional Information

This Course outline was approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Annexure 1

Format of Research Proposal

The length of the proposal should normally be limited to 6 A4 size pages typed in 12-point Times New Roman font with 1.5-line spaces.

I. Structure of the Research Proposal

(a) **Cover Page**: Clearly indicate title, name of candidate, stream/programme and Department & University with month and year at the bottom.
(b) **Introduction**: State the context of your work, the purpose, and goals
(c) **Background and Rationale**: This section should refer to the relevant work/publication in the proposed area and/or the background resources to take up the project. The reference sources should be textbooks, refereed journals, statutory and legal reports, and publications. Limit yourself to authentic sources. All references are to be reported in the reference section.
(d) **Objectives**: Limit yourself to objectives that are achievable in a semester.
(e) **Methodology**: Please mention very explicitly the methods you propose to achieve your aim and objectives.Indicate clearly, choice of methods to meet each objective/research question.
(f) **Expected Outcomes**: This should list the major products/knowledge to be gained/acquired through the project and, if possible, how the work can be carried forward.
(g) **References**: Refer to APA Style of Referencing Guide

Format of Final Report

I. Page setup compulsory for Final Report

(a) Page size of A4
(b) Times New Roman 12 point as the base font and 1.5 lines spacing.
(c) Page numbers in the top margin, centered.
(d) Printed on both sides.
(e) Captions must explain table/figures without reference to the text Position of caption: above tables and below figures.

The length of the report should be limited to 40 to 60 pages. The report should be structured in following chapters:

II. Structure of the Report

(a) **Abstract:** This is a summary of the work done within 300 words. Broadly, it defines the concepts/issue(s) studied and key findings. (Use 12 font and italic in this section).
(b) **Keywords:** Mention most appropriate 3-5 keywords found in research work, with the abstract.
(c) **Introduction:** State the context of your work, the purpose and goals. Also, explain the structure of the report.
(d) **Background and Rationale:** This should be based on the review of literature, giving an overview of the knowledge regarding your work and relevant concepts. It should lead to identifying the set of research problems you propose to explore. The reference sources should be textbooks, journals, statutory and legal reports and publications. Limit yourself to authentic sources. All references are to be listed in the reference section (in accordance with referencing style)
(e) **Objectives and Methodology:** This should state the objectives, research questions (wherever applicable), conceptual framework (wherever applicable), followed by choice of methodology for the study/project. Study area, if applicable, should be part of this chapter. Clearly indicate your choice of methods as per the objectives.
(f) **Results and Discussion:** This is the outcome of the work done during this period. The results will be based on analysis of both qualitative and qualitative data/information. The discussions will establish the relevance of the results with reference to the objectives. They will also be used for constructing larger arguments.
(g) **Conclusions and Recommendations (where applicable):** This section should have your assessment or

conclusions (in terms of important advances in the field of study, critics, limitations, scope for furtherresearch and policy implications) against the background of the state-of-art-knowledge in the field.

(h) **References:** Refer to APA Style Referencing Guide

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

Format of Final Presentation

The presentation content should have the following contents:

- Background/Introduction
- Objective(s)
- Methodology
- Results/Learning
- Conclusions and recommendations (if any)
- Limitations

Report structure should strictly be as per the standard format of the university, failing which the report would be subject to rejection.

Annexure 2:

Progress Report

1.	Name of the student	
2.	Title of the major project	
3.	Period of progress report	
4.	Objectives of the study	
5.	Work done during the current report period	
6.	Were you able to complete the work according to the proposed timeline? If not, why?	
7.	Work proposed for the next reporting period:	
Date		Comments of the Internal Supervisor (TSAS)

Annexure 3:

TITLE PAGE FORMAT (The Base of the Title Page is white; do not use any other color)

TITLE OF THE PROJECT (16 font + Bold +Capital Letter)

Final Project Report

Submitted by (11 font + Italics)
NAME OF THE STUDENT (12 font + Bold + Capital Letter)

In partial fulfillment of the requirement for the (11 font + Italics)

Degree of Masters of Arts in (12 font + Bold) Sustainable Development Practice(12 font + Bold)

Submitted to (11 font + Italics)

Department of Policy Studies (12 font + Bold) TERI School of Advanced Studies (12 font + Bold)

May 2020 (12 font)

Annexure 4:

DECLARATION

This is to certify that the work that forms the basis of this project "……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 acknowledgedin the project report.

Signature

(Name of the Student) Place and Date

Annexure 5:

Certificate

This is to certify that "**Name of the Student"** has carried out "**his/her"** major project in partial fulfillment of the requirement for the degree of Master of Arts in Sustainable Development Practice on the topic **"Name of the Project"** during January 2020 to May 2020. The project was carried out at the **Name of the Organization.**

The report embodies the original work of the candidate to the best of our knowledge.

Date:

(Signature)

Name of the External Supervisor
Designation
Name of the Organization

(Signature)

Name of the Internal Supervisor
Designation
Name of the Organization

(Signature)

Name of the Head of the Department
Head of the Department
Department of Policy Studies
TERI School of Advanced Studies
New Delhi

Course title: Project Design and Management for Sustainable Development Practice			
Course code: MPD 129	**No. of credits:** 4	**L-T-P distribution**: 46-14-00	**Learning hours**: 60
Pre-requisite: Students who have completed the course on "Group Practicum: community needs assessment" (MPD 106)			
Department: Department Policy and Management Studies			
Course coordinator (s): Dr Swarup Dutta		**Course instructor (s):** Prof G. Krishnamurthy	
Course type: Core		**Course offered in**: Semester 3	

Course Description:

The course aims at imparting to the students" knowledge of principles of processes commonly used in project cycle management and the skills for effective application of such processes for sustainable community-drive development programmes. It covers the tools and techniques for identification, analysis, design, implementation monitoring and evaluation of programmes and projects from the point of view of all stakeholders.

Course objectives:

The course will develop the students understanding and skill sets of:

- Identification of a holistic project concept that addresses immediate and long-term challenges and concerns through collaborative and participatory approaches.
- Identification of data/information needed for preparing a feasible project proposal.
- Synthesis of relevant information into a logical and cohesive project proposal which is feasible from all angles – technology, markets, inputs, institutions, management, environment, finance, and implementability.
- Analysis of risks inherent in the projects and formulation of feasible risk management approaches as back-up solutions.
- Identification of funding sources for long-term capital requirements and day-to-day working capital, and ability to liaise with the agencies for timely flow of funds.
- Critical appraisal of projects by financial institutions and funding agencies.

Course Contents:

Module	Topic	L	T	P
1.	**Project Idea Generation** • Project – Definitions, Attributes • Project Life Cycle • Project Identification – Approaches for Generation and Screening of Project Ideas – Individual and Group Creativity Methods • Appreciation of macro-environment in relation to project choice • Financial Mgt. Tools for Project Screening – Investment, • Benefits, Payback, ROI • Group Work on Project Idea Generation and Screening • Group presentations of Project Concepts *Remarks: The first steps of LFA, viz. stakeholder analysis, problem tree andobjectives tree development, and strategy analysis will be simultaneously introduced and related to the other project design approaches.*	11	2	0

2.	**Project Design** • Project Feasibility Study – Aspects of • Project Preparation and Appraisal • Steps and Processes • Cash Flow Estimates • Concepts of Economies of Scale and Minimum Volumes • Break-even analysis and need for healthy growth of cash inflows and surplus. • Cash Flow Analysis and use of MS Excel • Sensitivity Analysis with MS Excel • Group Work on Project Preparation	11	2	0
3.	**Project Financing and Appraisal** • Sources for project funds – long-term and working capital. • Decision on Capital Structure (Debt-Equity), including tax-related issues. • Preparation of Discounted Cash Flow Statements (where necessary) and criteria for financial appraisal – Payback, ROI, ARR, NPV, IRR, Discounted Payback/ARR/ROI • Project Budgets and their integration with the organizational budget • Project Appraisal Process by FIs and Funding Agencies • Simulation of Project Appraisal by students in groups and Presentations	7	3	0
4.	**Project Implementation Planning** • DBS, WBS, Activity Lists, Predecessor Relationships, • Estimation of Duration • Project Organization • Preparation of networks and Gantt Charts • Resource estimation, leveling, allocation. • Concept of Optimum Project Duration • Critical Path and Critical Chain – Importance of TOC • Project Budget Revision based on resource schedule. • Project Management Information System • Project Monitoring and Control Plan • Project Risk Management and Fall-back solutions • Project Implementation Completion and Exit Strategy • Programme/Project Evaluation Plan • Use of standard PM software packages for implementation planning Remarks: Students will simultaneously use LF Matrix to portray the project information comprehensively and deploy it for participatory implementation, monitoring, control, and evaluation.	5	3	0
5.	**Project Implementation Management** • Need for team approach. • Importance of communication • Project Systems and Processes for procurement, award of contracts, workforce management and reviews • Earned Value Method • Participatory Implementation • Management issues and their resolution • Project Manager – Unique Requirements	4	3	0

6	**Project Monitoring and Evaluation**
	• Centralized vs. Participatory Monitoring
	• Optimal Project Review Intervals
	• Use of PM software for monitoring
	• Control Decisions based on monitoring inputs.
	• Project Evaluation
	• Evaluation Study Design
	  • Formative vs. Summative
	  • Desk vs. Field-based
	  • Internal vs. External
	• Data Analysis, Inference and Conclusion
	• Project Revision and New Projects
	Remarks: Students will continue to use LF Matrix, in addition, for development of OVIs and MOVs for participatory implementation, monitoring, control and evaluation.
		8	1	0

Total		**46**	**14**	**00**

Evaluation procedure:

Component	*Weight (%)*
• Minor tests and Quizzes (2*5)	10
• Group Projects	
• Project Preparation – Stage I (Draft)	15
• Project Appraisal	10
• Project Preparation – Stage II (Final)	25
• Presentations – Projects	10
• Presentation – Appraisal	10
• Final examination	20

Learning outcomes:

- By the end of the course, students will.
- Appraise and understand the difficulties and dilemmas that project managers face in the implementation of programmes and projects aimed at bringing about changes. (All the tests)
- Develop a comprehensive understanding of the various approaches and tools (including LFA) required for effective change management. (All the tests)
- Develop critical understanding of the organizational and human resource management challenges encountered while implementing sustainable development programmes and projects (All the tests)
- Learning and applying various commercial project management software packages and an appreciation of their limitations.
- Integration of knowledge gained from monitoring and evaluation systems into the project design and revision of project objectives and activities.
- Develop work plans for effective implementation of the projects through teams consisting of project staff, beneficiaries, and other key stakeholders.

Pedagogical approach:

- The course will be delivered through a mix of lectures, simulation exercises, tutorials, case discussions and discussion of current projects. The lectures will be kept to the barest minimum, and the focus during the sessionswill be active classroom discussion to develop clarity and skills.
- The learning on the course will be through simulation of real-life situations, problems and issues. The simulation exercises, broadly comprising preparation of feasible project proposals by the students in groups and their appraisal, are expected to promote the students‟ curiosity, logical reasoning skills and creativity to develop innovative solutions which can be implemented, promote equitable distribution of benefits and are feasible from all aspects – social, cultural, organizational, managerial, technological, environmental and financial.

Suggested Readings:

A Guide to the Project Management Body of Knowledge (2008), PMI.

Chandra Prasanna (2011) *Projects: Planning, Analysis, Selection, Financing, Implementation, and Review*, TMH.

David Potts (2005) *Project Planning and Analysis for Development*, Viva Books Private Limited.

Gray, Larson (2008) *Project Management: The Managerial Process*, TMH.

Guide to Practical Project Appraisal (1978), United Nations, Reprinted by Oxford & IBH.

Khatua Sitangshu (2011) *Project Management and Appraisal*, OUP.

Mantel J, et. al. (2011) *Project Management*, Wiley India.

Nicholas (2011) *Project Management for Business and Technology*, PHI.

Pinto Jeffrey (2012) *Project Management: Achieving Competitive Advantage*, Pearson.

Other readings

- Project Reporter
- International Journal of Project Management
- PM Network

Additional information (if any): The term „Lecture" is loosely used here for conformance with the standard nomenclature adopted in university systems. However, the sessions must be extremely discussion-basedfor effective learning of concepts and practices by students.

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

Course Reviewers:

1. Prof. BN Hiremath, Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT),Gandhinagar, Gujarat.
2. Prof. KV Raju, IRMA
3. Prof. HK Mishra, IRMA

This Course outline has been approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Course title: Minor Project			
Course code: MPD 109	**No. of credits:** 2	**L-T-P:** 0-0-240	**Learning hours:** 240
Pre-requisite course code and title (if any):			
Department: Department of Policy and Management Studies			
Course coordinator(s): Dr Chandan Kumar	**Course instructor(s):** Dr Chandan Kumar		
Contact details: chandan.kumar@terisas.ac.in			
Course type: Core	**Course offered in:** Summer Break after second semester		

Course description:
The minor project is a 2-credit summer project (6 weeks), designed for MA SDP students and is positioned at the end of the first year of studies. Students are expected to submit a Report 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 andto 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 in an organization. The student will choose a topic based on mutual interests, the student's research aspirations and affiliated organization's goals. The student will continuously be supervised by the assigned mentor/supervisor in the affiliated organization.	0	0	240

Evaluation criteria:
An evaluation committee will be formed to assess the minor project. The distribution of marksfor the evaluation would be as per the following criteria (marks of each component is indicatedin parenthesis)

- **Feedback from the Host Organization (20 %)**
- **Presentation: (30 %)**
- **Final Report: (50 %)**

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 with as per the process mandated by Departmental Academic Integrity Panel (DAIP) and Institutional Academic Integrity Panel (IAIP)

Non-adherence to timelines

- Reports must be uploaded on the portal as per the date mentioned in the timeline.
- **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-SAS apply as laid down in the student handbook (available at the TERI School of Advanced Studies web page).
- **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.

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 demand in sustainable manner.

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.

1. **Course Reading Materials:** Topic relevant books and published papers and reports. Sources can be found on but notlimited to –
   - www.scopus.com
   - www.sciencedirect.com
   - www.springer.com
   - www.wiley.com
   - www.jstor.com
   - www.taylorandfrancis.com

Student responsibilities:

7. Following the issued instructions and guidelines of the minor project in entirety.Regular updating the progress of work to the mentor/supervisor.

8. Timely submission of all required documents through portal

Additional Information:

- A Minor project guideline indicating timeline of different activities and other details will be issued by the department before the start of the semester.
- 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.
- 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 studentto get the feedback submitted by external before the deadline.
- Plagiarism reports would be shared with the mentor/supervisor and the students.

Additional Information

This Course outline was approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Course title: Applied Quantitative Data Analysis in Development Practice

Course code:	**No. of credits:** 3	**L-T-P: 20-12-22**	**Learning hours:** 45

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

- MPD102- Group Practicum - from where students carry their own data sets collected from the field.
- MPD115- Quantitative Approaches & Methods for Development Practice

Department: Department of Policy and Management Studies

Course coordinator(s): Dr Chandan Kumar	**Course instructor(s):** Dr Chandan Kumar

Contact details: chandan.kumar@terisas.ac.in

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

Course description

The basic premise of this course lies in developing a set of skills among students for quantitative data analysis for programme and policy design. MA-SDP students collect an enormous amount of data while undertaking the course MPD 102, which is designed for a community needs assessment. While some of these data are analysed by the students using basic descriptive statistical methods, hands-on experience in developing a dataset based on the information collected from the community and analysing them using inferential statistical methods help students complete an entire process of an independent study. This training can also be useful in applying such techniques on large-scale datasets such as National Family Health Survey (NFHS), National Sample Survey (NSS), Longitudinal Ageing Study in India (LASI), India Human Development Survey (IHDS), etc. which are already collected by different agencies, and which is widely used in development planning.

Learning objectives:

- To provide students with a practical overview of survey data processing, exploration, and analyses
- To enable students to conduct advanced statistical analysis on large-scale survey data using statistical software.
- To enable students independently conceptualize a study satisfying a development inquiry, analyze the respective research questions using available secondary data, interpret and document the findings.

Course content

Module	Topic	L	T	P
1.	**Introduction** This module will hone on illustrations of quantitative data analyses and their ability to facilitate decision-making in development practice. Discussions will also be made on the select large-scale survey data available to use for satisfying development-oriented inquiries in the Indian context.	4		
2.	**Data Processing and Exploration** Data processing starts with selecting a data collection strategy and ends when data transformations are complete. This module will provide an overview of the survey data processing and data exploration along with the practical exercises using the data of group surveys conducted by the students in the 2nd semester. The tutorial will cover the following aspects: • Creating or Importing data files using statistical software (e.g., STATA, R) • Transforming data into variables useful for analysis • Translating the data across formats • Modifying data files (collapse, merge, append and reshape)	8	2	8

	• Describing the data – summarizing and tabulating the variables with descriptive statistics • Presenting data with graphs • Formatting the output tables (publication quality tables)			
3.	**Conceptualization and Data Analyses** This module will focus on the process and nuances of conceptualizing an analytical framework for a research study. In addition, discussions will be made on analytical procedures, estimation of sample statistics, statistical tests and model-building using survey data. This module will cover the following topics: • Research Hypothesis and Analytical Framework • Tests for One-way and Two-way tables (Tests for Goodness of fit, Independence, and Homogeneity) • Types of Multivariate Models (ANOVA-type, regression-type, ANCOVA-type) • Factor Analysis • Logit and Linear models for proportions • Model Building • Adjustment of survey-design	8	4	
4.	**Analysis of Small-Scale Sample Surveys** Application of statistical tools and techniques for small sample size datasets: Group Practicum based survey data will be considered as a practice dataset to learn structuring and developing a database, and apply methods of descriptive statistical analysis such as sample distribution, mean, standard deviations, standard error and confidence interval, tests for mean/proportion, correlation etc. In the practical session, students will be required to apply the knowledge gained in the previous modules to structure the data and address problems in the data set, if any. Students will be given exposure to common errors in data processing and analysis, specific to their survey data collected from the field. They will be required to undertake exercises related to both data structuring and data cleaning.		2	4
5.	**Analysis of Large-Scale Surveys for Development Inquiries** Students will explore and analyze the Large-scale survey data based on well-defined study objective(s) linked to development and sustainability issues including education, health, water and sanitation, gender, socioeconomic and regional differences in development indicators etc. The tutorial session will focus on understanding salient aspects of large-scale surveys (NFHS, NSS, LASI, IHDS): sampling, stratifications, unit of analysis, and the concept of data hierarchy. This will also include analysis of large-scale surveys: bi-variate and multi-variate associations, regression (linear and logit regression) models applicable to the specific study. Students will be required to carry out an analysis of the data set complete in all respect using appropriate software. Different elements of analysis will be clearly delineated and documented in the form of a small research study based on secondary data.	2	4	10

	Total	22	12	22

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor-1:** Written (along with Computer Practical) Test (20%)
- **Minor-2:** Presentation of Analysis based on Group-Practicum Data (20%)
- **Major:** Term paper submission (50%) and presentation (10%)

  Details: A term paper will be submitted by the students. This will be based on a select topic focusing on specific development issues using large-scale survey data analysis. The term paper will have a word limit of 3000-4000 words. The guideline on the structure and content of the term paper is given below:
  (1) Introduction: background and rationale of the study, existing research gaps.
  (2) Methodology: conceptual framework, source of data, measures, hypothesis (if any), statistical analysis.
  (3) Results: sample distribution, bivariate and multivariate results.
  (4) Discussion: relevance of study findings in the context of existing knowledge, policy implications, strength and limitations of the study and future scope.

Learning outcomes

Upon completion of this course, students would be able to:

1. create datasets using raw data collected during the primary survey in the community and analyze them with a well-defined objective.
2. use appropriate statistical techniques/methods based on the nature of data: Application of appropriate statistical techniques will be assessed based on the evaluation of the brief report (based on Community Need Assessment Data) where students will be asked to apply suitable statistical techniques based on the nature of variables and sample size.
3. use large scale survey data in exploring different development inquiries ranging from problem identification to programme and policy design. The term paper will be based on current development challenges and how large-scale nationally representative surveys can be used to generate evidence and evaluate policies (Test 4).

Pedagogical approach

Interactive pedagogical style to maximize the learning opportunity through hands-on experience. Use of statistical package (STATA, R) for data processing and analysis.

Suggested readings

Module 1:

International Institute for Population Sciences (IIPS) and ICF (2017). *National Family Health Survey (NFHS-4), 2015-16: India*. Mumbai: IIPS.http://rchiips.org/nfhs/NFHS-4Reports/India.pdf.

Lehtonen R, Pahkinen E (2004*). Practical Methods for Design and Analysis of Complex Surveys*. West Sussex, England: John Wiley & Sons Ltd.

- Ministry of Statistics and Programme Implementation, Government of India. *National Sample Survey*. http://www.mospi.gov.in/national-sample-survey-office-nsso

National Council of Applied Economic Research and the University of Maryland (2017). *India Human Development Survey (IHDS), 2005*. doi:10.3886/ICPSR22626.v11. https://ihds.umd.edu/

Module 2:

Acock AC (2014). *A Gentle Introduction to Stata, 4th Edition.* Texas: Stata Press.

Minot N (2009). *Using Stata for Survey Data Analysis*. http://www.ifpri.org/publication/using-stata-survey-data-analysis.

StataCorp. (2017). *Stata: Release 15*. Statistical Software. College Station, TX: StataCorp https://www.stata.com/manuals/r.pdf.

Module 3:

Baum CF (2006). *An Introduction to Modern Econometrics Using Stata*. Texas: StataCorp LP.

Cameron AC, Trivedi PK (2009). *Microeconometrics Using Stata*. Texas: StataCorp LP.

Daniels L, Minot N (2019). *An Introduction to Statistics and Data Analysis Using Stata: From Research Design to Final Report.* California: SAGE Publication, Inc.

Jarman KH (2013). *The Art of Data Analysis*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Hamilton LC (2013). *Statistics with STATA: Updated for 12th Version*. Eighth Edition. Boston: Brooks/Cole, Cengage Learning.

Student's responsibilities

Attendance: At-least 75% attendance will be required.

Practical Exercises:

- As part of Module 4, group exercises will be carried out in which students will use their group survey data and will be assigned to prepare and present a brief report using quantitative data analysis.
- The practical exercises in Module 5 will include the data analysis by each student, specifically conceptualised to develop his/her term paper as outlined in the course content and evaluation criteria.

Course reviewers

1. Dr. Manoj Alagarajan, Department of Development Studies, International Institute for Population Sciences (IIPS), Mumbai.
2. Dr. Lucky Singh, Scientist-D, National Institute of Medical Statistics (NIMS), New Delhi.

Additional Information

This Course outline was prepared by Dr Chandan Kumar and approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Course title: Contemporary Public Health Issues and Emerging Approaches			
Course code: MPD 144	**No. of credits:** 3	**L-T-P:** 38-04-06	**Learning hours:** 45
Pre-requisite course code and title (if any):			
Department: Department of Policy and Management Studies			
Course coordinator(s): Dr Chandan Kumar		**Course instructor(s):** Dr Chandan Kumar	
Contact details: chandan.kumar@terisas.ac.in			
Course type: Compulsory Core		**Course offered in:** 3rd Semester	

Course description

This course is designed to familiarize the students with the concurrent and critical public health issues and emerging approaches being conceptualized, adopted, and implemented by development organizations, especially public health institutions, in recent times. The course is divided into four broad modules; first, relating to the fundamentals of the One Health approach; second, relating to the public health surveillance system; third includes the lifestyle diseases, their risk factors, and sustainable solutions; and fourth focuses on the processes, challenges, and efforts for ensuring universal health coverage. The course aims to cover the recent discourses in public health encapsulating the widespread recent threats of zoonotic communicable diseases and chronic lifestyle diseases along with the approaches and efforts to address them through monitoring and facilitating healthcare services, with a focus on the national, regional, and global contexts.

Learning objectives:

- To orient students with the emerging integrated approach for addressing population health issues, i.e., One Health approach, its utility, viability, and implementation challenges.
- To explore and understand the emerging approaches and technologies to undertake public health surveillance required for informed decision-making to ensure preparedness, prevention, and control of potential outbreaks.
- To enable students to assess the global scenario and risks of lifestyle diseases and explore sustainable solutions for addressing chronic lifestyle diseases.
- To provide an overview of the context of universal health coverage (UHC), current challenges in healthcare coverage in low- and middle-income countries, e.g., India, and potential pathways to realize UHC.

Course content

Module	Topic	L	T	P
6.	**Fundamentals of One Health Approach** It has become increasingly clear that the majority of novel, emergent zoonotic infectious diseases originate in animals, especially wildlife, and that the principal drivers of their emergence are associated with human activities, including changes in ecosystems and land use, intensification of agriculture, urbanization, and international travel and trade. Thus, there is a need for an integrated, unifying approach, e.g., One Health, that aims to sustainably balance and optimize the health of people, animals and ecosystems by undertaking a risk assessment and developing plans for response and control. Antimicrobial resistance is a serious threat to human and animal health in recent times. This module will cover the distinctive discourses around the One Health approach. a) Introduction to the Concept of One Health Approach b) Drivers & Mechanisms of Disease Emergence at the Animal-	10		

	Human Interface c) Antimicrobial Resistance: Impact & International Challenges d) Real-world use of the One Health approach e) Challenges and Future Perspectives for the Application of One Health			
7.	**Public Health Surveillance** Public health surveillance is a basic tool of the field epidemiologist, providing the scientific and factual database essential to informed decision-making and to the conduct of public health prevention and control programs. Wastewater-based surveillance has enabled early identification of local outbreaks and informed targeting for rapid clinical testing, to reduce the disease burden and prevent further infections. Recently, social media has become an increasingly relevant tool for public health surveillance, as a real-time census, with organizations using social media to detect, monitor and predict epidemic trends to facilitate preparedness and rapid response. Major points of discussion under this module include: a) Introduction to Public Health Surveillance: types, attributes, design, data management and other important considerations b) Wastewater Surveillance and other Environmental Health Surveillance c) Social Media: an emerging surveillance tool for outbreak monitoring & healthcare d) Public Health Surveillance in India: Progress, Threats, Challenges and Opportunities	8	2	
8.	**Lifestyle Diseases: Risk Factors & Sustainable Solutions** Lifestyle diseases characterize those diseases whose occurrence is primarily based on the daily habits of people and are a result of an inappropriate relationship of people with their environment. They share similar risk factors such as prolonged exposure to three modifiable lifestyle behaviours — smoking, unhealthy diet, and physical inactivity — and result in the development of chronic diseases, specifically heart disease, stroke, diabetes, obesity, metabolic syndrome, chronic obstructive pulmonary disease, and some types of cancer. Today, these lifestyle diseases are a major public health problem worldwide. This module will discuss the scenario of such diseases along with their risk factors and evidence-based sustainable solutions. a) Major lifestyle diseases in India and the world b) Tobacco & Alcohol Use: epidemiology and regulatory policy c) Plant-based Diet: panacea for lifestyle diseases? d) Therapeutic role of *Yoga* in addressing chronic diseases e) Lifestyle as Medicine: emerging role of digital technology	10	2	6

9.	**Ensuring Universal Health Coverage** Universal health coverage (UHC) is an emerging priority of health systems worldwide and the overarching target for all other targets under Sustainable Development Goal (SDG) 3. Inequalities continue to be a fundamental challenge for UHC. Even where there is national progress on health service coverage, the aggregate data mask inequalities within countries. This module aims to cover the major discourses in order to realize UHC and notable initiatives taken globally and in the Indian context. a) Universal Health Coverage: need for equitable, quality healthcare, and resilient health systems b) The Political Economy of Health c) Global Strategy on Digital Health d) Challenges to healthcare coverage in India e) Ayushman Bharat: a comprehensive need-based health care service in India; Health and Wellness Centres (HWCs); Pradhan Mantri Jan Arogya Yojana (PMJAY)	10		
		38	**4**	**6**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor-1:** Written Test (20%)
- **Minor-2:** Submission and Presentation of Assignment (30%)
- **Major:** Written Test (50%)

Learning outcomes

Upon completion of the course, candidates would be:

4. able to understand the fundamental concepts, challenges, approaches, processes, and scenarios of emerging public health issues (All evaluations)
5. able to independently conceptualize and develop a piece based on the reviews of empirical evidence generated in the field and scope of relevant public health issues (Minor Test-2)
6. aware of multifaceted approaches, processes, and challenges in ensuring healthcare coverage to population (All evaluations)

Pedagogical approach

Classroom lectures, student-led seminars, invited talks from renowned public health practitioners and scientists, and case studies.

Suggested Readings

Module 1:

Atlas, R. M., & Maloy, S. (Eds.) (2014). *One health: people, animals, and the environment*. Washington, DC: American Society for Microbiology.

Kahn, L. H. (2016). *One Health and the Politics of Antimicrobial Resistance*. Maryland: Johns Hopkins University Press.

Mackenzie, J. S., Jeggo, M., Daszak, P., & Richt, J. A. (Eds.) (2013). *One Health: The Human–Animal–Environment Interfaces in Emerging Infectious Diseases. Food Safety and Security, and International and National Plans for Implementation of One Health Activities*. Heidelberg: Springer-Verlag.

Prata, J. C., Ribeiro, A. I., & Rocha-Santos, T. (Eds.) (2022). *One Health: Integrated Approach to 21st Century Challenges to Health.* London: Elsevier Inc.

Rüegg, S. R., Häsler, B., & Zinsstag, J. (Eds.) (2018). Integrated approaches to health: A handbook for the evaluation of One Health. The Netherlands: Wageningen Academic Publishers.

Zinsstag, J., Schelling, E., Waltner-Toews, D., Whittaker, M., & Tanner, M. (Eds.) (2015). *One Health: The Theory and Practice of Integrated Health Approaches*. Oxfordshire: CAB International.

Module 2:

Blanchard, J., Washington, R., Becker, M., Vasanthakumar, N., Madangopal, K., Sarwal, R. et al. (2020) Vision 2035: *Public Health Surveillance in India*. A White Paper. NITI Aayog.

Gregg, M. B. (Ed.) (2008). *Field Epidemiology*, Third Edition. New York: Oxford University Press, Inc.

Gupta, A., & Katarya, R. (2020). *Social media-based surveillance systems for healthcare using machine learning: A systematic review*. Journal of Biomedical Informatics, 108:103500.

Kilaru, P., Hill, D., Anderson, K., Collins, M. B., Green, H., Kmush, B. L., & Larsen, D. A. (2023). *Wastewater Surveillance for Infectious Disease: A Systematic Review*. American Journal of Epidemiology, 192(2):305-322.

Thacker, S. B., Stroup, D. F., Parrish, R. G., Anderson, H. A. (1996). *Surveillance in environmental public health: issues, systems, and sources*. American Journal of Public Health, 86(5):633-638.

Wilson, A. E., Lehmann, C. U., Saleh, S. N., Hanna, J., & Medford, R.J. (2021). *Social media: A new tool for outbreak surveillance*. Antimicrobial Stewardship & Healthcare Epidemiology, 1(1): e50.

Module 3:

Ascione, R. (2022). *The Future of Health: How Digital Technology Will Make Care Accessible, Sustainable, and Human*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Bijlani, R.L., Vempati, R.P., Yadav, R.K., Ray. R.B., Gupta, V., Sharma, R., Mehta, N., & Mahapatra, S.C. (2005). *A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus*. Journal of Alternative and Complementary Medicine, 11(2):267-274.

Boccia, S, Villari, P., Ricciardi, W. (Eds.) (2015). *A Systematic Review of Key Issues in Public Health*. Cham, Switzerland: Springer International Publishing.

Patel, J.C., Khurana, P., Sharma, Y.K., Kumar, B., & Ragumani, S. (2018). *Chronic lifestyle diseases display seasonal sensitive comorbid trend in human population evidence from Google Trends*. PLoS One, 13(12):e0207359.

Pickworth, W. B. (Ed.) (2020). *Smokeless Tobacco Products: Characteristics, Usage, Health Effects, and Regulatory Implications*. Amsterdam, Netherlands: Elsevier Inc.

Raveendran, A.V., Deshpandae, A., & Joshi, S.R. (2018). *Therapeutic Role of Yoga in Type 2 Diabetes*. Endocrinology and Metabolism (Seoul), 33(3):307-317.

Safaei, M., Sundararajan, E. A., Driss, M., Boulila, W., Shapi'i, A. (2021). *A systematic literature review on obesity: Understanding the causes & consequences of obesity and reviewing various machine learning approaches used to predict obesity*. Computers in Biology and Medicine, 136:104754.

Thulasi, A., Kumar, V., Jagannathan, A., Angadi, P., Umamaheswar, K., & Raghuram, N. (2022). *Development and Validation of Yoga Program for Patients with Type 2 Diabetes Mellitus (T2DM)*. Journal of Religion and Health, 61(3):1951-1965.

Wörle, L., & Pfeiff, E. (2010). *Yoga as Therapeutic Excercise: A Practical Guide for Manual Therapists*. Edinburgh: Elsevier Ltd.

Module 4:

International Labour Organization (2020). *Towards Universal Health Coverage: Social Health Protection Principles*. https://www.ilo.org/secsoc/information-resources/publications-and-tools/Brochures/WCMS_740724/lang--en/index.htm.

Kasthuri, A. (2018). *Challenges to Healthcare in India - The Five A's*. Indian Journal of Community Medicine, 43(3):141-143.

MacLean, S. J., Brown, S. A., Fourie, P. (Eds.) (2009). *Health for Some: The Political Economy of Global Health Governance*. Hampshire, UK: Palgrave Macmillan.

Patel, V., Bhadada, S., Mazumdar-Shaw, K., Mukherji, A., Khanna, T., & Kang, G. (2022). *A historic opportunity for universal health coverage in India*. Lancet, 400(10351):475-477.

Selvaraj, S., Karan, K.A., Srivastava, S., Bhan, N., & Mukhopadhyay, I. (2022). *India Health System Review*. New Delhi: World Health Organization, Regional Office for South-East Asia.

Shroff, Z.C., Marten, R., Ghaffar, A., Sheikh, K., Bekedam, H., Jhalani, M., & Swaminathan, S. (2020). *On the path to Universal Health Coverage: aligning ongoing health systems reforms in India. BMJ Global Health*, 5(9):e003801.

Walshe, K., & Smith, J. (Eds.) (2006). *Healthcare Management*. Berkshire: Open University Press.

Wilensky, S. E., & Teitelbaum, J. B. (2020). *Essentials of health policy and law, Fourth edition*. Burlington, Massachusetts: Jones & Bartlett Learning, LLC.

Yanful, B., Kirubarajan, A., Bhatia, D., Mishra, S., Allin, S., Di Ruggiero, E. (2023). *Quality of care in the context of universal health coverage: a scoping review*. Health Research Policy and Systems, 21(1):21.

Additional information: Up to FIVE candidates from outside the programme will be accommodated after the discussion with the course coordinator

Student responsibilities

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

Course reviewers

1. Dr. Amanda Rodrigues Amorim Adegboye, Associate Director of Research and Engagement, Centre for Agroecology, Water and Resilience (CAWR) & Centre for Healthcare Research (CHR), Coventry University, Coventry, England.
2. Dr. H. K. Chaturvedi, Scientist G & Director (i/c), National Institute of Medical Statistics, Indian Council of Medical Research, Department of Health Research, Ministry of Health & Family Welfare, Government of India.

This Course outline was prepared by Dr Chandan Kumar and approved in the 56th Academic Council Meeting on 10th August 2023 at TERI School of Advanced Studies, New Delhi.

Enclosure 8

Course Title: Project Management			
Course code:	**No. of credits:** 3	**Total Lectures:** 30-15-0	**Learning hours:** 45
Pre-requisite course code and title (if any): None			
Department: Policy and Management Studies			
Course coordinator: Dr. Shruti Sharma		**Course instructor:** Dr. Ann Francis	
Contact details: ann.francis@terisas.ac.in			
Course type: Core	**Course offered in:** Semester 3		

Course Description:

The course aims to give a basic perspective of project management and understanding a project through its life cycle. The course would provide hands-on training on tools and techniques for planning project timelines, resources, and risks.

Course objectives:

The objectives are to:

- Introduce the basic concepts of project management.
- Analyse different kinds of project delivery mechanisms and procurement methods
- Application of project management tools and techniques in project planning.
- Impart skills in planning resources and tracking the time and cost plans of a project.
- Introduce agile project management and a broad understanding of project financing

Course Contents

Module	Topics	L	T	P
1.	**Introduction to Project Management:** Foundation and Fundamental Concepts of Project Management, Phases in the Life cycle of Projects and their significance, Organization Strategy and Project Selection, Project management process groups, Stakeholders in a Project, Sustainable Project Delivery. Project feasibility analysis, Work Breakdown Structure, Organizational Charts	6	2	0
2.	**Project and Project Delivery:** Types of Projects, Public Private Partnership, Turnkey Projects, Contracts Management. Green Project Delivery Mechanism and Procurement. Fundamentals of Lean and six-sigma	6	2	0
3.	**Project Planning/Scheduling and Control:** Project Planning, Gantt Chart, CPM network diagrams, PERT, Project fast track and crashing, Resource loading, Resource levelling and planning. Software training on Microsoft Project (MSP) and Primavera scheduling, Project Monitoring.	8	6	0
4.	**Project Budgeting and Finance: Project Finance-**Key Features, Earned value analysis, Project Valuation, Risk Management, and Models for project financing. Performing cost management using Project Management software.	4	3	0

5.	**Introduction to Agile Project Management:** What is Agile and SCRUM. Why Agile. Principles of AGILE project management, Agile Methods. Agile implementation case studies.	6	2	0
	Total	**30**	**15**	**0**

Evaluation criteria:

- Test 1 – Minor Examination – 20%
- Test 2 – Group Project – 20%
- Test 3 – Individual Project – 20%
- Test 4 – Major Examination – 40%

Learning outcomes:

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

- Develop a project plan, sequence activities and structure them
- Evaluate different project delivery and procurement mechanisms
- Develop detailed project schedules using software tools
- Recognize issues and challenges in project planning in terms of costs and resources
- Develop an understanding of modern project management tools such as lean and agile and financing mechanism

Pedagogical approach:

The course will be primarily taught through class discussions, hands-on software tutorials, quizzes, case analysis and assignments, and presentations.

Materials

Suggested readings

Berkun, Scott (2008), *Making Things Happen: Mastering Project Management*, O'Reilly Media: Cambridge, MA.

C. Gray and E Larson (2011), *Project Management: The Managerial Process*, McGrow Hill.

Dennis Lock (2013), *Project Management*, Grower.

John M Nicholas (2008), *Project Management for Business and Technology*, Pearson.

Khanna, R. B. (2011), *Project Management*, PHI Learning Private Limited, New Delhi.

Kendrick, Tom (2004), *The Project Management Toolkit: 100 Tips and Techniques for Getting the Job Done Right*, AMACOM Books: Boston, MA.

Tate, Karen (2001), *Getting Started in Project Management*, Wiley: New York.

Internet References

www.pmi.org.in

Additional Information: The course framework and modules were designed and conceptualized by Dr. Ann Francis

Student responsibilities:

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

Course Reviewer(s):

1. Dr. Rajeev Agrawal, Associate Professor, Department of Mechanical Engineering, MNIT, Jaipur
2. Dr. Vasanth Kamath, Associate Professor, Department of Management, TA Pai Management Institute, Karnataka
3. Vandana C Padmanabhan, Lead (Engg. & Technology), Community Design Agency, Mumbai

Course Title: Supply Chain and Logistics Management			
Course code:	**No. of credits:** 2	**Total Lectures:** 30-0-0	**Learning hours:** 30
Pre-requisite course code and title (if any): The students should have undergone a course on Productions and Operations Management			
Department: Policy and Management Studies			
Course coordinator: Dr. Shruti Sharma		**Course instructor:** Dr. Ann Francis	
Contact details: ann.francis@terisas.ac.in			
Course type: Elective		**Course offered in:** Semester 3	

Course Description:

The course intends to provide a detailed understanding of the complete scope of supply chain management, ranging from supplying raw materials, through factories and warehouses, to meeting the demand in sales outlets. Supply Chain Management has emerged as a key element in providing a competitive advantage in the job markets. The course focuses on the bullwhip effect, types of supply chains, logistics management, distribution channels, green supply chain and modern tools .

Course objectives:

The objectives are to:

- Evaluate production and its operations from the perspective of supply chain management and logistics planning
- Analyze the tools and metrics associated with supply chain management and logistics
- Impart analytical and problem-solving skills necessary to develop solutions to supply chain conflicts
- Evaluate the need and techniques to 'Green' the supply chain and modern IoT tools for the supply chain.
- Develop the ability to design integrated supply chain strategies using modern tools for supply chain and logistics management.

Course Contents

Module	Topics	L	T	P
1.	**Introduction to Logistics and Supply chain management**: Understanding the Supply Chain, Issues and Challenges, Bullwhip Effect: Impact, Causes, Remedies, Risks in SCM, Demand Uncertainty in Supply Chain, Distribution channels and intermediaries, Principles of Logistics, Cooperation in channels and logistics, Beer distribution case demonstration.	6	0	0
2.	**Tools, Drivers, and Metrics for Supply Chain Management:** Tools/Drivers for supply chain and logistics management, Supply chain innovations, Organisation and Control in Supply Chain, Coordination in the supply chain, Dimensions of performance measures.	4	2	0
3.	**Designing the Supply Chain or Distribution Network:** Models for supply chain, Networks for locating plants and warehouses, Parameters to decide the suitable distribution, Supply chain and distribution-related business cases	4	4	0
4.	**Green supply chain management:** Sustainability and the Supply Chain. What it means to green the supply chain. Making a case for a	6	0	0

	sustainable supply chain, Metrics for green supply chain: GreenSCOR model. Sustainable warehousing and procurement. Reverse logistics			
5.	**Digitilisation and application of modern tools for supply chain**: Modern Logistics Operations**,** Digital Transformation application and cases, Application and trends in the digital supply chain, Technology-embedded supply chain models and associated case studies. AI for Supply chain Management	4	0	0
	Total	**24**	**6**	**0**

Evaluation criteria:

- Test 1 – Minor Examination – 30%
- Test 2 – Group Project – 20%
- Test 3 – Individual Project – 20%
- Test 3 – Major Examination – 30%

Learning outcomes:

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

- Identify and appreciate the application of the right supply chain practices.
- Demonstrate the ability to solve supply chain conflicts and design better supply chains.
- Develop integrated supply chain strategies for businesses
- Implement green/sustainable aspects into supply chain management and practice the use of modern IOT and digital tools for supply chain management

Pedagogical approach:

The course will be primarily taught through class discussions, supply chain simulation, quizzes, case analyses and assignments, and presentations.

Materials

Suggested readings

Chopra, S. and Meindl, P. (2015) *Supply Chain Management: Strategy, Planning, and Operation*. 6th Edition, Pearson, London.

David E. Mulchy & Joachim Sidon (2008) *A Supply Chain Logistics Program for Warehouse Management*. Auerbachian Publications.

Designing and managing the Supply Chain: Concepts, Strategies, and Case Studies 2e, 2003, Irwin McGraw Hill, pp. 1-21.

Gwynne Richards (2014) *Warehouse Management: A Complete Guide to Improve Efficiency and Minimizing Cost in the Modern Warehouse*. The Chartered Institute of Logistics and Transport, Kegan page limited.

Purchasing in Supply Chain Management Robert Monczka, Robert Trent and Robert Handfield, 1998, South-Western College Publishing.

Supply Chain, Strategic Supply Chain Management, Gattorna, J., Gower, 1998, pp. 425-445.

Additional Information: The course framework and modules were designed and conceptualized by Dr. Ann Francis

Student responsibilities:
Attendance, Participation in the class exercise and case discussions, to read relevant student material before attending the class.

Course Reviewer(s):

1. Dr. Rajeev Agrawal, Associate Professor, Department of Mechanical Engineering, MNIT, Jaipur
2. Dr. Vasanth Kamath, Associate Professor, Department of Management, TA Pai Management Institute
3. Vandana C Padmanabhan, Lead (Engg. & Technology), Community Design Agency, Mumbai

Course Title: Sustainable Production for Businesses			
Course code:	**No. of credits:** 2	**Total Lectures:** 30-0-0	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Policy and Management Studies			
Course coordinator: Dr. Shruti Sharma		**Course instructor:** Dr. Ann Francis	
Contact details: ann.francis@terisas.ac.in			
Course type: Elective		**Course offered in:** Semester 3	

Course Description:

The course intends to provide an awareness of how environmental degradation due to the production and use of goods and services could be reduced. It would provide insights into how production and consumption could be made more efficient by using fewer resources and generating less waste and pollution. It would raise awareness of how individuals and communities must collaborate to contribute to sustainable development. Further, it would educate the students on quantifying and assessing sustainability.

Course objectives:

The objectives are to:

- Impart knowledge of sustainable production and consumption, significance, indicators, and challenges with respect to achieving the SDGs
- Enable the evaluation and analysis of business models for sustainability
- Analyse green design options and processes and develop an understanding of sustainable decision making
- Perform sustainability assessments of various products and processes to understand the available tools and compare them from a sustainability perspective.
- Provide an overall understanding of sustainability accounting and financing.

Course Contents

Module	Topics	L	T	P
1	**Introduction to Sustainable Production and Consumption:** Links with Sustainable Development Goals, Challenges, and Opportunities for sustainable production and consumption in emerging economies, Key Indicators of Sustainability. Sustainable production through the lens of social, economic, and environmental sustainability.	4	0	0
2	**Business through sustainable production and consumption:** Models for sustainable business, Practical Case Discussions on sustainable business, Sustainable value chain, Environmental externalities	6	0	0
3	**Green Design and Decision making:** Sustainable product design, Principles, Labels and Certification, Green Ads, and Greenwashing. Multi-Criteria Decision-making methods	4	3	0
4	**Sustainability Assessment:** Life Cycle Assessment methods. Life Cycle Sustainability Assessment, Greenhouse Gas accounting, Detailed hands-on training on assessment and accounting tools. Circular economy-based business models-case discussions	4	4	0

5	**Sustainable financing and accounting:** Methods and Models for Life Cycle Costing, Overview on carbon credit frameworks, Financing options for sustainable businesses.	5	0	0
	Total	**23**	**7**	**0**

Evaluation criteria:

- Test 1 – Minor Examination – 20%
- Test 2 – Group Project – 20%
- Test 3 – Individual Project – 20%
- Test 4 – Major Examination – 40%

Learning outcomes:

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

- Build on the concept of sustainable consumption and production and discuss its role in sustainable development
- Incorporate sustainable production and consumption principles in the Businesses and Design and Develop sustainable business models.
- Evaluate green design and improve the decision-making capabilities concerning green products.
- Perform sustainability assessment for products and processes to take better decisions.
- Evaluate financing from the perspective of sustainable development.

Pedagogical approach:

- The course will primarily be taught through class discussions, case analyses, assignments, and presentations.

Materials

Suggested readings

Dhillon, B. (1989). *Life cycle costing: techniques, models, and applications*. Routledge.

Jolliet, O., Saade-Sbeih, M., Shaked, S., Jolliet, A., & Crettaz, P. (2015). *Environmental Life Cycle Assessment (1st ed.)*. CRC Press. https://doi.org/10.1201/b19138.

Kibert, C. J. (2016). *Sustainable construction: green building design and delivery*. John Wiley & Sons.

Simonen, Kathrina. *Life cycle assessment*. Routledge, 2014.

Sustainable Consumption and Production in the Proposed Sustainable Development Goals- A paper from the Inter-Agency Coordination Group (IACG) of the 10-Year Framework of Programmes on SCP (10YFP). June 2014. Available at: www.unep.org/10yfp/Portals/50150/10YFP%20IACG.pdf.

Thompson, Simon. *Green and sustainable finance: Principles and practice*. Vol. 6. Kogan Page Publishers, 2021.

UNEP, 2015. *Sustainable Consumption and Production Indicators for the Future SDGs*. Available at: http://www.scpclearinghouse.org/upload/publication_and_tool/file/440.pdf.

Additional Information: The course framework and modules were designed and conceptualized by Dr. Ann Francis
Student responsibilities: Attendance, Participation in the class exercise and case discussions, to read relevant student material before attending the class.

Course Reviewer(s):

1. Dr. Rajeev Agrawal, Associate Professor, Department of Mechanical Engineering, MNIT, Jaipur.
2. Dr. Vasanth Kamath, Associate Professor, Department of Management, TA Pai Management Institute.
3. Vandana C Padmanabhan, Lead (Engg. & Technology), Community Design Agency, Mumbai.

Course Title: Managing group processes and diversity issues: pillars of sustainable workplace			
Course code:	**No. of credits:** 2	**L-T-P:** 30-00-00	**Learning hours:** 30
Pre-requisite course code and title (if any): Organizational Behaviour			
Department: Policy and Management Studies			
Course coordinator: Dr. Shruti Sharma		**Course instructor:** Dr. Moumita Acharyya	
Contact details: moumita.acharyya@terisas.ac.in		**Course offered in:** Semester 3	
Course type: Elective			

Course description: To familiarize the students with the functioning of individuals in group situations. To provide students with an understanding of human behaviour at work and how to effectively integrate human and organizational resources. The course devises pathways to improve people's quality of work-life and group situations in organizations and understand how managers can create positive change in organizations. This course will introduce the learners to the fundamental aspects of group behaviour in detail.

Course objectives:

- To analyze the conceptual framework and fundamentals of group dynamics to enable and sustain high performance and effectiveness;
- To attain and improve the ability and skills to analyse and apply critical thinking and learning skills to "real life" problems and situations concerning human behaviour;
- To identify the behavioural skills that improve individual and group performance for business effectiveness and apply them in organizational work.
- To achieve overall development to become effective leaders & managers.
- To demonstrate how workplace discrimination undermines organizational effectiveness.

Course Content

Module	Topic	L	T	P
1.	Foundations of Group Behaviour: Defining and classifying Groups, stages of group development, Five Group properties. Impact of group working on organizational outcomes.	2		
2.	Group dynamics: Group decision making, Group Processes: Conformity, deviance, cohesiveness, social loafing and facilitation, cooperation and competition. Case study: The Everest Tragedy	4		
3.	Interpersonal Behaviour: Communication process, Modes of communication, transactional analysis, JOHARI window. Barriers to effective communication. Group Communication: Process, formal and informal communication, verbal and non-verbal patterns of communication, social networks, rumors, and grapevine.	4		
4.	Understanding Self: Diagnosing and Understanding Self, Self-Analysis Extending Self to Others, Interpersonal Relationship at Work. Emotional Intelligence.	4		
5.	Understanding work teams: Managing Team Effectively, Developing Assertiveness and Trust on others (Building Next Line of Leadership). Creating effective teams, Turning individuals into team players. Case study: Team building at Mindtree Consulting.	4		

6.	Organizational justice and ethics: Ethical behaviour in organizations and difference between morals and ethics, the guiding principle of global ethics, factors promoting ethical and unethical behaviour. Case study: Organizational justice – why care about it in service sector?	4		
7.	Positive Organizational Scholarship: Principle and scope of POS, Mindfulness at work and well-being at work.	4		
8.	Managing Diversity and Inclusion at workplace: Introduction, history and evolution of DEI: challenges & opportunities. Stereotypes and discrimination at workplace, implementing diversity management strategies. Interpersonal dynamics, Strategies and tools for creating inclusive culture. Case study: ABB leveraging diversity and inclusion.	4		
	Total (in hours)	**30**	**0**	**0**

Evaluation criteria:

1. Minor 1 Exam – 30%
2. Minor 2 Exam (Case Analysis/Assignment/Presentation) – 30%
3. Major Exam – 40%

Minor 1 Exam **(at the end of module 4)**
Structure: Students will be assessed through MCQ format quiz.
Minor 2 Exam **(at the end of module 7)**
Structure: The students will be assessed through a group task presentation (case analysis or problem solving) and participation in team building activities conducted in class.
Major Exam **(End-Term Exam; at the end of all modules)**
This will be an exam based on all the modules covered in the class. This will be a written examination and will be application based.

Learning outcomes:

By the end of the course, the students should be able to demonstrate the following understanding of skills, abilities and characteristics:

LO1: Broader perspectives and importance of interpersonal and organizational behaviour at the workplace.
LO2: Abilities to recognize components and complexities of group dynamics and employee engagement.
LO3: Comprehending best work practices in the changing working environment.
LO4: Insights on emotional intelligence competencies to manage disruptive work environment.
LO5: Analyse and apply the concept of groups and team building processes in organizations.

Materials

Suggested readings:

Parek, U. & Khanna, S., *"Understanding Organizational Behavior,"* 4th Ed, Oxford University Press. (2018).

Robbins, S.P. Judge, T.A. & Vohra, N., *"Organizational Behavior,"* 18th Ed, Pearson Education. (2019).

Additional readings:

Baron R. A. and Byrne D., *"Social Psychology"*, 10th Ed., Pearson Education, Inc. (2004).

Cameron, K.S., Dutton, J.E.& Quinn, R.E., *"Positive Organizational Scholarship,"* Berrett-Koehler Publishers, Inc, San Francisco. (2003).

Cameron, K.S. & Spreitzer, G.M., *"The Oxford Handbook of Positive Organizational Scholarship,"* Oxford Handbooks. (2012).

Greenberg, J. & Baron, R., *"Behavior in Organizations,"* 10th Ed, Pearson-Prentice Hall. (2009).

Luthans F., *"Organizational Behavior"*,10th Ed., McGraw-Hill Companies. (2004).

Pedagogical approach:
The course will be primarily taught though a combination of class discussions, quizzes, and case analysis, role plays and assignment, and presentations.

Additional information:
The course was prepared by Dr. Moumita Acharyya.
Few interesting articles can be accessed through the following:
https://hbr.org/2019/03/the-future-of-leadership-development
https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/raising-the-resilience-of-your-organization
https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/organizing-for-the-future-nine-keys-to-becoming-a-future-ready-company

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

Course Reviewer(s):

- Ms Pooja Singh (Sr. HR Manager, PSU, New Delhi)
- Dr. Sanyukta Jolly (Professor, IILM)

Course Title: Financial Accounting			
Course code:	**No. of credits:** 4	**L-T-P:** 42-18-00	**Learning hours:** 60
Pre-requisite course code and title (if any):			
Department: Policy and Management Studies			
Course coordinator:		**Course instructor:**	
Contact details:		**Course offered in:** Semester 1	
Course type: Core			

Course description:

The subject "Financial Accounting" aims at introducing the student to the general aspects of the accounting language, its concepts, conventions and uses by different stakeholders. It also explains the complete accounting process, preparation of different types of accounts and statements, and make students aware of the different accounting problems faced by the business.

Course objectives:

- To understand the general purposes and functions of accounting
- To describe the main elements and terms of financial accounting information used in the business like assets, liabilities, revenue, expenses, PAT, EBIT etc
- To understand and apply the process of maintaining accounts for a business, from journal to final accounts
- To understand and solve the inventory and depreciation accounting problems
- To identify the main financial statements, their purpose and reading of financial statements of a real time company
- To prepare profit and loss account, balance sheet and cash flow statements

Course Content

Module	Topic	L	T	P
9.	Nature and purpose of accounting: What Is Accounting? purpose and importance of accounting, its relationship to business, role of accounting information in making an economic decision, users of accounting information, important accounting terms like assets, liabilities, income, expense, EBIT, PAT etc, introduction to the three main financial statements, accounting concepts and principles- application of different accounting concepts and conventions, Indian Accounting Standard, Generally Accepted Accounting Principles (GAAP), **accounting equation**, introduction to accounting process	4	1	0
10.	First stage of accounting process: Recording in the Journal Identifying the business transaction, rules of debit and credit, entering these transactions into the journal in a precise format by **passing journal entries**, passing opening and closing entries, introduction to subsidiary books	4	4	0
11.	Second stage of accounting process: Journal to Ledger	3	1	0

	Introduction to ledger, its purpose, format of the ledger, **posting all the journal entries into the ledger** and balancing each ledger, cash account and different types of cash account			
12.	Third stage of accounting process: Ledger to Trial Balance Introduction to Trial balance, its purpose, format of Trial Balance, **posting of all the ledgers balance into the trial balance**, how Trial Balance serves as a summary of debits and credit balance	2	1	0
13.	Capital and revenue expenditure and receipts: Introduction to capital expenditure, revenue expenditure, deferred revenue expenditure, capital receipt, revenue receipt-its meaning, purpose in business with suitable examples	2	0	0
14.	Depreciation and Amortisation Introduction to depreciation, purpose of charging depreciation on non-current assets, depreciable assets, **methods of charging depreciation, change in the method of depreciation**, disposal of non-current assets, revaluation of non-current assets and depreciation, treatment of depreciation as per Income tax act and Company's Act, accounting standard of depreciation	4	1	0
15.	Bank reconciliation statement Introduction, causes of difference between the two balances, methods of reconciliation, **preparation of bank reconciliation statement**	3	1	0
16.	Rectification of errors Introduction, different types of errors, trial balance and errors, errors not disclosed by trial balance, **rectification of errors at different stages-before preparation of trial balance, after preparation of trial balance but before preparation of final accounts, after preparation of final accounts, suspense account**	3	1	0
17.	Inventory accounting Introduction, types of inventory, inventory accounting and its objectives, **methods of inventory systems** like LIFO, FIFO etc	3	1	
18.	Final accounts (without and with adjustments) Introduction to profit and loss account, format of profit and loss account, explanation of items appearing in the profit and loss account, calculation of gross profit and net profit, introduction to balance sheet, format of balance sheet(horizontal and vertical), explanation of items appearing in balance sheet, marshalling of balance sheet, balancing of assets and liabilities, **preparation of final accounts without adjustments**, explanation of various adjustments given outside the trial balance, **preparation of final accounts with adjustments**	7	5	0
19.	Cash flows statements Introduction, uses of cashflow statements, objectives of preparing cash flow statements, **methods of preparing cash flow statements**, format of cash flow statement as per the accounting standard, limitations of cash flow statement	**3**	**2**	

	Final accounts of a company Introduction of all the financial statements of a company i.e balance sheet, statement of profit and loss, statement of changes in equity, cashflow statement, format of financial statement as per Accounting standard, features of the company's financial statements, understanding the interlinkage between the financial statements, explaining the financial statements of a real time company(Asian paints)	**4**	**0**	
	Total (in hours)	**42**	**18**	**0**

Evaluation criteria:

4. Minor 1 Exam – 30%
5. Minor 2 Exam (Case Analysis/Assignment/Presentation) – 30%
6. Major Exam – 40%

Minor 1 Exam **(at the end of module 4)**
Structure: The students will be quizzed from the first four modules of the course.
Minor 2 Exam **(at the end of module 7)**
Structure:
Major Exam **(End-Term Exam; at the end of all modules)**
This will be an exam based on all the modules covered in the class.

- **Learning outcomes:**
- Analyze the accounting process of a business unit
- Prepare final accounts of a sole proprietor
- Read the financial statements of a real time company
- Analyse the items of financial statements of a real time company

Materials
Suggested readings

- Financial Accounting for BBA, 2/e**,** published by Vikas Publishing
- Dr S N Maheshwari, CA Sharad K Maheshwari & Dr Suneel K Maheshwari

Additional readings

Introduction to Financial Accounting, 11th edition, Published by Pearson

- Charles Horngren Edmund W. Littlefield Professor Emeritus of Accounting at Stanford University
- Gary L. Sundem University of Washington
- John A. Elliott Baruch College, The City University of New York
- Donna Philbrick University of Washington

Pedagogical approach:
Problem solving using Ms Excel
Case study method,
Flip-flop method(at certain places),

Real time scenarios discussion (picking up Asian paints company's financials)
Additional information:
Student responsibilities: Students will be involved in continuous assessments using quizzes, assignments, viva, group presentation(picking up real time companies), and written exam

Course Prepared by: Dr. Silky Kushwaha

Course Reviewer(s):

- Dr. Shikha Shrivastav, Associate Professor, Bennett University
- Dr. Ashima Arora, Assistant Professor, Arun Jaitley National Institute of Financial Management.

Course Title: Principles of Management			
Course code:	**No. of credits:** 4	**L-T-P:** 42-18-0	**Learning hours:** 60
Pre-requisite course code and title (if any):			
Department: Policy and Management Studies			
Course coordinator:		**Course instructor:**	
Contact details:		**Course offered in:** Semester 1	
Course type: Core			

Course description:

Objective of the course is to give a basic perspective of management theories and practices. This will form foundation to study other functional areas of management and to provide the students with the conceptual framework and the theories underlying organizational behaviour.

Course objectives:

The objectives are:

- To understand the concept of Organization and its governance in the 21st century
- To get acquainted with concepts, principles, processes and applications of management
- To inculcate ways of enhancing organizational effectiveness and efficiency through managerial skills
- To focus on effectively recognizing and resolving various managerial issues in diverse organizational settings

Course Content

Module	Topic	L	T	P
1.	**Introduction:** Introduction to Principles of Management, Icebreakers & Why study Management, Managerial Skills & Skills required to thrive in future, theories of management. Mintzberg's 10 roles, Evolution (classical approaches, Quantitative approach, OB Approach) Introduction to P-O-L-C framework.	6	2	0
2.	**Concept and Nature**, Objectives of Management, Development of Management Thoughts: F. W. Taylor, Henri Fayol, Max Weber, Chester I. Barnard, Elton Mayo, etc.	4	0	0
3.	**Environmental Scanning**-Macro and Micro Environmental scanning, PESTEL Analysis.	4	2	0
4.	**Planning:** Concept and Nature, Types, Planning Premises, Importance, Steps in Planning Process, Long-range and Short-range Planning, Effective Planning. Business Continuity Planning • What & Why of Business & BCP • BCP Implementation • BCP steps • Anatomy of BC Plan	4	2	0
5.	**Organising and Staffing:** Concept and Nature of Organizing. Characteristics, Formal & Informal Organizations, Principles of Delegation, Delegation of Authority. Authority- Responsibility Relationships, Staffing: Nature and Significance, A brief knowledge of Recruitment, Selection, Placement, and Induction.	4	0	0
6.	**Organizational Design & Structure** - Factors that affect OS, Organizational Design, Forms of Organizational Structure, Modern	6	4	0

	OS Vs Traditional OS, Virtual Organizations /Remote Working, hybrid working (Benefits and Challenges), Hybrid working and related challenges: Perspectives.			
7.	**Directing and Controlling:** Concept and Nature of Directing, Techniques of Directing and Supervision, Controlling Concept, Importance of Controlling. Types of Control, Steps in Control Process, Span of Control.	4	3	0
8.	**Problem Solving and Decision Making** • Introduction to Problem Solving Process • Problem Analysing Tools Fishbone Analysis, Pareto Analysis, Root Cause Analysis • Types of Decisions • Decision Making Tools • Decision Tree, Decision Matrix	4	3	0
9.	**Leadership** ●Glimpses of Political & Corporate leaders ●Theories of leadership ●Styles of leadership ●Transactional and Transformational leadership **Discussion on issues like** How to Develop Emotionally intelligent leader- Who thinks rationally. Leadership during crisis	6	2	0
	Total (in hours)	**42**	**18**	**0**

Evaluation criteria:

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

Test 1 (at the end of module 4)
Structure: The students will be quizzed from the first four modules of the course.
Test 2 (at the end of module 7)
Structure: The students will be required to identify an organization in consultation with the course instructor and submit a report based on analysis of primary and/or secondary data covering critical review of any one dimension like organisational design, leadership, organisational culture, structure, etc. Each report shall focus on one dimension to be decided in consultation with the course instructor.
Parameters: Type of data; originality; timeliness, structure and formatting; logic of arguments and flow of thoughts; understanding of theoretical base will be the parameters for evaluation. All five components carry equal weightage.
Test 3 (End-Term Exam; at the end of all modules)
This will be an exam based on all the modules covered in the class.

Learning outcomes:
By the end of the course, the students should be able to:
(a) Understanding functions of managers; qualities of an effective manager.
(b) Learning to take decisions

(c) Understanding the role and importance of environment and organizational culture
(d) Learning to plan, organize, styles of leading and controlling
(e) Importance of Management of human resource and various process.

Materials

Suggested readings

- Koontz, H and Wechrich, H., Management, New York, McGraw Hill
- Luthans, F., Organizational Behaviour, New York, McGraw Hill
- Banerjee, M., Organisation Behaviour, Allied
- Prasad, L. M., Organisational Behaviour, Sultan Chand
- Robbins, S. P., Management, New Jersey, Englewood Cliffs, Prentice Hall Inc.
- Robbins, S. P., Organizational Behaviour, New Delhi, Prentice Hall of India
- Singh, Dalip, Emotional Intelligence at Work, Response Books, Sage Publications, Delhi

Additional readings

- Kao, S R. etc. Effective Organization and Social Values. New Delhi, Sage, 1994.
- Robbins, S P. Organizational Behaviour. 7th ed., New Delhi, Prentice Hall of India, 1996.

Additional information:

The following websites may also be visited at regular intervals:

- https://journals.aom.org/doi/abs/10.5465/ame.1990.4274710
- https://hbr.org/2014/01/ideos-culture-of-helping
- https://hbsp.harvard.edu/download?url=%2Fcatalog%2Fsample%2FH05JNP-PDF-ENG%2Fcontent&metadata=eyJlcnJvck1lc3NhZ2UiOiJZb3UgbXVzdCBiZSByZWdpc3RlcmVkIGFzIGEgUHJlbWl1bSBFZHVjYXRvciBvbiB0aGlzIHdlYiBzaXRlIHRvIHNlZSBFZHVjYXRvciBDb3BpZXMgYW5kIEZyZWUgVHJpYWxzLiBOb3QgcmVnaXN0ZXJlZD8gQXBwbHkgbm93LiBBY2Nlc3MgZXhwaXJlZD8gUmVhdXRob3JpemUgbm93LiJ9

We have the corporate database CMIE Prowess. Students are advised to use it for assignment and other work.

Pedagogical approach:

The course will be primarily taught though a combination of class discussions, quizzes, and case analysis and assignment, and presentations.

Additional information:

Student responsibilities:

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

Course prepared by: Dr. Silky Kushwaha, Associate Professor, NDIM.
Course Reviewer(s): Dr. Shikha Srivastava, Associate Professor, Bennett Univrsity