10, Institutional Area, Vasant Kunj,
New Delhi 110070

54rd MEETING OF THE ACADEMIC COUNCIL

MINUTES OF THE FIFTY FOURTH MEETING OF THE ACADEMIC COUNCIL HELD ON 30 JANUARY 2023 AT 10.30 A.M.

PRESENT

The following members of the Academic Council attended the meeting:

Members	Special Invitee
Professor Prateek Sharma, Chairperson	Dr Swarup Dutta
Professor Ramakrishnan Sitaraman	Dr Shikha Shrivastav
Professor Shaleen Singhal	Dr Gopal Sarangi
Professor Anandita Singh	Dr L.N. Venkataraman
Professor T.C. Kandpal	Dr Aviruch Bhatia
Professor Sagnik Dey	Dr Vidhi Madaan Chadda
Mr Manoj Chugh	Dr Shantanu De Roy
Mr Shubhashis Dey	Dr Chandan Kumar
Dr Bidyut Kumar Bhadra	
Dr Niraj Sharma	
Dr Madhusudan Sau	
Mr Sudhir Vadehra	
Dr Sudipta Chatterjee	
Professor Naqui Anwer	
Dr Sukanya Das	
Dr Chaithanya Madhurantakam	
Professor Arun Kansal	
Dr Shruti Sharma Rana	
Mr Kamal Sharma, Secretary	

Prof Shreekant Gupta, Dr Sabhyata Bhatia, Prof. P.S.N. Rao, Prof. Suresh Jain, Mr Rahul Mittal, Professor Shashi Bhushan Tripathi, Dr Anu Rani Sharma, Dr Smriti Das, Dr Chander Kumar Singh and Professor Vinay Shankar Prasad Sinha could not attend the meeting.

Prof Prateek Sharma welcomed all the Academic Council members. He introduced the new members to the Academic Council, Dr Bidyut Kumar Bhadra, Dr Niraj Sharma, Dr Madhusudan Sau and Mr. Sudhir Vadehra. He also welcomed Dr Shruti Sharma Rana, the internal member to the Academic Council. He said that the institution will immensely be benefitted from their rich experience and expertise. Before taking up the agenda items, Prof. Prateek Sharma briefly

mentioned to the AC members the major activities happened in the last one year namely setting up of Emerson Centre for Sustainability Studies with the help of CSR funds of Emerson and IPCA Centre for Waste Management and Research. He also informed that in September last year, NAAC inspection had taken place and they have awarded 'A' grade to TERI SAS. Prof Sharma thanked all the faculty members for their hard work for achieving this goal. Academic Council members appreciated the efforts of the faculty members in this regard. Prof Sharma then requested the Registrar to take up the agenda items.

Item No. 1: To confirm the minutes of the Fifty Third Meeting of the Academic Council held on 26 August 2022. The Registrar informed that the minutes of the Fifty Third Meeting of the Academic Council, held on 26 August 2022, were circulated to the members and no comments have been received. The Academic Council may, therefore, consider confirming the minutes, as circulated.

TS/AC/54.1.1 The Council resolved that the minutes of the 53rd Academic Council Meeting held on 26 August 2022 be confirmed.

Item No. 2. Inclusion of a cross-cutting course across Master's programmes

The Registrar requested the Dean (Academic) to brief the Academic Council on the agenda item. Dean (Academic) informed that approval to offer the course NRE 165 – Introduction to Sustainable Development as a cross-cutting course across all Master's programmes except to students of MA (Public Policy and Sustainable Development) programme was taken in the 53rd Academic Council meeting held on 26 August 2022. However, after consultation with the Heads and the Programme Coordinators, it has been decided that this course will not be offered to the MBA (Sustainability Management) and MA (Sustainable Development Practice) programmes as well, as it is already built in their course curriculum. Prof Kandpal stated that overall requirement of students becomes less in some programmes and hence such issues may be looked into before implementation in future.

[Action: Dean (A)]

TS/AC/54.2.1 The Academic Council resolved to approve withdrawal of course NRE 165 – "Introduction to Sustainable Development" to the students MBA (Sustainability Management) and MA (Sustainable Development Practice) programmes since it is already built in their course curriculum.

Item No. 3: Delegation of approval authority for the inclusion of SWAYAM online courses in the curricula of Master's and Doctoral programmes to Heads of Departments

The Academic Council is requested to authorize the Heads of Departments in their capacity as Chairpersons of their respective Boards of Studies to approve the inclusion of SWAYAM courses in the curriculum. The Master's Programme Executive Committee/Doctoral Programme Executive Committee (as the case may be) will recommend appropriate courses for inclusion each semester to the concerned departments. Since the Departments are running the course and are

aware of the requirements. Inclusion and delivery of SWAYAM courses will be governed by the University Grants Commission (Credit Framework for Online Learning Courses through Study Webs of Active Learning for Young Aspiring Minds) dated March 25, 2021." Members were of the view that mapping of the courses that were approved by the AC should be the criteria, evaluation criteria should be the same; course coordinator to be assigned; no student should be in a disadvantage situation. After hearing all the members, Prof Prateek Sharma informed that a comprehensive plan will be prepared which will be put up in the next Council meeting. **[Action: Dean (A)]**

TS/AC/54.3.1 The Academic Council resolved that the proposal be carefully reconsidered, reformulated and presented again to the Academic Council.

Item No. 4: To consider and approve the second semester course outlines of MBA (Sustainability Management), M.Sc. (Economics) and MA (Sustainable Development Practice) programme

Dr Shruti Sharma Rana, Dr Shikha Shrivastav, Dr Vidhi Madaan Chadda, Dr Swarup Dutta, Dr Chandan Kumar, Dr, L.N. Venkataraman and Dr. Gopal Sarangi respectively presented to the Academic Council the second semester course outlines of MBA (Sustainability Management), M.Sc. (Economics) and MA (Sustainable Development Practice) programme placed as **Enclosure 1**. After detailed deliberation members suggested some minor modifications to be carried out in the course outlines and approved the course outlines**.** However, the course on State, Civil Society and Development being presented by Dr L N Venkataraman for MA (Sustainable Development Practice) programme and Data Analytics being presented by Dr Shruti Rana Sharma for MBA (Sustainability Management) programme were dropped after detailed deliberations.

In this context Prof. Kandpal stated that the University should follow a common template for all the course outlines. He felt that name of the instructor should be left blank since the faculty can change anytime and course reviewers name should be written in full along with their affiliations. Prof. Kandpal also pointed out that the reading material suggested should be updated and all reference should be complete. Prof Prateek Sharma while agreeing with Prof Kandpal's views informed that in future all the course outlines before being put up to the Academic Council should be vetted and forwarded by the respective Head of the Department to the Dean (Academic) for his approval and only after approval of the Dean (Academic) be presented to the Academic Council.

TS/AC/54.4.1 The Academic Council resolved to approve the second semester course outlines of MBA (Sustainability Management), M.Sc. (Economics) and MA (Sustainable Development Practice) programme placed as **Enclosure 1**.

Item No. 5. To consider and approve the revised programme structure and second semester course outlines of M.Tech (Renewable Energy Engineering and Management) programme

Prof. Naqui Anwer and Dr Aviruch Bhatia presented to the Academic Council the second semester course outlines of M.Tech (Renewable Energy Engineering and Management) programme placed as **Enclosure 2**. Prof. Anwer further stated that there is no revision in programme structure and only slight modifications are made in the course outlines. After detailed deliberation members suggested some minor modifications to be carried out in the course outlines and approved the course outlines.

TS/AC/54.5.1 The Academic Council resolved to approve the second semester course outlines of M.Tech (Renewable Energy Engineering and Management) programme placed as **Enclosure 2**.

Item No. 6. To consider and approve the Major Project Course for M.Sc. (Biotechnology) programme

Dr. Chaithanya Madhurantakam presented to the Academic Council the Major Project course outline for M.Sc (Biotechnology) programme placed as **Enclosure 3**. After detailed deliberation members approved the Major Project course outline for M.Sc. (Biotechnology) programme.

TS/AC/54.6.1 The Academic Council resolved to approve the Major Project course outline for M.Sc. (Biotechnology) programme placed as **Enclosure 3**.

Item No. 7. To discuss and approve the list of experts for Selection Committee for interview of faculty position

The point was dropped from the agenda item.

Item No. 8. Any other item with the permission of the Chair

The Registrar informed that we may consider certain MVoc programmes such as MVoc in Renewable Energy, MVoc in Smart Power System, MVoc in Refrigeration and Air-Conditioning etc. as eligibility criteria for taking admission in MTech (Renewable Energy Engineering and Management) programme. Based on students' application the MPEC will take a final decision to ascertain the eligibility for entering the selection process in MTech (Renewable Energy Engineering and Management).

TS/AC/54.8.1 The Academic Council approved MVoc as qualification for MTech (Renewable Energy Engineering and Management) programme subject to MPEC approval.

There being no other items for discussion, the meeting was adjourned with a vote of thanks to the Chair at 1445 hours.

Sd/
Kamal Sharma
Registrar (Acting)

Enclosures:-

1. Course outlines of MBA (Sustainability Management), M.Sc. (Economics) and MA (Sustainable Development Practice) programme
2. Revised programme structure and second semester course outlines of M.Tech (Renewable Energy Engineering and Management) programme
3. Major Project Course for M.Sc. (Biotechnology) programme

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

Printed Copy: Registrar Office

Enclosure 1

Course title: Macroeconomic Environment			
Course code: BSI 122	**No. of credits:** 4	**L-T-P:** 43-17-0	**Learning hours:** 60
Pre-requisite course code and title (if any):			
Department: Policy & Management Studies			
Course coordinator(s): Dr Shantanu De Roy		**Course instructor (s):**	
Contact details: shantanu.roy@terisas.ac.in		**Course offered in:** Semester 2	
Course type: Core			

Course description

In the present world, the economy of a country is influenced by various national and international phenomena. For instance, the inflation targeting policy by the Government of India, or the global financial crisis could affect various agents of an economy. Therefore, understanding the bigger picture of the economy and associated changes is crucial. In view of this, the course has been developed as a foundational course to introduce the key elements of Macroeconomic Environment.

Course objectives

The course is intended to familiarize the students with the conceptual foundation of Macroeconomics and policy drives that influence income, interest rates, inflation, employment and exchange rates with explanations of the potential short-run and long-run fallouts on the economy.

Course content

Module	Topic	L	T	P
1.	**Concept and Nature of Macroeconomics** • Concepts of Macroeconomics and Microeconomics • Three Core Macroeconomics Concerns: Output, Unemployment and Inflation • Macroeconomic Stability and Business Environment: The Relationship with Focus on Indian Economy, concept of exchange rate.	3	0	0
2.	**Measuring the Macroeconomic Performance** • National Income Accounting • Gross Domestic Product – Components, Measurement • National Income and Social Welfare • GDP and Underground Economy • National Income Accounting System of India	3	1	0
3.	**Social Progress and GDP** • Limitation of GDP in Measuring Social Progress • Understanding Human, Social and Natural Capital • HDI and Gross National Happiness • Environmental Adjustment of National Income for Sustainability	2	1	0
4.	**Theory of Income Determination** • The Keynesian Theory of Consumption • Investment function • Equilibrium Income/Output Determination • Concept of Multiplier • The Paradox of Thrift	4	2	0

5.	**Role of Government** • Fiscal Policy: Concept and Instruments • Government Spending Multiplier, Tax Multiplier, Balanced Budget Multiplier • Country Experiences • Contra Cyclical Fiscal Policy • Budgets and Budgetary Policy of Government of India	6	2	0
6.	**Money, Interest and Income** • Demand for Money and the Interest Rate • Aggregate Demand in the Goods and Money Market – IS-LM Model • Money Supply: Concepts and Measures • Credit Creation: Banking System • Monetary Policy: Targets and Instruments	6	2	0
7.	**Aggregate Price Level, Inflation and Unemployment** • Aggregate Demand and Aggregate Supply: • Determination of Aggregate Price Level • Interaction between the Fiscal and Monetary Policy • Inflation: Definition and Causes; Budget Deficit and Money Supply • Public Debt: Concept and Burden • Labour Market: Definition of Unemployment and Measurement • The Philips Curve	6	2	0
8.	**Business Cycle and Stabilization Policies** • Business Cycle: Meaning and Phases • Macroeconomic Stabilization: Classical, Keynesian and Neo-classical**,** Post-Keynesian Perspectives	3	1	0
9.	**Open Economy Macroeconomics & International Trade** • Concept of Open Economy • Institutions and Regulations of Trade • Balance of Payment • Exchange Rate Determination • Fixed and Flexible Exchange Rates • Devaluation and Purchasing Power Parity • Balance of Payment Crisis • India's Balance of Payment Crisis	5	2	0
10.	**Macroeconomic Policies & Indicators of India** • Analyse various recent macroeconomic policies in India • Impact of such policies on various economic indicators	1	2	
11.	**Growth and the Economy** • The Theory of Growth • Growth Models • Total Factor Productivity • Indian Economic Reform and Growth • Dilemmas of Economic Growth	4	0	0
	Total (in hours)	**43**	**17**	**0**

Evaluation criteria: The grading will be based on the students' participation in the class-discussion, presentation accompanied by submission of a term paper/report and a major exam at the end of the course

Minor 1 Exam (Written Test (Module 1-4)- 20%

Minor 2 Exam Economic Policy Analysis (Module 5 & 6)- 20%
Indicators for assessment: (a) Identification of the problem; (b) Data collection; (c) Relevance of the data analysis method;
(d) Representation and explanation; (e) Punctuality and timeline adherence.
Note: (a), (b) and (c) would carry a weightage of 10% each; (c) would carry 30% weightage and (d) would carry 40 %weightage.

Minor 3 Exam (Term Paper and Presentation (Module 6-8)- 30%
i. Structure: (1) identification of an important problem related to macroeconomic issues; (2) explain why it is important forthe country/state/province from the macroeconomic perspective; (3) how has this problem
been addressed in the literature (both empirical and theoretical); (4) where is the scope of improvement - in policy, methodetc.; (5) specify the objective of the work; (6) clearly mention the data source and methodology (7) explain & discuss the results obtained; (8) policy directions/ recommendations & scope of further research.
ii. Indicators for assessment: (a) Identification of the problem; (b) Identification of specific research question(s); (c)
Structure and referencing; (d) Content, language, clarity (Academic Merit); (e) punctuality & timelineadherence.
Note: (d) shall carry a weight of 50%; (a) & (b) shall carry 15% each; the rest will carry 10% each

Major Exam (Written Examination (Module 5-12)- 30%

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

1. Interpret and measure the key Macroeconomic variables (Test-1)
2. Explain the circular flow of income (Test-1)
3. Describe the roles of fiscal and monetary policy in an economy (Test 1 & 2)
4. Understand the concept of business cycle (Test-3 & 4)
5. Explain and uses of the growth models (Test-4)
6. Analyse the factors influencing the balance of payments and the exchange rate (Test 3 & 4)
7. Explain and understand the mechanisms of international trade (Test 2, 3 & 4)

Materials

Books:

1. Barro, R. and X. Sala-i-Martin (latest edition). Economic Growth, Prentice Hall, India.
2. Blanchard, O. (latest edition). Macroeconomics. Pearson Education, New Jersey, USA.
3. Case K.E., Fair R. and Oster S. (latest edition). Principles of Macroeconomics. Prentice Hall, Pearson.
4. De Souza, E. (latest edition). Macroeconomics. Pearson Education, New Delhi.
5. Jones, C. (latest edition). Introduction to Economic Growth. W.W. Norton, New York.
6. Ray, D. (latest edition). Development Economics. Princeton University Press, New Jersey.
7. Romer, D. (latest edition). Advanced Macroeconomics. McGraw-Hill, New Delhi.
8. Sikdar, S. (latest edition). Principles of Macroeconomics. Oxford University Press, New Delhi.

Websites:

1. Reserve Bank of India: www.rbi.org.in
2. Budget and Economic Survey: www.indiabudget.nic.in
3. MOSPI: www.mospi.nic.in
4. CMIE: www.cmie.com
5. Economic & Political Weekly: http://www.epw.in/

Pedagogical approach

A combination of class-room interactions and assignments

Additional information (if any)

Student responsibilities

Attendance, feedback, discipline etc. as per University rules

Prepared by: Dr Montu Bose

Course Reviewers:

1. Dr. Seema Sangita
   Associate Professor
   Krea University.
2. Prof. Ananya Ghosh Dastidar
   University of Delhi
   Delhi

Course title: Management Information System			
Course code: BSI 171	**No. of credits:** 2	**L-T-P:** 24-04-04	**Learning hours:** 30
Pre-requisite course code and title (if any):			
Department: Policy and Management Studies			
Course coordinator(s): Dr Shruti Sharma Rana		**Course instructor(s):** Guest Faculty	
Contact details:		**Course offered in:** Semester 2	
Course type: Core			

Course description

The objective of this course is to introduce the students to the Management Information System (MIS) and its application in organizations. The course would expose the students to the managerial issues relating to information systems and help them identify and evaluate various options.

Course objectives

1. To provide students an understanding about the usage of Information Systems in management.
2. To make them familiar with activities that are undertaken for acquiring an Information System in an organization.
3. To make them aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organization

Course content

Module	Topic	L	T	P
1.	**Introduction** Meaning and Role of Information Systems, Constituents, and Characteristics of MIS, Decision Making and MIS, Cost and Value of Information. Ethics and Social Issues	4	0	0
2.	**Classification of Information Systems** Computer Based Information Systems: Office Automation Systems; Transaction Processing Systems; Management Information Systems; Real-time Information System; Decision Support Systems; Group Decision Support Systems; Executive Information Systems. Artificial Intelligence Based Systems such as Expert System, Knowledge Management System; Informationsystem security issues and control;	6	0	0
3.	Structured Systems Analysis; System Development; System Development Life Cycle.	2	0	0
4.	**Enterprise Systems**- Enterprise Data Warehousing, Enterprise Resource Management Systems, SupplyChain Management, Customer Relationship Management; Developing Business Intelligence from these systems	4	0	0
5.	**Introduction to Big Data** Database, RDBMS, Big Data, Big Data Analytics, Relationship of Data warehousing and Big DataAnalytics, Tools and techniques of Big Data Analytics	4	2	0
6.	**Introduction to Other Latest Development for MIS** Data Mining and Analytics, Artificial Intelligence and Machine Learning, Blockchain Applications, Data Lake, Delta Lake, Google	4	2	4

	Cloud Dataflow, Introduction to Cloud Computing			
	Total (in hours)	**24**	**4**	**4**

Evaluation criteria

Minor 1 Exam (Quiz)-	20%
Minor 2 Exam (Presentation)-	20%
Minor 3 Exam-	20%
Major Exam-	40%

Learning outcomes

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

1. Develop an exhaustive understanding of the usage of MIS in organizations.
2. Demonstrate an ability to explain the classifications of MIS and linking MIS to business strategy for strategic advantage.
3. Develop an ability to assess the requirements of MIS design in different organizations including functions and issues at each stage of system development.

Materials:

Required textbooks

1. Kenneth, Laudon and Jane Laudon, MIS: Managing the Digital Firm, Pearson Education.

Reference:

1. James, A. O'Brien. Introduction to Information Systems. Tata McGraw Hill. (Latest Edition).
2. Goyal, D.P. Management Information Systems, Macmillan India Ltd. (Latest Edition).
3. Turban, E., McLean, E. and Wetherbe, J. Information Technology for Management: Making Connections for Strategic Advantage. John Wiley and Sons. (Latest Edition).
4. Jawadekar, W. S. Management Information Systems. Tata McGraw Hill (Latest Edition).

Pedagogical approach

The course will involve a mix of instructor led training and case studies.

Additional information (if any):

Student responsibilities

Attendance, feedback, discipline: as per university rules.

Prepared by: Dr Shikha Mittal Shrivastav

Course Reviewers:

1. Dr. Shruti Choudhary
   Associate Professor
   Karnavati University, Ahmedabad
2. Mr Amit Kumar Das
   Assistant General Manager (Head MIS Team)
   Air India, New Delhi

Course Title: Corporate Finance			
Course code: PPM 122	**No. of credits:** 4	**L-T-P:** 45-15-0	**Learning hours:** 60
Pre-requisite course code and title (if any): NA			
Department: Policy and Management Studies			
Course coordinator: Dr Shikha Mittal Shrivastav		**Course instructor:** Dr Shikha Mittal Shrivastav	
Contact details: shikha.shrivastav@terisas.ac.in		**Course offered in:** Semester 2	
Course type: Core			

Course description:

In this course the students are exposed to the decisions taken by an individual or a business firm, which have financial implications. While decision processes are dealt with the objective of maximization of wealth of shareholders, a focus is kept on sustainability issues.

Course objectives:

The course is designed to provide an understanding of the essential elements of finance and its functions and the financial environment in which the business firm operates. The paper will examine the objective of shareholder wealth maximization which encompasses much of modern corporate finance and its implication for decision making in the present context.

Course contents

Module	Topic	L	T	P
1.	**Introduction to Corporate Finance** An introduction to Corporate Finance, Evolution of finance as a discipline, the scope of finance function, Financial Objectives: Profit Maximization Vs Wealth Maximization, Forms of business organization, Agency Problems, the financial decision making, Role of Finance Manager	4	1	0
2.	**Value, Risk and Return** **(A)Time value of money**-Compounding, Future value, Discounting, Present value, Annuities, Perpetuity, Applications **(B) Risk and return-** Risk and its measurement, Return, Risk & return of a single asset, Risk & return of a portfolio, Measurement of market risk, Relationship between risk & return: The CAPM	3 3	2 2	0 0
3.	**Long Term Investment Decisions -**Capital Budgeting Decisions, Techniques- NPV, IRR, Profitability Index, Payback period, ARR, Estimation of Cash Flows, NPV v/s IRR, Risk analysis in Capital Budgeting	5	2	0
4.	**Long Term Sources of Finance**- Equity shares/Ordinary Shares, Preference Shares, Debentures/Bonds, Long Term Loans, Retained Earnings	2	0	0
5.	**Cost of Capital-**Meaning and Concept, Cost of Equity, Cost of Preference Shares, Cost of Debt, Cost of Retained Earnings, Calculation of WACC, Calculation of Cost of Capital in practice	4	1	0
6.	**Financing Decisions-**Capital Structure, Theories and Value of the	8	2	0

	firm-Net Income Approach, Net Operating Income Approach, Traditional Approach, Modigliani Miller Model, Determinants of Capital Structure, Practices in India, Costs of Bankruptcy and Financial Distress. EBIT-EPS Analysis-Concept of Leverage, Types of Leverage: Operating Leverage, Financial Leverage, Combined Leverage			
7.	**Dividend Decisions**- Forms of Dividend, Theories of Dividend-Relevance and Irrelevance, Trade Off Theory, Pecking Theory, Factors affecting Dividend Decision, Dividend practices in India	5	1	0
8.	**Working Capital Management**-Working Capital Policies, Liquidity, Risk & Profitability trade-off, Cash management, Inventory Management, Receivables management, Payables Management, Working Capital Financing, Determinants of Working Capital	7	2	0
9.	**Capital market**- Primary and secondary markets, Capital market efficiency, Organized exchanges in India, SEBI	2	1	0
10.	**Corporate Restructuring & Business Combinations**-Corporate Restructuring, Types of Business Combinations, Mergers & Acquisitions in India	2	1	0
	Total (in hours)	**45**	**15**	**0**

Evaluation criteria:

1. Case Analysis and Assignments- 20%
2. Minor 1 Exam (Quiz) - 20%
3. Minor 2 Exam- 20%
4. Major Exam - 40%

Learning outcomes:

- Understanding the evolution and growth of the finance function
- Understanding the role of the organisation's financial managers in achieving strategic objectives of the organisation for the finance function
- Requisite skills needed for financial decision making
- An introductory knowledge about financial markets and Corporate Restructuring

Materials:

Suggested readings

1. Pandey, I.M., Financial Management, Vikas Publishing, New Delhi. (12th Edition)
2. Chandra, Prasanna, Financial Management: Theory and Practice, Tata McGraw-Hill Publishing Co, New Delhi. (8th Edition)
3. Khan and Jain, Financial Management: Text, Problems and Cases, McGraw Hill Education. (8th Edition)
4. Richard A. Brealey and Stewart C. Meyers, Franklin Allen and Pitabas Mohanty, Principles of Corporate Finance, New Delhi, Tata McGraw Hill. (11th Edition)
5. Ross, Westerfield, & Jordan, Fundamentals of Corporate Finance, Tata McGraw Hill. (10th Edition)
6. Vanhorne and Wachowicz, Fundamentals of Financial Management Pearson Education. (13th Edition)

Additional Readings

1. Journal of Finance
2. The Review of Financial Studies Journal
3. Journal of Financial Economics

Pedagogical approach:

The course will be primarily taught though a combination of class discussions, quizzes, and case analysis and assignment, and presentations
Additional information: Students are strongly advised to read at least one business news daily like the Economic Times, the Business Standard and the Financial Express.

Course Reviewer(s):

1. Prof Samta Jain
   Fore School of Management
   New Delhi
2. Dr Anjala Kalsie
   Associate Professor
   Faculty of Management Studies
   University of Delhi, Delhi

Course Title: Legal Aspects of Business			
Course code: PPM 158	**No. of credits:** 3	**L-T-P:** 37-08-0	**Learning hours:** 45
Pre-requisite course code and title (if any):			
Department: Policy and Management Studies			
Course coordinator (s): Dr. Vidhi Madaan Chadda		**Course instructor (s):** Dr. Vidhi Madaan Chadda	
Contact details: vidhim.chadda@terisas.ac.in		**Course offered in:** Semester 2	
Course type: Core			

Course description

Law and legal institutions play a major role in the conduct of business. The purposes of laws relating to business in India are mainly twofold: To create an ecosystem conducive for the growth of business; and to ensure that business operates within the larger framework of governance in the country. There are a number of laws that have a bearing on the conduct ofbusiness. These broadly encompasses areas relating to commercial framework; corporate dealings; market regulation; dispute resolution to name a few. In this course an attempt is made to introduce the participants to a few of these legal aspects. The course is divided into four modules dealing with introduction to legal framework, formation of contract, breach of contract and its remedies; competition regulation; incorporation of companies and its management; and corporate insolvency regulation. In addition to the relevant statutory provisions, important case laws would be discussed under each module.

Course objectives

1. To appreciate and understand the issues concerning business from a legal perspective.
2. To examine the various legal forms that a business entity can take and the relative advantages and disadvantages of each of these forms
3. To provide an overview of important laws that have a bearing on the conduct of business in India

Course content

Module	Topic	L	T	P
1.	**Introduction to business laws in India** Jurisprudential analysis of law, Sources of business law, constitution and business- a brief discussion	4	0	0
2.	**Commercial Laws** a. The Indian Contract Act,1872: Essential elements of a contract; Formation of contracts; Void agreements and Voidable contracts; Discharge of contracts; Specific type of contracts- Agency, Guarantee, Indemnity, Bailment and Pledge b. The Sale of Goods Act, 1930: Transfer of title; Caveat Vendor; Conditionsand Warranties; Rights of an unpaid seller; Hire purchase and Installment sale. c. The Partnership Act, 1932: Definition of "Partnership", "Partner, Types of partnerships, Rights and duties of partners, Dissolution of partnership and firm. d. Limited Liability Partnership Act, 2008: Nature, incorporation, Administration and winding up	15	4	0
3.	**Company and Insolvency Laws** a. Definition-features-concept of limited liability-different types of companies. b. Formation and Incorporation: Process and Documents. c. Administration: Meetings and Directors.	10	3	0

	d. **Insolvency and Bankruptcy Code, 2016**: Key elements; Company Insolvency Resolution Process, Winding up - Overview			
4.	**Competition and Consumer Protection Laws** a. The Competition Act, 2002: Objectives and evolution; Definitions; Salient features; Role of Competition Commission of India. b. The Consumer Protection Act, 2019: Key definitions; Consumer rights; Product liability; Consumer Disputes Redressal mechanism and mediation	8	1	
	Total (in hours)	**37**	**8**	**0**

Evaluation criteria

- Minor 1 Exam (Written Exam) 25%
- Minor 2 Exam (Assignment/Presentation) 25%
- Major Exam (Written Exam) 50%

Learning outcomes

After completing this course, the students would be:

1. able to appreciate the significance of law and legal institutions for businesses
2. able to have a basic understanding of the laws relating to contract, consumer protection, competition, companiesand insolvency resolution.

Materials

Suggested readings (books) :

1. Kapoor, N.D., Elements of Mercantile Law, Sultan Chand & Sons, New Delhi.*
2. Ramappa, T., Competition Law in India, Oxford Books.*
3. Agarwal, Anurag K., Business Law for Managers, IIM Ahmedabad Books, Ahmedabad.*
4. Singh, A., Law of Contract & Specific Relief, Eastern Book Company.
5. Pathak, A, Legal Aspects of Business, Mc Graw Hall*

*Latest editions as
availableAdditional
Readings:
a. Bare Acts of the laws
b. Case Laws (to be
updated and shared by
the instructors)
Additional reading materials as delivered by the faculty from time to time.

Pedagogical approach

A combination of class-room interactions, case laws, tutorials, and assignments

Additional information (if any)

Student responsibilities

Attendance, feedback, discipline etc.

Prepared by:
Dr Vidhi Madaan Chadda

Course Reviewers

1. Prof. Mamta Biswal
   Gujrat National Law University
2. Dr. A. Saravanan
   IIM, Ahmedabad

Course Title: Organizational Effectiveness and Change			
Course code: PPM 180	**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: Dr Shruti Sharma Rana		**Course instructor:** Guest Faculty	
Contact details:		**Course offered in:** Semester 2	
Course type: Core			

Course description:

Organizational effectiveness and change are vital for success and great performance in today's dynamic environment. As organizations are constantly dealing with changing social, political, cultural, global as well as economic environments, having a clear understanding of the factors that drive effectiveness will enable future managers and leaders to develop strategies that will drive performance in line with the vision of their organization and its people. The purpose of the course is to provide future managers and leaders with state of art knowledge for achieving and enhancing organizational effectiveness in context of current realities. The course aims to acquaint students with approaches to manage organizational conflict, stress, power and cross-cultural dynamics in a professional and humanistic manner to achieve organizational effectiveness and change while safeguarding the interest of all stakeholders, including society and environment.

Course objectives:

The objectives are:

1. To impart knowledge about classical and contemporary approaches and concepts related to organisational effectiveness.
2. To sensitize students about managing organizational conflict, stress, cross-cultural and power dynamics in a professional and humanistic manner
3. To prepare students with managerial and leadership challenges while dealing with organisational change.

Course Content

Module	Topic	L	T	P
1.	Organizational Effectiveness: concept, need and importance, Critical issues of organizational effectiveness; Various approaches to measuring effectiveness; Value creation process by organization;	6	4	0
2.	Relationship between organizational design, Leadership and effectiveness. Factors contributing to organizational effectiveness:	4	0	0
3.	Strategies to improve effectiveness; Strategic role of Human element (employers, employees) in developing effectiveness	4	0	0
4.	Organizational Culture-Meaning and Characteristics; Culture Versus Climate; Creating the Organization Culture; Strong and Weak Cultures, Cross-cultural dynamics; Hofstedes Cultural Framework.	4	2	0
5.	Power and Politics - Concept; Bases of Power; Power, Authority and Influence; Political implications of power	4	0	0

6.	Conflict and Negotiation-Concept; Process of Conflict; Conflict levels; Reactions to conflict; Management of Conflict; Resolution Strategies; PRAM Model. Leadership-Concept; leadership skills, Styles and Theories of Leadership-trait Theory; Situation Theory, Path Goal Leadership; Transactional and Transformational Leadership	6	4	0
7.	Work Stress and Its Management- Understanding Stress and its consequences; Hans Selye's General Adaptation Syndrome (GAS) Potential sources of stress; Effects of stress; Coping Strategies-Individual and Organizational Coping Strategies.	4	4	0
8.	Organizational change: Definition and process, types and forms of change. Forces for change, Resistance to change, Tools for effectively introducing and sustaining change. Lewin's Change Model	4	0	0
9.	Issues and complexities in managing organizational change. Strategic role and impact of change on organizational performance, Ethical issues related to change. Role of vision in organizational change; Theories of Planned Change; Overview of Change activities: Motivating change, managing the transition, Role of change agent.	6	4	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%

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: 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, power relationships, stress issues, 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.

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:

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

1. Demonstrate an understanding of organizational effectiveness and the role of leadership, stress, conflict culture, change, power relationships in building effectiveness.
2. Ability to reflect on their personal skills and ability to contribute to organisational effectiveness.
3. Ability to assimilate, and apply knowledge of basic theories and concepts to solve

problems and build strategies for organisational effectiveness and change.

Materials

Suggested readings

1. Kavitha Singh, Organizational Change and Development, Excel Books, 2010
2. Cummings and Worley, Theory of organization Development and change CENGAGE Learning, New Delhi
3. French and Bell, Organizational Development Prentice Hall of lndia. New Delhi
4. Bennis. W.G. Changing Organizations, Tata McGraw Hill, New York
5. Khandwalla, Organizational Design for Excellence, Tata McGraw hill, New Delhi

Additional readings

1. Palmer I, Dunford R, Akin G, (2010), 'Managing Organizational Change a multiple perspectives approach, Tata McGraw Hill Publication, New Delhi
2. Kao, S R. etc. Effective Organization and Social Values. New Delhi, Sage, 1994.
3. Robbins, S P. Organizational Behaviour. 7th ed., New Delhi, Prentice Hall of India, 1996.

Pedagogical approach:

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

Additional information:

The following websites may also be visited at regular intervals:
https://online.hbs.edu/blog/post/organizational-change-management
https://hi.hofstede-insights.com/organisational-culture
https://hbr.org/2002/03/do-you-have-a-well-designed-organization

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

Student responsibilities:

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

Course Prepared by: Ms Vedika Singh

Course Reviewer(s):

1. Dr. Shweta Singha
   Expert OB-HR

2. Dr. Alka Agnihotri
   Assistant Professor
   School of Business
   Galgotias University

Course Title: Production and Operations Management			
Course Code: PPM 187	**No. of credits**: 3	**L-T-P**: 38-07-0	**Learning hours**: 45
Pre-requisite course code and title (if any): NA			
Department: Policy & Management Studies			
Course coordinator: Dr Shruti Sharma Rana		**Course Instructor :** Guest Faculty	
Contact Details :		**Offered in:** Semester 2	
Course Type: Core			

Course Description:

Any or every organization is a system of operations, whether or not called 'operations'. Ultimate goal or purpose of such a system being production of goods and/or services and to carry them tills the point of time and place of consumption. Therefore operations management involves everything an organization does and hence **every manager is an operations manager**.

Production and Operations Management (POM) focuses on carefully managing the processes to produce and distribute products and services." Conventionally speaking Major, overall activities under POM, include product creation, development, production and distribution. Major functions of POM include Managing purchases, Inventory control, Quality control, Storage, Logistics and Evaluations. Focus will be efficiency and effectiveness of the processes.

The basic premise of Operations may not have changed over the years. However, over the years there has been a significant growth in Services and E-Businesses. Services operations Planning and Scheduling needs special focus.

Course objectives

One of the most critical areas for success in any business enterprise is how Production and Operations are managed. In the 'Productions and Operations Management' course an attempt will be made to integrate the courses studied by the students like statistics, economics, finance, organizational behaviour and strategy into a consolidated production and operation related decisions.

Course Contents

Module	Topic	L	T	P
1.	Generation of Four key deliverables: Review of existing Organisation set-up for 'Production and Operations'. Systems Perspective Best Practices of Indian and International companies Re-designing the set-up to global standards Support Systems & Policies necessary for such an International set-up. Managing Operations Strategy in a Global Environment, Factors affecting location decisions.	4	0	0
2.	Defining an optimal model for POM Organisational set-up of the entity following a five step approach: Setting Vision & Rationale: Developing Vision: To double size of the entity by Next 5/10 years and further triple by .15/20 years to be within the top three companies in particular product category / taking the best elements from three key areas to build a robust	4	0	0

	growth strategy Forecasting Current POM Themes. Best Fit Extended Themes. Set-up and Resources: depending on the vision, business needs Defining Implementation Plan and Support (after having completed development of thePMO set-up as in the following chapters)			
3.	Vision Strategic Direction and Performance Objectives. Design Principles Design of Products and Services (Emerging from managements perspectives for where.1 the POM set-up is and where it should be) Best Practices (Determined above II(2) and shortlisted on the criteria of SWOT for the respective organisation. Building a future operating model for the entity will need to sustain strengths and remove weaknesses. Exiting Portfolio Shape and Direction: To be developed on a specially designed new Pyramidal model. Portfolio Needs, Activity Plans, Workload and commitments: To be synthesised from the business plans of the organisation (5yearplans/10year plans or strategic intents), by understanding future 1 Resource requirements, supported by an activity-driven model.	8	0	0
4.	Core functions and support-functions to bediscussed in details: Core Operation 1 : Production OperationsDefining operating philosophy Planning production volumes and capacities Analysing Operating facilities Core Operation 2: Maintenance Developing maintenance planning and strategy Executing maintenance activities Monitoring maintenance performance Support Operation 1: Contracts & Procurement Defining outsourcing philosophy Developing sourcing strategy Selecting suppliers Managing suppliers Reviewing supplier performance Understanding total costs of procurement Support Operation 2: Supply Chain Management Managing supply chain Sustainability in the Supply Chain Managing orders Managing inventory Support Operation 3: Logistics Managing warehouse Managing transport Measuring effectiveness and efficiency of the operations. Quality	18	7	0

	Controls, Statistical Concepts. Just in Time, Lean Operations, Toyota Production System, Agile Methodology			
5.	Case Studies Strategic Considerations in InternationalizationChoice of Markets Entry Options : Rapid / Beachhead Challenges. Managing Global Competitiveness:Identifying Bottlenecks in POM	4	0	0
	Total (in hours)	**38**	**7**	**0**

Evaluation criteria

- Minor 1 Exam (Class Participation)- 20%
- Minor 2 Exam (Individual assignments on mapping and redesigning different organizations on specific new models introduced in the class and/or pre-announced quizzes/class tests)- 20%
- Minor 3 Exam (Presentation)- 20%
- Major Exam (Written Exam)- 40%

Learning Outcome:

After completing the course the participants shall develop an understanding on how to create a productionentity with focus on -

1. Production Base
2. Financial (Cost) Performance
3. Technical and Operational capabilities
4. Human Capabilities

Materials:

1. B Malakooti (2014), 'Operation and Production System with Multiple Objectives', Wiley
2. S N Chary (2013), 'Production and Operation Management', 5th Edition, Tata Mac Graw Hill
3. William Stevenson. Operations Management, 12th Edition, Mc Graw Hill
4. Heizer. Operations Management – Sustainability and Supply Chain Management, 12th Edition, Pearson

Pedagogical approach

- Lectures
- Illustrative cases and case discussions (groups)
- Assignments (Individual / group).

Additional information (if any)

Student responsibilities

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

Prepared by: Dr Vinod Kumar Jangid

Course Reviewers:

1. Dr. N M Ahuja
   ONGC
2. Mrs. Pomila Garga
   ONGC Videsh Limited (OVL)

Course title: Macroeconomics-II

Course code: MPE 129	**No. of credits:** 4	**L-T-P:** 60-0-0	**Learning hours:** 60

Pre-requisite course code and title (if any): MPE 113 (Mathematical Methods for Economics) or equivalent

Department: Department of Policy and Management Studies

Course coordinator: Dr Shantanu De Roy	**Course instructor:** Dr Shantanu De Roy
Contact details: shantanu.roy@terisas.ac.in	
Course type: Core	**Course offered in:** Semester 2

Course description:

This course introduces theories of economic growth and their applications with an emphasis on application to India's economic growth. Dynamic macroeconomic models are used here to analyse the process of economic growth. Besides the models, other empirical tools will also be used to identify factors that lead to economic growth in India andother developing nations.

Course objectives:

1. Understanding the factors that lead to economic growth of nation-states.
2. To equip the students with tools and techniques to appreciate and analyze dynamic macroeconomic models andempirical strategies that can explain the process of economic growth.
3. To foreground the role(s) played by the institutions, human capital, and environment in the economic growth. Enabling the students to evaluate the application of concepts, theories, and models in explaining India's economicgrowth.

Course contents

Module	Topic	L	T	P
1	Introduction Cross country differences in Income A narrative on India's economic growth	4	0	0
2	Harrod-Domar Model	4	0	0
3	Kaldorian and Kaleckian Growth Models	8	0	0
4	Solow Model	6	0	0
5	Solow Growth Accounting	4	0	0
6	Neo-Classical Growth Models: Introduction	6	0	0
7	Models with Overlapping Generations	4	0	0
8	Empirics: Cross-country Differences in Economic Performances	6	0	0
9	Endogenous Growth Models	6	0	0
10	Institutions and Economic Growth	4	0	0
11	Human Capital and Economic Growth	4	0	0
12	Environment and Economic Growth	4	0	0
	Total (in hours)	**60**	**0**	**0**

Evaluation criteria:

1. **Minor 1 Exam**- Written examination (Modules 1 to 5) [30%]
2. **Minor 2 Exam**-Written examination (Modules 6 to 12) [40%]
3. **Major Exam**-Written examination (entire course) [30%]

Learning outcomes:

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

1. Identify factors that have influenced economic growth in India and the associated policy implications [Minor 1]
2. Appreciate empirical strategies in Growth Economics. Understand the contribution of institutions and human capital to economic growth as well as limits of growth imposed by natural resources and environmental degradation. [Minor 2]
3. Understand different macroeconomic models of growth. Assess the applicability of economic growth models in India and other developing nations. [Minors 1, 2 and Major exam]

References (* = compulsory readings)

Books

a. Acemoglu, Daron. 2009.*Introduction to Modern Economic Growth* (DA henceforth), Princeton: PrincetonUniversity Press.
b. Sen, Amartya. 1970.*Growth Economics – Selected Readings*, Middlesex, England: Penguin.
c. Aghion, Philippe and Peter W. Howitt. 2008.*The Economics of Growth*, Cambridge MA: MIT Press.
d. Robert J. Barro and Xavier I. Sala-i-Martin. 1998 *Economic Growth*, Cambridge MA: MIT Press,
e. Romer, David.2018. *Advanced Macroeconomics*, 5th Ed. (DR henceforth)New York: McGraw Hill.

Suggested Readings

1. *Introduction; Cross-country differences in income; A narrative of India's growth story*
   a. DA – Chapter 1
   b. Jones, Charles I. 1997. "On the Evolution of the World Income Distribution." *Journal of EconomicPerspectives* 11, no. 3 (Summer): 19-36.
   c. Basu, K., and A. Maertens. 2007. ―The Pattern and Causes of Economic Growth in India.‖ *Oxford Review of Economic Policy*, 23(2): 143-167.
   d. Rodrik, D., and A. Subramanian. 2005.―From Hindu Growth" to Productivity Surge: The Mystery ofthe Indian

Growth Transition.‖ IMF Staff Papers, Palgrave Macmillan, 52(2), 193-228.

   e. Binswanger-Mkhize, Hans P. 2013. ―The Stunted Structural Transformation of the Indian Economy Agriculture, Manufacturing and the Rural Non-Farm Sector‖ *Review of Rural Affairs, EPW supplement*, vol.xlviii nos. 26 & 27: 5-12 http://www.epw.in/system/files/pdf/2013_48/2627/The_Stunted_Structural_Transformation_of_the_Indian_ Economy.pdf

2. *Harrod-Domar Model*
   a. Harrod, Roy F. 1939. "An Essay in Dynamic Theory". *The Economic Journal*. 49 (193): 14–33.
   b. Domar, E. 1946. "Capital Expansion, Rate of Growth, and Employment". *Econometrica*. 14 (2):137–147.

3. *Kaldorian and Kaleckian Growth Models*
   a. Kaldor, N. 1957. ―A Model of Economic Growth.‖ *The Economic Journal*, 67(268): 591-624. doi:10.2307/2227704
   b. Setterfield, Mark and John Cornwall. 2002. ―A Neo-Kaldorian Perspective on the Rise and Decline of the Golden Age.‖ In *The Economics of Demand-Led Growth*, edited by Setterfield. M., 67-86. Mass: Edward Elgar Publishing.
   c. Amitava Krishna Dutt. 2012. "Kaleckian Growth Theory: An Introduction," *Metroeconomica*, vol. 63(1): 1-6
   d. Blecker, Robert.2002.―Distribution, Demand and Growth in Neo-Kaleckian Macro-Models.‖In *The Economics of Demand-Led Growth*, edited by Setterfield. M., 129-152. Mass: Edward Elgar Publishing.
   e. Sawyer, Malcolm. 2012.―The Kaleckian Analysis of Demand-Led Growth, *Metroeconomica*, vol. 63(1):7- 28.

4. *Solow Model*
   a. DA – Chapter 2
   b. Solow, Robert. 2000.*Growth Theory: An Exposition*. 2nd ed. NY: Oxford University Press, ISBN:9780195109030
   c. DeLong, J. B. 2003.―India since Independence: An analytic growth narrative. In *In Search of Prosperity: Analytic Narratives on Economic Growth*, edited by D. Rodrik: 184-204. Princeton NJ: Princeton University Press.
   d. Robertson, Peter E. 2010. "Investment Led Growth in India: Fact or Mythology", *Economic and PoliticalWeekly*, 45(40): 120-124.

5. *Solow Growth Accounting*
   a. DA – Chapter 3
   b. Bosworth, Barry & Susan M. Collins & Arvind Virmani. 2006. "Sources of Growth in the Indian Economy,"*India Policy Forum*, vol. 3: 1-6.http://www.ncaer.org/publication_details.php?pID=161

6. *Neo-classical Growth Models (Ramsey-Cass-Koopman model)*
a.DA Chapter 5; Chapter 8

7. *Growth with Overlapping Generations*
   a. DA Chapter 9
   b. Ghate, Chetan, Gerhard Glomm and Jialu Liu Streeter. 2016. ―Sectoral Infrastructure Investments in an Unbalanced Growing Economy: The Case of Potential Growth in India‖, *Asian Development Review*, 33(2):144-166.
   c. Agénor, P., J. Mares and P. Sorsa. 2015. ―Gender Equality and Economic Growth in India: A Quantitative Framework‖, *OECD Economics Department Working Papers, No. 1263*, OECD Publishing, Paris. http://dx.doi.org/10.1787/5jrtpbnt7zf4-en

8. *Endogenous Growth Models*
   a. DA Chapter 11
   b. Madsen, Jakob B,Shishir Saxena, and James B Ang. 2010. "The Indian growth miracle and endogenous growth." *Journal of Development Economics*, vol. 93(1): 37-48.

9. *Empirics: Determinants of differences in economic performances*
   a. DA Chapter 4
   b. Mankiw, N. Gregory, David Romer, and David N. Weil. 1992. "A Contribution to the Empirics ofEconomic Growth." *Quarterly Journal of Economics*, 107 (2): 407-437.
   c. Young, Alwyn. 1995. "The Tyranny of Numbers: Confronting the Statistical Realities of the East AsianGrowth Experience." *Quarterly Journal of Economics* 110(3): 641-680.
   d. Hall, Robert, and Charles I. Jones. 1999. "Why Do Some Countries Produce So Much More Output perWorker than Others?" *Quarterly Journal of Economics* 114(1): 83-116.
   e. Quah, Danny. 1997. "Empirics for Growth and Distribution: Stratification, Polarization, and ConvergenceClubs." *Journal of Economic Growth*, 2(1): 27-59.
   f. Kumar, Utsav and Arvind Subramanian. 2012 ―Growth in India's States in the First Decade of the 21st Century: Four Facts.‖ *Economic and Political Weekly*, 47(3): 48–57.

10. *Institutions and Economic Growth*
   a. DA- Ch 24, 25, 26 North, Douglass C. 1989. ―Institutions and economic growth: An historical introduction.‖ *World Development*, Vol 17(9): 1319-1332. https://doi.org/10.1016/0305-750X(89)90075- 2Acemoglu, Daron, Simon Johnson, and James A. Robinson. (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review* 91, no. 5 (December 2001): 1369-1401
   b. Alesina, Alberto and Dani Rodrik. (1994) ―Distributive Politics and Economic Growth.‖ *Quarterly Journal of*
c. *Economics*, Vol. 109, No. 2 (May, 1994), pp. 465-490
d. Acemoglu, Daron and Simon Johnson and James Robinson, ―Reversal of fortune: Geography and institutions in the making of the modern world income distribution,‖ *Quarterly Journal of Economics*, Vol.117(4): 1231-1294. http://www.gdsnet.org/UnderstandingProsperityandPoverty.pdfSubramanian, A. 2007.
―The evolution of institutions in India and its relationship with economic growth.‖ *Oxford Review of Economic Policy*, 23(2): 196-220

11. *Human Capital and Economic Growth*

a. Mankiw, G., D.Romer, D.Weil, . 1992. ―A Contribution to the Theory of Economic Growth.‖ *Quarterly Journal of Macroeconomics*, 107 (May) :407-437.

b. Benhabib, Jess and Mark M. Spiegel. 1994. ―The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data.‖ *Journal of Monetary Economics*, Vol. 34(2):143-173.

c. Hanushek, Eric and Dennis Kimko (2000) ―Schooling, Labor-Force Quality, and the Growth of Nations.‖ *American Economic Review*, Vol. 90 (5) :1184-1208.

d. Krueger, Alan B. and Mikael Lindahl. 2001. "Education for Growth: Why and For Whom?" *Journal ofEconomic Literature*, Vol. 39(4):1101-1136.

e. Moretti, Enrico. 2004. ―Workers' Education, Spillovers and Productivity: Evidence from Plant-Level Production Functions.‖ *American Economic Review*, Vol. 94(3):656-690.

f. Ghate Chetan, Gerhard Glommand John T. Stone III. 2015 "Public and Private Expenditures on Human Capital Accumulation in India." *WIDER Working Paper Series 024*, World Institute for Development EconomicResearch (UNU-WIDER).

g. Rao, B. Bhaskara and Krishna Chaitanya Vadlamannati. 2010. ―The level and growth effects of human capital in India.‖ *Applied Economics Letters*, 18(1): 59-62, DOI: 10.1080/13504850903427146

h. Schündeln, Matthias and John Playforth. 2014. "Private versus social returns to human capital: Educationand economic growth in India." *European Economic Review*, vol. 66(C): 266-283.

12. *Environment and Economic Growth*

a. DR - Ch 1.8

b. Brock, William A. andM. Scott Taylor. 2005. "Economic Growth and the Environment: A Review ofTheory and Empirics," In *Handbook of Economic Growth* Edited by Philippe Aghion& Steven Durlauf (ed.), Handbook of Economic Growth, edition 1, volume 1: 1749-1821. Amsterdam: North Holland.

c. William Brock and M. Taylor. 2010. "The Green Solow model," *Journal of Economic Growth*, vol. 15(2):127-153.

d. Bovenberg, A.L., and S. Smulders. 1995.―Environmental Qualityand Pollution Augmenting Technological Change in a Two Sector Endogenous Growth Model. ‖*Journal of Public Economics*, Vol 57(3): 369-391.

e. Grossman G.M, and A. B. Krueger. 1995. "Economic Growth and the Environment." *Quarterly Journal ofEconomics*, vol. 110(2): 353-377.

f. John, A. and R. Pecchenino. 1994. "An Overlapping Generations Model of Growth and the Environment." *The Economic Journal*, 104(427): 1393-1410.

Additional information (if any):

- Suggested journals—*Journal of Economic Perspectives*, *Journal of Development Economics*, *Journal of EconomicGrowth*, *Indian Economic Review*
- Understanding of basic macroeconomic theories is desirable.

Pedagogical Approach:

- Classroom teaching
- Emphasis on solving neoclassical growth models and calibration

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

Prepared by:
Dr Seema Sangita

Course reviewers:

1. Prof. Chetan Ghate, Indian Statistical Institute, Delhi Center, 7, S. J. S. Sansanwal Marg, New Delhi, Delhi110016
2. Dr. Mausumi Das, Delhi School of Economics, University Enclave, Delhi, 110007

Course title: Microeconomics-II

Course code: MPE 137	**No. of credits:** 4	**L-T-P:** 60-0-0	**Learning hours:** 60

Pre-requisite course code and title : MPE 131 Microeconomics; MPE 113 Mathematical Methods for Economics

Department: Department of Policy and Management Studies

Course coordinator: Mr Sanyyam Khurana	**Course instructor:** Mr Sanyyam Khurana

Contact details: sanyyam.khurana@terisas.ac.in

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

Course description:

Standard Microeconomic theory claims that price-taking behavior results in efficient market outcomes under assumptions like rational preferences, certainty of outcomes and complete information. This course recognizes the fact that in the last fifty years, advances in game theory and the theory of contracts, problems of asymmetric and incomplete information have significantly taken the theory beyond price taking behavior and optimal equilibria.

Course objective:

To understand the role of Strategic behavior and asymmetric information in the characterization of markets.

Main references are : Mas-Colell, Whinston and Green (MWG), Hal Varian (H), and Robert Gibbons (G)

Course contents

Module	Topic	L	T	P
1	**Module 1: An uncertain world** 1.Expected Utility Theorem, Measures of Risk Aversion Application:Insurance Readings : MWG Ch. 6B; H Ch. 11.3	5		
2	**Module 2: Game Theory – Basics** (a) : Extensive and Normal Form Games Readings : H- ch.15 ; MWG Ch. 7, 8A, 8B (b) : Domination in Strategies, Nash equilibrium Readings : G- Ch. 1,1A,B,C, Appendix 1.1C: H-Ch.15; MWG-Ch.8 (b1) : Mixed Strategies, Bayesian Nash (Incomplete Information games) Readings : G – Ch. 1.3 Ch.3.1, 3.2A; H –Ch.15; MWG- Ch.8 (c) ; Backward Induction, Subgame Perfection Readings : G- Ch. 2.1, MWG – Ch.9A, 9B	17		
	Game Theory – Advanced Topics (d) Asymmetric Information Adverse Selection Reading : MWG Ch. 13A,B ; H Ch. 25 (e) Signaling Reading : MWG Ch, 13C ; H Ch. 25 (f) Screening Reading : MWG Ch. 13D ; H Ch.25 (g) Principal-Agent problems Reading : MWG Ch.14; H Ch.25	15		
3	**Module 3: Law and Economics** 1.Coase and Transaction Cost approach; 2.Brief overview of law and economics Reading : R. Coase – The Firm, The Market and The Law ; Ch. 1,5 & 6	5		
4	**Module 4: Mechanism design with money** Reading : MWG Ch, 23	10		
5	**Module 5: Cooperative Games** Reading : MWG Ch18 & appendix A	8		
	Total	**60**		

Evaluation criteria:
Minor 1 Exam- Written Examination - 25%
Minor 2 Exam- Written Examination - 25%
Major Exam- Written Examination (whole course) - 50%

Learning outcomes:
On completion of this course, the students would:

1. Understand the nature of different forms of market failure and theoretical responses to such market failure
2. Be able to conceptualize and resolve simple problems of market/institutional failure

Pedagogical approach:
Standard classroom teaching followed by problem solving sessions; classroom experiments.

Materials:
Lecture Notes will be provided.

Suggested readings
Required:

1. Mas-Colell, Andreu, Michael Dennis Whinston, and Jerry R. Green. Microeconomic theory. Vol. 1.NewYork: Oxford university press, 1995.
2. Gibbons- Game Theory for Applied Economists
3. Hal Varian : Microeconomic Analysis (ed. 3)

Additional:

1. LeRoy, Stephen F., and Jan Werner. Principles of financial economics. Cambridge University Press, 2001.
2. Krepps, David : Microeconomic theory
3. Salanié, Bernard. The economics of contracts: a primer. MIT press, 2005
4. Laffont, Jean-Jacques, and David Martimort. The theory of incentives: the principal-agent model. Princeton University Press, 2009.4. Bolton, Patrick, and Mathias Dewatripont. Contract theory. MIT press, 2005.
5. Coase, Ronald Harry. The firm, the market, and the law. University of Chicago press, 2012.

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

Course prepared by: Badal Mukherji

Course reviewers:
This course was reviewed by:

1. Prof Debasis Mishra, Indian Statistical Institute, New Delhi
2. Prof Priyodarshi Banerjee, Indian Statistical Institute, Kolkata

Course title: Environmental Economics

Course code: MPE 152	**No. of credits:** 4	**L-T-P:** 52-8-0	**Learning hours:** 60

Pre-requisite course code and title (if any): MPE 131 Microeconomics

Department: Department of Policy and Management Studies

Course coordinator(s): Dr Sukanya Das	**Course instructor(s):** Dr Sukanya Das

Contact details: sukanya.das@terisas.ac.in

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

Course description:

The course lies in the intersection of disciplines of economics and environment within which economic system operates. This interlinkage can be expressed through the (a) inputs from environment to the economic system and (b) by products of economic system to the environment. Latter, or, the 'sink' function of the environment, is covered within this course. The former or 'source' function is covered in the Natural Resource Economics course that complements it.

Over the years, impacts of economic system on the environment have increased; they have become qualitatively different too. The way in which environment impacts economic system have undergone both quantitative and qualitative changes. Discipline of economics have been one of first ones to recognize, appreciate and address environment related problems to human and environmental health. In the last one hundred years, the treatment has become more sophisticated, some which this course attempts to capture.

Course objectives

1. To familiarizes students with the theory and application of economics to environmental problems, in distinction with the other approaches.
2. To make the student aware of the different methods grounded on economic theory, to assign monetary values to a variety of environmental goods and services.
3. To make the students appreciate the formulation of environmental policies involving economic instruments, associated institutions and supporting governance mechanisms.

Course content

Module	Topic	L	T	P
1.	**Property right, externalities and environmental problems** The Human-Environment relationship Environmental Problems and Economic Efficiency Property Rights Imperfect Market Structures Externalities and Public Goods as sources of Market Failure The Government Failure The Pursuit of Efficiency	6		
2.	**Economic Principles and Overview of Valuation Methods** Welfare Measures for Changes in Supply of Environmental Good Environmental Values and their classification Use Values, Non-use Values and Option Value	4		
3.	**Stated Preference Techniques** Contingent Valuation Method and its applications Choice Experiment Method and its applications	8		
4.	**Revealed Preference Techniques** Household Production Function models Travel Cost method Hedonic Price models	10		
5.	**Meta- Analysis and Cost benefit Analysis**	4		

	Conducting Meta-analysis Cost-Benefit analysis			
6.	**Economic Instruments** Incentives through Market: prices through Charges and Subsidies Incentives through Regulation: Liability Rules, Fees, Deposit-refunds Incentives through Quantity Rationing—Tradeable Permits Uncertainty and choice of Instruments Market Structure, number of Players and choice of Instruments. Evaluation of Instruments against selected criteria Comparison of Instruments.	12 2 2 2 2 2 1 1		
7	**Environmental Governance: selected case studies** Local Air Pollution: from stationary and non-point sources Local and regional Water Pollution: from agriculture and industry	8	8	
	Total	**52**	**8**	

Evaluation

1. **Minor 1 Exam-**Written test (on 1-4 modules): 25%
2. **Minor 2 Exam-** Presentation of a seminal paper in Environmental Economics: 15%

Choice: from the list supplied by the course coordinator

Structure: No presentation can exceed 20 minutes. No more than 8 slides (excluding title and references) will be used. No more than 10 minutes per presentation on Q&A. No more than two pages of handout distribution.

Criteria: Introduction; Identification of Research Question/Problem/Issue; Relevance-- either theoretically or in empirical terms or both; Clarity - Audible and comprehensible; Sequence and pace; Pronunciation and oratory skills; Organization and layout of visual presentation; Responses during Q&A session -- Clarity and sufficiency [each with equal weight]

3. **Minor 3 Exam-** Written test (on 5-8 modules): 25%
4. **Major Exam-** Submission of an original essay of 5,000 words: 35%

Structure: (a) which one you think is the best answer to the question pursued by you addressed in the literature survey and why, (b) what are the strongest objection(s) to your choice; (c) briefly outline what further work would be needed to provide a better answer.

Criteria: Indicators: (a) Logical consistency, (b) Academic Rigour, (c) Originality [each with equal weight]

Learning Outcomes

a. To appreciate the 'sink' function of environment, its impact on the economic system and its valuation in monetary terms (test 1)
b. To understand and assess applicability of a range of valuation methods, tools and techniques in the context of several environmental issues at local and national levels (test 1).
c. To be exposed to and learn in the process skills for making effective presentations (test 2).
d. To gain an understanding on a variety of economic instruments for addressing environmental problems (test 3)
e. To be exposed to and learn in the process skills for preparing original works (test 4)

Reading Materials CORE

Module 1

T Tientenberg Chapter 2: The Economic Approach: Property Rights, Externalities, and Environmental Problems, in *Environmental and Natural Resource Economics*

W J Baumol and W E Oates, 1988, *The Theory of Environmental Policy*, Cambridge University Press, 'Chapter 2: Relevance and the theory of externalities', 'Chapter 3: Externalities: definition, significant types, and optimal-pricing conditions', and 'Chapter 4: Externalities: formal analysis'.

Ayres, R. U., & Kneese, A. V. (1969). Production, consumption, and externalities. *The American Economic Review*, *59* (3): 282-297.

Module 2

Freeman, III, A.M. (1993): *The Measurement of Environmental and Resource Values: Theory and Methods*, Washington D. C: Resources for the Future.
Karl-Göran Mäler, Jeffrey R. Vincent (Edited) (2005): Handbook of Environmental Economics: Valuing Environmental Changes, Volume 2, Elsevier/North-Holland, Amsterdam., 'Chapter 12 welfare theory of valuation' 'Chapter 13Environment, uncertainty and option values'

Module 3

Bateman, et al (2002) *Economic Valuation with Stated Preference Techniques: A Manual*, Edward Elgar Publishing, Cheltenham.
Whittington, D. (1998). 'Administering contingent valuation surveys in developing countries'. *World development*, *26*(1), 21-30.
Bennett, J and R. Blamey (2001) *The Choice Modelling Approach to Environmental Evaluation*, Edward Elgar.

Module 4

Freeman, III, A.M. (1993): *The Measurement of Environmental and Resource Values: Theory and Methods*, Washington D. C: Resources for the Future.

Case studies for module 3 and 4 [All SANDEE working papers; freely downloadable from http://www.sandeeonline.org/publicationdisp.php?pcid=1]

Revealed Preference

Irfan, M. (2013). Do Open Sewers Lead to a Reduction in Housing Prices? Evidence from Rawalpindi, Pakistan. Das, S. (2007). Storm protection by mangroves in Orissa: an analysis of the 1999 super cyclone. Guha, I., & Ghosh, S. (2009). A Glimpse of the Tiger: How Much are Indians Willing to Pay for It?. Adhikari, N. Measuring Health Benefits from Air Pollution Reduction in Kathmandu Valley (No. 70) **Stated preference** Mishra, P. P. (2014). Potential Benefits and Earnings from Improving the Hussain Sagar Lake in Hyderabad: A combined revealed and stated preference approach (No. 90).
Rai, R. K., Nepal, M., Shyamsundar, P., & Bhatta, L. D. (2015). Demand for Watershed Services: Understanding Local Preferences through a Choice Experiment in the Koshi Basin of Nepal (No. id: 7292).
Rathnayake, R. W. (2015). Estimating demand for turtle conservation at the Rekawa sanctuary in Sri Lanka..

Module 5

Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2011). *Introduction to meta-analysis.* John Wiley & Sons.
N Hanley, 2017, 'Environmental Cost Benefit Analysis' in Shorgen et al, *Encyclopaedia of Energy, Natural Resource and Environmental Economics*, volume 3, pp. 17-24

Module 6

N Hanley, J F Shorgen and B White, 2007, *Environmental Economics in Theory and Practice* Palgrave Macmillan, Chapter 4: Incentive Design and Chapter 5: Pollution Taxes and tradable emission permits: Theory and Practice
W J Baumol and W E Oates, 1988, *The Theory of Environmental Policy*, Cambridge University Press, Chapter 5: Uncertainty and the choice of policy instruments: price or quantity controls? and Chapter 6: Market imperfections and the number of participants

Module 7

All from Jason F Shogren et al, eds., 2013 *Encyclopedia of Energy, Natural Resource and Environmental Economics*, Volume 3, London and San Diego: Elsevier

J B Braden and JS Shortle, 2013, 'Agricultural Sources of Water Pollution', pp. 81-85 AM Bento, 2013, 'Local/Regional Air Pollution from Stationary Sources', pp. 103-108 D Earnhart, 'Water Pollution from Industrial Sources', pp. 114-120
M Walls, 2013, 'Deposit-Refund Systems in Practice and Theory', pp. 133-137 JS Shortle and JB Braden, 'Economics of Nonpoint Pollution', pp. 143-149
I Parry, 'Green Tax Design in the Real (Second-Best) World', pp. 161-168 K Segerson, 'Price Instruments', pp. 185-192
T Requate, 'Prices versus Quantities', pp. 193-203

J Rubin and S Siriwardena 'Quantity Instruments', pp. 204-211 GE Helfand, 'Standards', pp. 217-221

OTHER

Module 1

K Singh and A Shishodia, '3. Basic Concepts and Theories: Individual Choices' and '4. Basic Concepts and Theories: Collective Choices' in K Singh and A Shishodia, *Environmental Economics: theory and application*, Sage

David Anderson, 'Chapter 2: Efficiency and Choice', 'Chapter 3: Market Failure', 'Chapter 4: Role of Government' in *Environmental Economics and Natural Resource Management*

Ronald H Coase, 1960, 'The problem of social cost', *Journal of Law and Economics* 3: 1-44

N Hanley, J F Shorgen and B White, 2007, *Environmental Economics in Theory and Practice* Palgrave Macmillan, 'Chapter 3: Market Failure'

R Perman et al, Chapter 5: Welfare Economics and the Environment in *Natural Resource and Environmental Economics*

Module 2

Markandya, A. (2014). Economic principles and overview of valuation methods for environmental impacts.

Haab, Timothy C, and Kenneth E. McConnell (2002): *Valuing Environmental and Natural Resources: The Econometrics of Non-Market Valuation*, Edward Elgar, Cheltenham, UK. Northampton MA, USA.

Per-Olov Johansson, 2000, 'Microeconomic of Valuation' in *Principles of Environmental and Resource Economics*, edited by H Folmer and H Landis Gabel, Cheltenham and Northampton: Edward Elgar

Per-Olov Johansson, 1987, *The economic theory and measurement of environmental benefits*, Cambridge: Cambridge University Press (also for module 3 and 4)

Mordechai Shechter, 2000, 'Valuing the Environment' in *Principles of Environmental and Resource Economics*, edited by H Folmer and H Landis Gabel, Cheltenham and Northampton: Edward Elgar

Module 3

Whittington, D. (2010). 'What have we learned from 20 years of stated preference research in less-developed countries?' *Annual Review of Resource Economics 2*(1), 209-236.

Hensher D.A., Rose J.M. & Greene W.H. (2005) *Applied Choice Analysis: A primer* Cambridge University Press.

Bennett J., Birol, E. (2010). *Choice experiments in developing countries. implementation, challenges and policy implications*.Edward Elgar Publications Ltd.

Module 4

Ward, F.A and D.J Beal (2000), *Valuing Nature with Travel Costs Models: A Manual*, Edward Elgar, Cheltenham Viscusi (1993) 'The Value of Risk to Life and Health' *Journal of Economic Literature* 31.

Orgill-Meyer, Jennifer, Marc Jeuland, Jeff Albert, and Nathan Cutler. 2018. 'Comparing contingent valuation and averting expenditure estimates of the costs of irregular water supply' *Ecological Economics* 146: 250-264.

David Pearce, ed. (2009) *Environmental Valuation in Developed Countries: Case Studies*, Edward Elgar Publishing Ltd

M N Murty (2009): *Environment, Sustainable Development and Well-Being: Taxation, Incentivesand Valuation*, Oxford University Press, New Delhi.

A E Haque, M N Murty and P Shyamsundar. (2011). *Environmental Valuation in South Asia*. Cambridge University Press.

S Kumar and D N Rao (2001). 'Valuing the benefits of air pollution abatement using a health production function a case study of Panipat thermal power station, India'. *Environmental and Resource Economics*, 20(2), 91-102.

Module 5

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2009). 'Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement'. *PLoS medicine*, *6*(7), e1000097.

Lindhjem, H., & Navrud, S. (2008). 'How reliable are meta-analyses for international benefit transfers?' *Ecological Economics*, *66*(2-3), 425-435.

Asian Development Bank (2013) *Cost-benefit analysis for development: A practical guide*. R Stavins, ed., 2005, *Economics of the Environment: selected* readings, W W Norton,
Section on The Goals of Environmental Policy: economic efficiency and benefit-cost analysis
Kenneth Arrow et al, 'Is there a role for Benefit-Cost Analysis in Environmental, Health and Safety Regulation?
Steven Kelman, 'Cost Benefit Analysis: An ethical critique'
Replies to Steven Kelman from J V DeLong, R M Solow, G Butterns, J Calfee and P Ippolito
N Hanley, 2000, 'Cost-Benefit Analysis' in *Principles of Environmental and Resource Economics*, edited by H Folmer and H Landis Gabel, Cheltenham and Northampton: Edward Elgar
Drèze, Jean, and Nicholas Stern. "The theory of cost-benefit analysis." In *Handbook of public economics*, vol. 2, pp.
909-989. Elsevier, 1987

Module 6

Tomasz Zylicz, 2000, 'Goals, principles and constraints in environmental policies' in *Principles of Environmental and Resource Economics*, edited by H Folmer and H Landis Gabel, Cheltenham and Northampton: Edward Elgar
Jean-Philippe Barde, 2000, 'Environmental policy and policy instruments' in *Principles of Environmental and Resource Economics*, edited by H Folmer and H Landis Gabel, Cheltenham and Northampton: Edward Elgar

Module 7

All from Jason F Shogren et al, eds., 2013 *Encyclopedia of Energy, Natural Resource and Environmental Economics*, Volume 3, London and San Diego: Elsevier

E Lichtenberg, 2013, 'Economics of Pesticide Use and Regulation', pp. 86-97 SL Stafford, 2013, 'Hazardous Substances', pp. 98-102
MA Cohen, 'Water Pollution from Oil Spills', pp. 121-126
C Bohringer and A Lange, 'European Union's Emissions Trading System', pp. 155-160 S Kallbekken, 'Public Acceptability of Incentive-Based Mechanisms', pp. 306-312
R Innes, 'Liability Rules and the Environment', pp. 169-184

Pedagogical Approach

Lectures will provide an overview besides emphasizing on a few matters in each area. Students are expected to read the materials listed above but not marked compulsory to gain a better understanding. Presentations will provide opportunities for co-learning. They will complement the lectures.

Additional information (if any): none

Student responsibilities

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

Prepared by: Sukanya Das and Nandan Nawn

Reviewers:

1. M.N. Murty, Retired Professor, Institute of Economic Growth, Visiting Professor, TERI School of Advanced Studies
2. R.N. Bhattacharya, Honorary Adjunct Professor of Economics, School of Oceanographic Studies, Jadavpur University, Kolkata-700032.

Approved by Academic Council in its 46th meeting held at Conference Hall, TERI School of Advanced Studies on 26thJuly 2019.

Course title: Econometrics-II			
Course code: MPE 187	**No. of credits:** 4	**L-T-P:** 46–0–28	**Learning hours:** 60
Pre-requisite course code and title (if any): None			
Department: Department of Policy and Management Studies			
Course coordinator: Dr Shantanu De Roy		**Course instructor:** Guest faculty	
Contact details: shantanu.roy@terisas.ac.in			
Course type: Core		**Course offered in:** Semester 2	

Course description:

This course builds on the basic understanding of causal inference using classical linear regression modelling using cross-sectional data. The course begins with developing an understanding of asymptotic analysis and deriving the asymptotic properties of an estimator, using the Ordinary Least Square Estimator as an example. Causal inference using multiple linear regression analysis is extended to models with qualitative information. Linear Probability Model thus serves both the purpose of an illustrative example of relinquishing the linearity assumption and motivating non-linearities in parameters. Understanding of non-linearities is put into practice for the data-generating process that involves censoring and truncation. In the last but important module, the understanding of omitted variable bias due to the underlying endogeneity is used to motivate linear panels and learn estimation and inference using Panel data models.

The students learn data analysis using both cross-sectional data and panel data using software such as STATA.

Course objectives:

1. To provide an understanding of the restrictive assumptions of the classical linear regression model and examples of violation and correction for causal inference.
2. To understand the problems of censoring and truncation in modelling the data generating process and remedial measures.
3. To understand and model panel data for causal inference.
4. To provide hands-on training in the use of statistical software for data analysis.

Course contents

Module	Topic	L	T	P
1	**Multiple Regression Analysis**: OLS Asymptotic Asymptotic Properties of OLS: Consistency, Efficiency, and Asymptotic Normality	4	0	0
2	**Multiple Regression Analysis: Further Issues:** Effects of Data Scaling on OLS Statistics Models with Logs and Quadratics Models with Interaction Terms	2	0	4
3	**Multiple Regression Analysis with qualitative Information** Single/ Multiple Dummy Independent Variables/Ordinal Information using Dummy Variables A Binary Dependent Variable: Latent Variable approach, Linear Probability Model, Logit and Probit Model. Interpretation of Marginal Effects. Multinomial Choice Model/Conditional Choice Model. Interpretation of odds and log-odds ratio.	8	0	5
4	**Generalized Least Square methods (GLS)** Testing for Homoskedasticity- White's test, Breusch Pagan Test White's Robust Standard Errors Homoskedasticity Correction using GLS Bootstrap Standard Errors	6	0	2
5	**Instrumental Variables and Two Stage Least Square methods** Measurement Error Testing for endogeneity Statistical Inference with the IV Estimator Two Stage Least Squares	10	0	5
6	**Sample Selection Correction** Tobit-Type I Model for corner Solution Tobit-Type II Model for Sample Selection Truncated Regression Models	8	0	6

7	**Simple Panel Data Methods** Fixed Effect Estimator (Time demean transformation, first differencing transformation, dummy variable approach) Difference in Difference estimator	8	0	6
	Total	**46**	**0**	**28**

Evaluation criteria:

1. **Minor 1 Exam-** (Modules 1, 2) – 30%
2. **Minor 2 Exam-** (Modules 3, 4, 5) – 30%
3. **Major Exam-** (Modules 6,7) – 40%

Learning outcomes:

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

1. Understand the violations of classical linear regression model assumptions and measures of correction. (Evaluation criteria 1)
2. Understand the problem of censoring and truncation in sampling methods ((Evaluation criteria 2).
3. Apply Linear Panel Models for causal inference using Panel Data (Evaluation criteria 2).
4. Apply statistical and econometric concepts to economic models (All evaluation criteria)
5. Use STATA and reporting and interpreting software outputs (All evaluation criteria)

Study Materials:

1. *Wooldridge, J.M. 2007. *Introductory Econometrics: A Modern Approach*, 7th Edition, Boston: Cengage
2. Greene, W. H. 2003. *Econometric Analysis*, 5th edition, New Jersey: Prentice Hall.
3. Baum, C. 2006. *An Introduction to Modern Econometrics Using STATA*, Stata Press

* Indicates core reference

Pedagogical Approach:

- Classroom teaching, problem solving, assignments and quizzes
- Hands-on introduction to software applications

Additional information: Students must have basic understanding of Statistics and Econometrics.

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

Prepared by: Kavita Sardana

Reviewers

1. Prof. JV Meenakshi, Professor, Delhi School of Economics.
2. Prof. Abhiroop Mukhopadhyay, Professor, ISI Delhi.

Course title: Group Practicum- Community Needs Assessment			
Course code: MPD 106	**No. of credits:** 4	**L-T-P distribution:** 12-12-72	**Learning hours:** 60
Pre-requisite course code and title (if any): None			
Department: Department of Policy and Management Studies			
Course coordinator (s): Dr Smriti Das		**Course instructor (s):** Dr Smriti Das	
Contact details: smriti.das@terisas.ac.in			
Course type	Core	**Course Offered:** Semester 2	

Course Description

This course is a foundational course for students who aim to be development practitioners. It would help the students demystify community engagement and understand the importance of working with local population. It would build their skills to carry out independent research and data analysis to understand community needs and design development interventions in a participatory mode.

For field training, students would be attached in groups with local development organizations who would help them facilitate rapport building and deal with other logistical challenges. Students would also report to the local organization on their progress so that they could effectively facilitate data collection.

The course also intends to develop an attitude of team learning among students so that they could be prepared for working in any development organization.

Course objectives

1. Building skills to design and carry independent research to identify community need/gap assessment
2. Building skills to identify development needs of an area and prioritize these needs in consultation with thecommunities

Course Content

Module	Topic	L	T	P
1	➢ Revision of few methods for social science research: survey, interview, focus group discussion, participantobservation, life history ➢ Participatory Rural Appraisal and Appreciative Inquiry ➢ Problem and Situation Analysis ➢ Objective Analysis and Introduction to Logical FrameworkAnalysis ➢ Needs assessment: gap analysis, identification of priorities/importance, tools and techniques for data collection and data analysis ➢ Preparation of research plan/proposal	12	12	0
2	➢ Field Visit for carrying out Community Needs Assessment	0	0	72
Total		**12**	**12**	**72**

Evaluation Criteria

- Field report to be submitted at the end of the semester: 50%
- Presentation on the field research and findings: 25%
- Feedback from the host organization/local reporting officer: 25%

Learning outcomes

By the end of this course, students will learn to:

1. Design and carry out independent research with the local community
2. Appreciate the significance of understanding the local socio-cultural and economic context before designinga development intervention
3. Identify community needs using various research tools and participatory techniques
4. Prioritize community needs with the community, depending on local conditions and resource context

Pedagogical approach

This course is primarily a field-oriented course; therefore, students are trained to carry out independent research andtrained on ethical considerations.

Pedagogical methods include a mix of lectures, role plays, field visits and mock exercises.

Course Reading Material (*=Compulsory)

*Chambers .R. (2013), Rural Development –Putting the Last First, Routledge , New York

*Cooke, B. and Kothari, U.(Eds,) (2001), Participation: The New Tyranny? London: Zed Books

*Mukherjee, N (1993), Participatory Rural Appraisal- Methodology and Applications,

*Scheyvens R. and Storey, D., 2003, eds., Development fieldwork: A practical guide, London: Sage (chapters 8 and 9)

*Srivastava, V.K. (eds) (2005), Methodology and Fieldwork, OUP, New Delhi

*Watkins R., Meiers M. W. and Visser, Y. L. (2012), A Guide to Assessing Community Needs, World Bank, Washington DC

Journals

Economic and Political Weekly, World Development, Development and Change

Advanced Reading Material

Additional information (if any)

Open only for students of MA-SDP

Student responsibilities

Students are required to be disciplined and regular in attendance. At-least 75% attendance will be necessary to be able to appear for the final exam. While regular reading and class discussion are compulsory requirements, additional readings and discussions will enhance learning outcome.

Course Reviewers:

Dr. Kajri Mishra

Dr. Steve Russell

Course title: Minor Project			
Course code: MPD 108	**No. of credits:** 2	**L-T-P:** 0-0-240	**Learning hours:**
Pre-requisite course code and title (if any):			
Department: Department of Policy and Management Studies			
Course coordinator(s): Dr L.N. Venkataraman		**Course instructor(s):** Dr L.N. Venkataraman	
Contact details: venkataraman.ln@terisas.ac.in			
Course type: Core		**Course offered in:** Summer Break	

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

Course content

Module	Topic	L	T	P
1.	The student will carry out the minor project dissertation 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

1.Evaluation criteria:

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

1.1 Evaluation distribution

1. Meeting timeline (10 %) (Consisting of:
    a. Joining report
    b. Two progress reports
    c. Feedback form
    d. Final Report
2. Minor project report (20%)
3. Minor project presentation (30%)
4. Question & answers/viva voce (30%)
5. Response/feedback from the host organization/supervisor (10%)

2. Plagiarism

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

3. Non-adherence to timelines

1. Reports must be uploaded on the portal as per the date mentioned in timeline.
2. Monthly progress report: No monthly progress report will be accepted until its is complete and signed/approved by mentor/supervisor.
3. Submission of draft and final report for evaluation: The softcopy for draft and final report must be uploaded as per the timeline. Report that is submitted after the mentioned date will not be considered for evaluation and "0" marks will be awarded for the same. Further, the regulations of the TERI-SAS apply as laid down in the student handbook (available at the TERI School of Advanced Studies web page).
4. Minor Project Report: The Minor project is completed after the plagiarism free report is submitted as mentioned in the guidelines. Any non-compliance regarding certificate, formatting instructions as suggested for different sections of the report and any other requirement as mentioned in the guidelines will be considered incomplete and would lead to non-submission of the dissertation/thesis. Thus, students are advised to follow all the guidelines of Minor project.

4. 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.

5. 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.

6. Course Reading Materials:

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

Additional Information:

1. A Minor project guideline indicating timeline of different activities and other details will be issued by the department before the start of the semester.
2. If students are doing a combined project, they are required to seek approval from the Minor project coordinator by writing a justification for the joint/combined work. Only if the approval is given by the minor project coordinator the student will be allowed for joint work. However, the students are required to upload separate progress reports and other documents on their portal. The individual reports should not be verbatim copy of each other.
3. Feedback form – Follow-up with the respective mentor/supervisor is to be done by the student and any delay due to technical reasons should be informed before final submission with a copy to external supervisor. It is solely the responsibility of the student to get the feedback submitted by external before the deadline.
4. Plagiarism report would be shared with the mentor/supervisor and the students

Mentor/Supervisor:

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

Student responsibilities:

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

Course title: Population Health & Sustainable Development: Analytical Perspective

Course code: MPD 130	**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: Core	**Course offered in:** Semester 2

Course description

This course is designed to impart a relevant understanding of the population health required for a sustainable development practitioner. It begins by discussing population health as a fundamental marker of sustainable development, to designing a population health study, to comprehending decision-making processes in health care. The course is divided into four broad modules; first, relating to basic concepts and frameworks for the comprehension of population health and its linkages to sustainable development; second, relating to data, measures and study designs for exploring population health; third includes the recent scenario, major issues and challenges in global health; and fourth focuses on the processes for health promotion and developing healthy public policy. The aim is to familiarize students with the nuances of population health analysis, and processes for decision-making in the health care system, with a focus on the national, regional, and global contexts.

Learning objectives:

- To provide students with a basic understanding of population health, its role and importance in development discourse, and the factors affecting the health of the population.
- To discuss the sources and quality of required information, basic measures, and the processes of designing a relevant study for assessing population health.
- To enable students to assess the global population health scenario and comprehend the contemporary challenges in global health.
- To provide an overview of the concepts and frameworks of health promotion and decision-making processes in population health care.

Course content

Module	Topic	L	T	P
1.	**Population Health & Sustainable Development: Fundamentals** The main aim of this module is to introduce the fundamental concepts related to population health and its linkages to sustainable development. Human health, monitored and understood ecologically at the population level, provides an integrated outcome measure of the extent to which human societies manage to live within the sustainable limits of the environment at regional and, ultimately, global levels. Along with discussing the full spectrum of population health, this module also focuses on the changes in population over time which can affect health. Major points of discussion under this module include: a) Defining Health, Public Health, and Population Health	8		

	b) Health and development linkages c) Population Health: A fundamental marker of Sustainable Development d) Determinants of Health e) Demographic and Health/Epidemiological Transition f) Population Health and the Health Care System			
2.	**Population Health: Data, Measures, and Study Designs** This module will extend the basic understanding of study designs, sources and quality of data, measures, and analytics for population health assessment. Quality data allows the health system to establish baselines, benchmarks, and goals to keep moving forward. Measurement of population health, its causes, and its distribution is fundamental to the development of evidence for health policies, and for the evaluation and planning of health systems and intervention programs. Major discussions and computations involved in this module are as follows: a) Sources and Quality of Health Data b) Summary Measures of Population Health c) Summary Measures of Health Inequality d) Designing Population Health Studies e) Assessing Health Risks in Populations	10	2	6
3.	**Population Health: Status, Major Issues & Challenges** The objective of this module is to provide an overview of the global, regional, and national trends and patterns of key health indicators and diseases, along with the nutritional status of the population. This also includes the major contemporary challenges in global population health and nutrition. Specific discussions include: a) Health Trends of Communicable Diseases b) Global Burden and Health Trends of Non-Communicable Diseases c) The State of Global Nutrition d) Global Food and Nutrition Challenges e) Global Environmental Change and Health f) Major contemporary challenges in global health, e.g., Mental Health, Adolescent Health, Pandemics, Disparity in Healthcare etc.	10	2	

4.	**Population Health Promotions, Interventions, Evaluations & Policy Perspectives** This module introduces the concept of health promotion and its evolution, population health interventions, methods of their evaluations, and healthy public policy. The module discusses the Health in All Policies (HiAP) approach to improve evidence-based policymaking in order to promote the health and well-being of countries. Major discussions involved in this module are as follows: a) Health Promotion: Concept, Models, and Practice Frameworks b) Types and Levels of Population Health Interventions c) Framework and Methods for Health Programme Evaluation d) Decision-Making in Health Care e) Concept of Health in All Policies (HiAP)	10		
		38	**4**	**6**

Evaluation criteria:

Course grades will be based on the following criteria:

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

Learning outcomes:

Upon completion of the course, candidates would be:

1. able to understand the fundamental concepts, tools, and processes to assess population health scenarios (All evaluations)
2. able to design a small population health study and summarize the results in the form of a brief report (Minor Test-2)
3. aware of multifaceted approaches and processes of decision-making in health care and able to apply various common frameworks of health policy (All evaluations)

Pedagogical approach

Classroom lectures, application of excel based functions for tabulating the sample data and required analysis, invited talks from renowned public health scientists, and case studies.

Suggested Readings

Module 1:

- Mayzell, G. (2016). *Population Health: An Implementation Guide to Improve Outcomes and Lower Costs*. Boca Raton, FL: CRC Press (Taylor & Francis Group).
- Young, T. K. (2004). *Population Health: Concepts and Methods, 2nd Edition*. New York: Oxford University Press, Inc.
- Redclift, M., & Springett, D. (2015). *Routledge International Handbook of Sustainable Development*. New York: Routledge.
- Balarajan, Y., Selvaraj, S., & Subramanian, S.V. (2011). Health care and equity in India. *The Lancet*, 377(9764), 505-515.
- Jacobsen KH (2014). Introduction to Global Health, Second Edition. Burlington, MA: Jones & Bartlett Learning.
- McCracken K, Phillips DR (2012). *Global Health: An introduction to current and future trends*. New York: Routledge.
- Phelan, J. C., Link, B. G., & Tehranifar, P. (2010). Social conditions as fundamental causes of

health inequalities: theory, evidence, and policy implications. *Journal of health and social behavior*, 51 Suppl, S28–S40.
- WHO (2010). *A Conceptual Framework for Action on the Social Determinant of Health*. Social Determinants of Health Discussion Paper 2. Debates, Policy & Practice, Case Studies. Geneva: World Health Organization (WHO).

Module 2:

- Mayzell, G. (2016). *Population Health: An Implementation Guide to Improve Outcomes and Lower Costs*. Boca Raton, FL: CRC Press (Taylor & Francis Group).
- Joshi, A., Thorpe, L., & Waldron, L. (2019). *Population health informatics: driving evidence-based solutions into practice*. Burlington, MA: Jones & Bartlett Learning.
- Young, T. K. (2004). *Population Health: Concepts and Methods, 2nd Edition*. New York: Oxford University Press, Inc.
- McCracken K, Phillips DR (2012). *Global Health: An introduction to current and future trends*. New York: Routledge.
- Jacobsen KH (2014). Introduction to Global Health, Second Edition. Burlington, MA: Jones & Bartlett Learning.
- Bharat, S., & Sethi, G. (Eds.) (2019). *Health and Wellbeing of India's Young People: Challenges and Prospects*. Singapore: Springer Nature Singapore Pte Ltd.
- Davies, M., & Macdowall, W. (2006). *Health Promotion Theory*. London: London School of Hygiene & Tropical Medicine
- WHO (2020). Health Equity Monitor: Compendium of Indicator Definitions. https://cdn.who.int/media/docs/default-source/gho-documents/health-equity/health-equity-indicator-compendium-vjuly2020.pdf?sfvrsn=927c7420_2
- Schlotheuber, A., & Hosseinpoor, A. (2022). Summary Measures of Health Inequality: A Review of Existing Measures and Their Application. *International Journal of Environmental Research and Public Health*, 19(6), 3697.

Module 3:

- McMichael, A. J., Campbell-Lendrum, D. H., Corvalán, C. F., Ebi, K. L., Githeko, A. K., Scheraga, J. D., & Woodward, A. (2003). *Climate change and human health: Risks and Responses*. Geneva: World Health Organization.
- Boccia, S., Villari, P., & Ricciardi, W. (2015). *A Systematic Review of Key Issues in Public Health*. Switzerland: Springer International Publishing.
- Mohanty, S. K., Mishra, U. S., & Chauhan, R. K. (Eds.) (2019). *The Demographic and Development Divide in India: A District-Level Analyses*. Singapore: Springer Nature Singapore Pte Ltd.
- Bharat, S., & Sethi, G. (Eds.) (2019). *Health and Wellbeing of India's Young People: Challenges and Prospects*. Singapore: Springer Nature Singapore Pte Ltd.
- Faghih, N., & Forouharfar, A. (Eds.) (2022). *Socioeconomic Dynamics of the COVID-19 Crisis: Global, Regional, and Local Perspectives*. Cham, Switzerland: Springer Nature Switzerland AG.

Module 4:

- Davies, M., & Macdowall, W. (2006). *Health Promotion Theory*. London: London School of Hygiene & Tropical Medicine.

- Green, L. W., & Kreuter, M. W. (1991). *Health Promotion Planning: An Educational and Environmental Approach, 2nd Edition*. California City, CA: Mayfield Publishing Co.
- Glanz, K., Rimer, B. K., & Viswanath, K. (2008). *Health behavior and health education: theory, research, and practice, 4th Edition*. San Francisco, CA: John Wiley & Sons, Inc.
- Clavier, C., & de Leeuw, E. (2013). *Health Promotion and the Policy Process*. New York: Oxford University Press, Inc.
- Timmreck, T. C. (1995). *Planning, Program Development, and Evaluation: A Handbook for Health Promotion, Aging, and Health Services*. Sudbury, MA: Jones and Bartlett Publishers.
- Young, T. K. (2004). *Population Health: Concepts and Methods, 2nd Edition*. New York: Oxford University Press, Inc.
- Rao KD, Ramani S, Hazarika I, George S (2013). When do vertical programmes strengthen health systems? A comparative assessment of disease-specific interventions in India. *Health policy and planning*, 29(4), 495-505.
- National Science Foundation (2002). The 2002 User-Friendly Handbook for Project Evaluation. https://www.nsf.gov/pubs/2002/nsf02057/nsf02057.pdf
- CDC (2021). Comprehensive Cancer Control Branch Program Evaluation Toolkit, 2nd Edition. https://www.cdc.gov/cancer/ncccp/pdf/CCC-Program-Evaluation-Toolkit-508.pdf
- Hasenfeld, Y., Hill, K., & Weaver, D. (n.d.). A Participatory Model for Evaluating Social Programs. https://ctb.ku.edu/sites/default/files/chapter_files/eval_social.pdf
- American Academy of Pediatrics (2008). Evaluating Your Community-Based Program Part II: Putting Your Evaluation Plan to Work. https://hsc.unm.edu/community/toolkit/docs6/evaluatingpart2.pdf

Additional information: Up to FIVE candidates will be accommodated from other courses/disciplines after discussion with the course coordinator

Student responsibilities

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

Prepared by: Dr Chandan Kumar

Course reviewers

1. Prof. Rasheda Khanam, Professor (Health Economics), School of Business, University of Southern Queensland, Australia.
2. Dr. Manacy Pai, Associate Professor, Department of Sociology, Kent State University, Kent, Ohio, United States of America.

Course title: Integrated Impact Assessment			
Course code: MPD 145	**No. of credits:** 3	**L-T-P:** 39-0-12	**Learning hours:** 45
Pre-requisite course code and title (if any): MPD 137 or equivalent			
Department: Department of Policy and Management Studies			
Course coordinator: Dr Swarup Dutta	**Course instructor:** Guest Faculty		
Contact details: swarup.dutta@terisas.ac.in			
Course type: Core	**Course offered in:** Semester 2		

Course description:

Integrated Impact Assessment (IIA) provides a framework for a balanced consideration of the economic, environmental, social and health impacts of development interventions at the project, sector, and economy levels. The course in Integrated Impact Assessment (IIA) is designed to build detailed knowledge, understanding and skills among students for conducting IIA, so that they can identify sustainable modes of environmental operation. The course starts with an overview of IIA – the different methodologies on which it draws the state of the art, current practices, constraints and future directions. The final module of the course is intended to strengthen students' analytical capacity and assessment skills by making them work through actual/simulated scenarios.

Course objectives:

- Exposure to the key approaches to integrated impact assessment (environmental, economic, social and health) with a focus on methodology and tools and techniques including field and lab-based approach in the key discipline areas such as industry, biodiversity, urbanization, transport, and health
- To provide a basic understanding of the strategic environmental assessment at policy and planning stage itself, Environmental Impact Assessment (EIA) process as it is used project or program evaluation, monitoring, and regulatory enforcement
- To relate the uses of scientific research to practical societal situations in project planning and decision making using various impact assessment tools such as Health/Social/ Strategic environmental impact assessment
- To familiarize students about various methods of data generation including GIS for impact studies.

Module	Topic	L	T	P

1	**Introduction and overview of Integrated Impact Assessment (IIA)**
	• Key Approaches of IIA: Environment, Social, Health and Economy
	• Current Practices and Changing Perspectives in IIA – Contribution of IIA to decision-making – prospects & constraints; Stakeholder participation in IIA – importance, methodological and practical issues
	• Approach to integrating an array of diverse specialization.
	  ◦ Life cycle analysis, waste reduction in manufacturing processes
	  ◦ Indicators for various studies and index and their limitation
	  ◦ Types of assessment in Indian context; ISO, ISOTC207, EMS, Environmental Audit, MP, etc.
		4	0	0

2	**Integrated assessment of Natural resources** • Water Agriculture and Forestry • Projected IPCC model for Future Scenario • local, regional, and global scale approaches • Indian Environmental Status Assessment • Risk assessment and environmental disaster assessment	6	0	0
3	**Environmental Clearance Processes: Background and Concept** • Evolution of EIA in India • Various EIA Notifications (1994,2006 and 2020 draft notification) • Forest and Wildlife Clearance Acts and amendments	4		

	• Coastal Zone Clearance Act 2014 and Exclusive Economic Zone (EEZ)			
4	**Environment Impact Assessment (EIA)** • Techniques, Impact prediction and analysis, Treatment of Risk and Uncertainty, EIA inputs to the project cycle and development planning, • Procedures for Strategic Environmental Assessment (SEA) – Policy, plans, project steps • Indicators for various sector specific of EIA • Projects clearance procedures- TOR and EC • Administrative and legal compliance • *Case studies:* current urban centric development projects such as Metro Rail Constructions in major cities like Bangalore, Nagpur, Ahmedabad, Pune EIA as submitted by the state agencies and as finally implemented on ground. Char Dham project approval procedures etc.	6	0	0
4	**Biodiversity Impact Assessment (BIA)** • BIA – concept and factors • Role of BIA in the existing EIA process: Identification, prediction, and evaluation of impacts on biodiversity, techniques of biodiversity impact assessment and monitoring, threat reduction methods – case studies from India and elsewhere • Methodology for Biodiversity assessment through IUCN guidelines: 1) Singapore Index with special attention on Indian urban spaces. 2) Shannan Index • Case Studies: i) Railway doubling of Konkan and its Impact on biodiversity and people's resistance in Goa, Kerala and Karnataka; ii) Kerala rail project	6	0	0
5	**Health Impact Assessment (HIA)** • Developing framework for HIA Analysis- Changing concept and approach • Health Need Assessment, tools, and techniques - Case Studies from India • Concept and Protocols of Health Risk Assessment – HRA (WHO mandates) • HIA- Covid-19 pandemic case studies • Health Economic Assessment Tool (HEAT): Analysis from transport sector, health and social assessment, Dose response assessment, Pollution loads and impact on health, factors in health assessment • Case studies of Covid-19 Pandemic • Case studies: Example of application of HEAT and HIA specific to road accidents	5	2	0
6	**Social Impact Assessment (SIA)** • Concept and approaches of SIA • Methodological tools for SIA • Economic assessment of social Impact (poverty assessment) • Land acquisition- rules, implementation, and conflicts • Public-Partnership in SIA – Case studies from India • Public hearings in assessment approach	6	0	0

	• Special Economic Zone (SEZ) and SIA • Case studies: Various Hydro, Railway and other development projects in Uttarakhand, Current Crisis in Joshimath etc.			
7	**Group field work:** The students will conduct fieldwork in different parts of Delhi in groups. Census and observation methods will be employed to assess any one of the five above mentioned areas of assessment and will finally submit an Evaluation Report.	0	0	12
	Total	**37**	**2**	**12**

Evaluation Criteria

- **Minor 1 Exam-** (10%): the minor test will specifically focus on students' overall understanding on Module 1 and 2.
- **Minor 2 Exam-** (15%): the minor test will specifically focus on students' overall understanding on research process covering Module 3, 4 and 5.
- **Fieldwork report and Viva** - (15%)
- **Assignment Submission** – 10%
- **Major Exam**– 50%

Learning outcomes

- After attending the course, the students shall have acquired knowledge to conduct integrated impact assessment across many sectors of human activities, so that they are able to identify sustainable modes of environmental operation.
- Students would be able to understand the key elements of BIA, HIA, EIA, Urban biodiversity index and its processes by which they can apply to relevant ground level projects.
- Able to understand various tools and techniques, including GIS, used in identification and analysis of impacts suggest appropriate mitigation measures and prepare environmental management plans.

Pedagogical approach:

- The course will be delivered through classroom lectures, discussion of case studies from original relevant research articles and field visits. Data collection via observations, questionnaire, presentation as groups in class and finally examined with written report and viva as well.

Suggested Readings:

Books

- Rossini, Frederick (2020) Integrated Impact Assessment Paperback, Routledge- London
- Singh RK and Dutta, Ritwick (2006) Environment Impact Assessment, Other India Press
- Cave, Bane; Jha-Thakur, Urmila; Rao, Mala; Labhasetwar, Pawan; Fischer, Thomas B. (2013) Health in impact assessment and emerging challenges in India. In *Integrating Health Impact Assessment with the Policy Process: Lessons and experiences from around the world* by Monica O'Mullane (ed.), Oxford University Press: New Delhi
- Raman, N.S.; Gajbhiye, A.R.; Khandeshwar, S.R. (2006) Environmental Impact Assessment. Willey India
- Singh, Mahesh Prasad; J. K. Mohanka; Reena Forest (2007) Environment and Biodiversity Daya Books.
- Emmeline Lars (ed) (2006) Effective Environmental Assessment Tools - Critical Reflections on Concepts and Practice
- Jonathan Randall, (2010) Environmental Impact Assessment Tools and Techniques Green Recovery And Reconstruction: Training Toolkit For Humanitarian Aid. World Wildlife Fund Inc.

Other readings:

- Abaza H., Bisset R. and Sadler B. (2004) Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach. Economics and Trade Branch, UNEP, Geneva
- Adhikari A.P. and Khadka R.B. (eds.) (1998). Strategic Environmental Assessment: Proceedings of the South and Southeast Asian Regional Training Workshop on Strategic Environmental Assessment. Jointly organized by AREAP, IUCN Nepal and the Netherlands Commission for EIA, September 18-20, 1997, Kathmandu, Nepal. Asian Regional Environmental Assessment Program, IUCN, Nepal.
- Integrated Impact Assessment for Sustainable Development: A Case Study Approach June 2001, World Development 29(6):1011-1024 DOI:10.1016/S0305-750X(01)00023-7
- Lebret E. (2016) Integrated Environmental Health Impact Assessment for Risk Governance Purposes; Across What Do We Integrate? International Journal of Environmental Research and Public Health 13(1): 71. doi: 10.3390/ijerph13010071
- City Biodiversity Index (or Singapore Index: (Conference on biological diversity CBD), IUCN publicati0n. 2000
- Therivel, Riki and Wood, Graham (2017) Social Impact Assessment Natural and Built Environment Routledge; 4th edition (15 Sept. 2017)
- The Singapore Index on Cities' Biodiversity Dr Lena Chan National Parks Board, Singapore Global Platform for Sustainable Cities Monitoring and Reporting Urban Ecological Performance 3 November 2021

Additional information: NA

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

Course Reviewers:

- Prof. Dr. Dhiraj Mohan Banerjee, FNA, Alexander von Humboldt, British Council & JSPS Fellow, Former Professor & Head, Center of Advanced Study in Geology, University of Delhi
- Prof. N. J. Raju, Alexander von Humboldt Fellow, Hydrogeology and Environmental Geology, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi

Course title: Development Economics			
Course code: MPD 147	**No. of credits:** 3	**L-T-P:** 37-08-00	**Learning hours:** 45
Pre-requisite course code and title (if any): NA			
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 2		

Course description

Development economics has been one of the most lively and thought-provoking areas in economics and getting enriched almost everyday basis. The present course aims to build students' capabilities of understanding the critical developmental questions of emerging economies by using various tools, frameworks, and techniques of economics science. The course offers a mix of traditional developmental concepts such as growth, poverty, inequality, and unemployment along with emerging issues such as impact of climate change and the role of technology in economic development. Besides, it also seeks to understand the questions of migration, land acquisition, and problems of agriculture. The pedagogical approach consists of essentially a blend of theories, combined with empirical validity of theories by utilizing various qualitative and quantitative tools and techniques. In all modules, developmental policy implications are discussed, and relevant case studies from India are examined.

Course objectives

- To understand the traditional and emerging developmental themes, issues, and challenges from the lens of economic science
- To enrich theoretical understanding with empirical research related to developmental issues with real-world examples.
- To develop analytical skills by using economic tools and techniques while analyzing the key developmental challenges
- To make students comprehend the developmental challenges through case studies

Course content

Module	Topic	L	T	P
1.	**Conceptual issues around development and Development Economics** Historical perspectives and evolution of the notion and concept of development and development economics; understanding the nature, character, and significance; economics of development and development economics, traditional and emerging views, alternative approaches, theories of development; growth, and development debate	05	00	00
2	**Correcting GDP and beyond** Measurement issues: GDP as a measure of progress and limitations; alternatives approach to GDP, per capita income, green GDP, adjusted net savings, genuine savings, genuine progress indicator (GPI); subjective well-being (SWB): concepts, approaches and measurement; human development: concepts and measurement, indices	06	02	00
3	**Environment and development: debates and discourses** Historical perspectives of environment and development, emerging debates around environment and development in the 1970s and onwards; the relationship between environment and economy; debates around sustainable development; economics of sustainable development: theories, approaches and frameworks; case of green national accounting in India; emerging issues around climate and development: climate mitigation and climate adaptation and economic development	08	02	00
4.	**Debates around conventional development problems and emerging trends I** Poverty, vulnerability and well-being: evolving concepts and approaches; biological approach, utilitarian approach, approaches based on basic needs, capability approach to understand poverty;	09	04	00

	Sens entitlement approach to famines; measurement of poverty:; various indices and tools to measure poverty; multidimensional approach(s) to well-being and welfare; standard of living and quality of life; approaches and methods to analyze and measure the ecology and well-being; emerging conceptual issues around climate vulnerability and resilience; debates and discourses in measuring poverty in India, economic inequality: definitional contestations and theoretical approaches; measurement issues; the Lorenz curve, the inverted U hypothesis, EKC; Inequality in India			
5.	**Debates around conventional development problems and emerging trends II** Labour market in developing countries; land contracts and tenancy, land ownership, land acquisition for developmental projects: models and practices in India; land reforms in India; agricultural markets and contract farming, ecological sustainability of agricultural system; example of WEF nexus; rural-urban migration, urban informal sector and migration and development; technology and development	09	00	00
	Total	**37**	**08**	**00**

Evaluation criteria

- **Minor 1 Exam**- Seminal paper presentation and discussion (individual presentations by students): 20 %
- **Minor 2 Exam**- Literature survey (individual submissions by students): 30 %
- **Major Exam**- (written) : 50 %

Learning outcomes

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

- Comprehend and appreciate conventional developmental challenges such as poverty and inequality along with emerging challenges such as climate change and the role of technology in development (All the evaluation criteria)
- Develop analytical abilities to connect various developmental challenges and critically analyse them (All the evaluation criteria)
- Contextualize developmental challenges and identify potential solutions (All the evaluation criteria)

Pedagogical approach

Classroom lectures will be supplemented by seminal readings on key developmental issues and presentation of the same.

The assignment component would involve surveying literature, presenting seminal papers and discussing them and written tests.

Course Reading Materials

Books

- Debraj Ray, 1998, *Development Economics*, Princeton University Press
- Banerjee, Abhijit V.; Benabou, Roland.; Mookherjee, Dilip, 2006, *Understanding Poverty*; Oxford University Press, Oxford
- M. P. Todaro and S.C. Smith, 2012, '*Economic Development*', Pearson Publication
- Taylor, J. E., Lybbert, T. J., 2020, *Essentials of Development Economics*, Third Edition. United States: the University of California Press.

Module 1

Essential readings

- Dudley Seers, 1969, The Meaning of Development, IDS Communication 44
- Pranab Bardhan, 1993, Economics of Development and the Development Economics, The Journal of Economic Perspectives, Vol. 7, No. 2
- M. Desai, 1994, The Measurement Problems in Economics, Scottish Journal of Political Economy, Vol. 41. No. I
- Gilbert Rist, 2014, The History of Development: From Origins to Global Faith, Fourth Edition, Zed Books (Chapters 1 & 4)

- V.R Panchamukhi, An Integrated Paradigm for Development Process in the Asian Countries, CMDR Monograph Series 13.

Suggested readings

- Stephen A. Resnick, 1975, State of Development Economics, American Economic Review, Volume 5, No. 2
- Nicholas Stern, 1989, The Economics of Development: A Survey, The Economic Journal, Vol. 99, No. 397
- Syed, Nawab Haider Naqvi, 1996, The Significance of Development Economics, World Development, Vol. 24, No.6
- Debraj Ray, 2000, What is New in Development Economics?
- Edward K. Y. Chen, 2005, Teaching and Learning Development Economics: Retrospect and Prospect, The Journal of Economic Education, 2005, Vol. 36, No. 3

Module 2

Essential readings

- Human Development Reports
- Griffin, James, 1988, Well-Being: its Meaning, Measurement and Moral, University of Oxford
- M. Desai, 1991, Human Development: concepts and measurements, European Economic Review, 35
- Paul Streeten, 1994, Human Development: Means and Ends, The American Economic Review, Vol. 84, No. 2
- Simon, D and E. Neumayer, 2004, Genuine savings: a critical analysis of its policy-guiding value. International journal of environment and sustainable development, 3 (3/4).
- J. Boyd, 2008, The non-market benefits of nature: what should be counted in green GDP, by J. Boyd, Resources for the Future Discussion Paper RFF DP 06-24, 2006
- A Green GDP, EPW Editorial, December 5, 2009, Vol. XLIV, No. 49
- Robert Costanza, 2009, Beyond GDP: The Need for New Measures of Progress, The PARDEE Papers, No.4.
- Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi, 2010, Report by the Commission on the Measurement of Economic Performance and Social Progress, The New Press
- Thiry, G. and Cassiers, 2010, Alternative Indicators to GDP: Values behind Numbers Adjusted Net Savings in Question, IRES Discussion Paper 2010-18
- S. Hicks, 2011, The measurement of subjective wellbeing, Paper for Measuring National Well-being Technical Advisory Group, 4 February 2011

Suggested readings

- World Bank. 1997. Expanding the Measure of Wealth. Washington, DC: World Bank
- E. Neumayer, 1998, The ISEW: Not an Index of Sustainable Economic Welfare. Social Indicators Research, 48
- Costanza et al. 2009. Beyond GDP: The Need for New Measures of Progress
- Ida Kubiszewski, 2013, Beyond GDP: Measuring and achieving global genuine progress, Ecological Economics, 93
- Giannetti et al., 2015. A review of limitations of GDP and alternative indices to monitor human wellbeing and to manage eco-system functionality, Journal of Cleaner Production, 87
- Anita Frajman Ivković, 2016, Limitations of the GDP as a measure of progress and well-being
- Suman Seth and Antonio Villar, 2017, Measuring Human Development and Human Deprivations, OPHI Working Paper Number 110
- Miles B. Cahill, 2005, Is the Human Development Index Redundant? Eastern Economic Journal, Vol. 31, No. 1

Module 3

Essential readings

- V. Shantora, 1983, Environmental Concerns of the 80s, Journal of the Air Pollution Control Association, 33:6, 559-561, DOI: 10.1080/00022470.1983.1046561
- Sharachchandra Lele, 1991, Sustainable Development: A critical review
- MEA, 2005, Chapter 3: Ecosystems and Human Well-being' in Millennium Ecosystem Assessment, Ecosystems and Human Well-being: A Framework for Assessment, Island Press
- Agrawala, S and S Fankhauser (ed.), 2008, Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments (Paris: 0ECD).
- Kavi Kumar et al, 2010, Economics of climate change adaptation in India, Economic and Political Weekly, Volume 45, Number 18
- Eric Neumayer, 2013, Chapter 2: Sustainable Development: conceptual, ethical and paradigmatic issues' in

Weak and Strong Sustainability: exploring the limits of two opposing paradigms, Fourth Edition, Edward Elgar

- Ashish Kothari, 2013, Development and Ecological Sustainability in India: possibilities for the post-2015 framework ‘, EPW, 48 (30)

Suggested readings

- Edward B. Barbier, 1987, The Concept of Sustainable Economic Development’, Environmental Conservation, 14 (2),
- Laura H. Kosloff, 1997, Climate Change Mitigation and Sustainable Development, Natural Resources & Environment, Fall 1997, Vol. 12, No.2
- Sneddon, C., R. Howarth & R. Norgaard, 2006, Sustainable development in a post-Brundtland world. Ecological Economics 57
- Nick Hanley, Jason F Shogren and Ben White, 2007, Chapter 2: The economics of Sustainable Development’ in Environmental Economics: in theory and practice
- Giovanni Ruta and Kirk Hamilton, 2007, The capital approach to sustainability’ in Giles Atkinson, Simon Dietz and Eric Neumayer, eds., Handbook of Sustainable Development, Edward Elgar,
- Matthew Agarwala et al., 2014, Assessing the Relationship Between Human Well-being and Ecosystem Services: A Review of Frameworks, Conservation & Society, Vol. 12, No. 4
- Jiaqi Qui et al., 2022, Influential paths of ecosystem services on human wellbeing in the context of sustainable development goals, Science of the Total Environment

Module 4

Essential readings

- ILO, 1976, Employment, Growth and Basic Needs: a one-world problem, International Labour Office.
- A. Sen, 1981, Poverty and Famine: an essay on entitlement and deprivation, CLARENDON PRESS OXFORD
- A. Sen, 1999. Development as Freedom, Oxford University Press, 1st Edition
- J. Dreze, and Deaton, A. 2002, Poverty and Inequality in India: A Re-examination.” Economic and Political Weekly, Vol. 37(36)
- Soumyananda Dinda, 2004, Environmental Kuznets Curve Hypothesis: A Survey’, Ecological Economics
- T.E. Weisskopf, 2012, What kinds of economic inequality really matter, Indian Economic Review, Vol. 48
- Sabine Alkire and Suman Seth, 2015, Multidimensional Poverty Reduction in India between 1999 and 2006: Where and How?, World Development 72

Suggested readings

- P. Streeten, 1979, Basic needs: premises and promises, Journal of Policy Modelling.
- M V Nadkarni, 2000; Poverty, Environment, Development: a many patterned nexus’, Economic and Political Weekly, April 1
- J. Haughton, Shahidur R Khandker. 2009 Handbook on Poverty and Inequality. Washington, DC: World Bank.
- P. Dasgupta and K. Maler, 2010, Poverty, institutions, and environmental resource base (Chapter 39), Handbook of Development Economics, Vol. 5, Edt. By D. Rodrik and M.R. Rosenzweig
- P. Stephen. Jenkins and Philippe Van Kerm. 2011, The Measurement of Economic Inequality, In the Oxford Handbook of Economic Inequality. Edited by Brian Nolan, Wiemer Salverda, and Timothy M. Smeeding, Oxford University Press
- Himanshu and Sen, K. 2014, Revisiting the Great Indian Poverty Debate: Measurement, Patterns, and Determinants” BWPI Working Paper 203.

Module 5

Essential readings

- Mark R. Rosenzweig, 1995, Labor Markets in Low-Income Countries: Distortions, Mobility and Migration, Handbook in Development Economics
- R. B. Singh, 2000, Environmental Consequences of Agricultural Development: A Case Study from the Green Revolution State of Haryana, India, Agriculture, Ecosystems and Environment, December, 82(1-3).
- Sukhpal, Singh, 2002, Contracting Out Solutions: Political Economy of Contract Farming in the Indian Punjab, World Development, September, 30(9)
- Ravi Kanbur, Ravi, 2009, Conceptualising Informality: Regulation and Enforcement, Cornell University,

Department of Applied Economics and Management, Working Paper 09-11
- Ashwin Mahalingam, Aditi Vyas, 2011, Comparative Evaluation of Land Acquisition and Compensation Processes across the World, Economic and Political Weekly, Vol xlvi, no 32

Suggested readings

- Utsa, Patnaik, 1986, The Agrarian Question and Development of Capitalism in India‖, Economic and Political Weekly, May, 21(18).
- Timothy, Besley and Maitreesh Ghatak, 2010, Property Rights and Economic Development." Handbook of Development Economics, Elsevier.
- Ram Singh, 2012, Inefficiency and abuse of compulsory land acquisition: an enquiry into the way forward, Economic and Political Weekly, 47 (19)
- A. Sengupta, 2013, Migration, poverty, and vulnerability in the informal labour market in India, The Bangladesh Development Studies, 36 (4)
- Ashlesha et al., 2017, Taking Agroecology to Scale: The Zero Budget Natural Farming Peasant Movement in Karnataka, India‖, The Journal of Peasant Studies, February,45(1)
- S. Martin, 2010, Climate change, migration and governance, Global Governance, 16 (3)
- Endo et al., 2017, A review of the current state of research on the water, energy, and food nexus, Journal of Hydrology: Regional Studies 11 (2017)
- Endo et al, 2020, Dynamics of water–energy–food nexus methodology, methods, and tools, Current Opinion in Environmental Science & Health 2020, 13:46–60

Recommended journals for reference

- World Development
- Journal of Development Studies
- Journal of Development Economics

Student responsibilities

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

Course reviewers:

Prof. Badri Narayan Rath, Professor of Economics, Department of Liberal Arts, IIT Hyderabad, Hyderabad, India

Dr Santosh Kumar Sahu, Associate Professor of Economics, Department of Humanities and Social Sciences, IIT Madras, Chennai, India

Course title: Public Policy Processes and Institutions			
Course code: MPD 161	**No. of credits:** 3	**L-T-P:** 35-10-0	**Learning hours:** 45
Pre-requisite course code and title (if any): None			
Department: Department of Policy and Management Studies			
Course coordinator(s): Dr Smriti Das	**Course instructor(s):** Dr Smriti Das		
Contact details: smriti.das@terisas.ac.in			
Course type: Core	**Course offered in:** Semester 2		

Course description:

The policy challenge of the 21st century is varied and require the decision makers and analysts to see issues from multiple perspectives. Apart from those of the state, these perspectives include other stakeholders whose participation is important for attainment of collective goals of the society. Sustainable development practitioners need a lens that appreciates these influences along with appreciation of cross-sectoral linkages.

In this context, the course would help to build an understanding on how policies are developed and put into action. This would entail examining the emergence of issue, deciding on priority, setting of agenda, managing interests and implementing decisions. In the process the role of various bureaucratic, political, organized and unorganized interest groups, actors and networks would be highlighted. It would aim at understanding as well as exploring various forms of engagement of stakeholders. Although the geographical focus of most of the decisions would be in the Indian context, case studies from several other countries would help in contextualizing the issues.

Through this course the myth of Government as unitary actor with coherent set of objectives would be annulled. It would help the students to understand the complexities of policy process and the way various stakeholders exercise influence on policy decisions.

Course objectives:

1. To familiarize the students with how policies are formulated and implemented
2. To build a nuanced understanding of the role of various institutions and interest groups in this process.
3. To help students understand how various stakeholders exercise influence in the policy process and what are theoutcomes of such influences.

Course content

Module	Topic	L	T	P
1	**Basic Concepts and Theories of Public Policy and Policy Processes** Session 1: Understanding Public Policy; Policy Types Session 2 and 3: Approaches to policy making- various models of policy making and its relevance tostudy the policy process and changes thereof Session 4: Case discussion: Cuban Missile Crisis to highlight the influence of actors and organizations	7	2	0
2	**Institutions and its role in Public Policy** Session 1: Policy making institutions in India: judiciary, executive and legislature; how policymaking is accomplished in India Constitutional/Statutory bodies and its role in policy process Session 2: Political institutions (political parties/agendas/governing principles such as adult franchise and accountability) and extent to which they constrain room for manoeuvre of policy Session 3:	8	0	0

	Changing role of institutions: new public management; new governance model; role ofnetworks in shaping public policy			
3	**Policy Process: Formulation of policies** Session 1: Case study: policy in a specific sector will be examined to understand how it developed Session 2 and 3: Principal phases of policy process: issue identification/agenda setting, stakeholderconsultation and review; transparency in policy formulation Session 4: Identifying the main actors/stakeholders in the policy process; idea of political powerand influence; regional versus national interest	8	2	0
4	**Policy Process: implementation of policies** Session 1: Examining policy from implementation perspective; identifying implementation gaps;feedback on policies Policy implementation as a political process: political economy Session 2: Service Delivery, accountability and people's participation: role of decentralization andlocal governance Session 3: Group presentation (for 30 minutes) on stages of policy formulation. Debating the importance of various stages, consequences of adhering to these stages and fall out ateach stage with ways to improvise.	6	4	0
5	**Policy Change and its agents** Sessions 1, 2 and 3: Identifying role of domestic and international actors (leaders/agencies/pressure groups)in determining policy choices; Endowments and Constraints on their power to determine policy choices Civil Society/pressure groups/networks and its role in influencing policy decisionsMarket (private sector/business) as an agent in influencing policy decisions Media and its role in influencing public policy	6	2	0
	Total	**35**	**10**	**0**

Evaluation criteria:

Minor 1 Exam - 15% [End of Module 2]

The preliminary understanding of the students of the policy process and the role of institutions.

Minor 2 Exam - Group Presentation 35% [End of Module 4]

Thematic presentation would be in groups where the students will be free to work on a policy of their choice. This will be scheduled after the completion of policy formulation stage and policy implementationstage.

Major Exam -50% [End of Module 5]

Will be based on a policy and will assess the student's ability to analyze the process and the role of various stakeholders. It will also examine the ability of students to interpret the rationale of policy and discuss the larger relevance of the idea in the societal context.

Learning outcomes:

By the end of this course, the students will be expected to:

1. Be able to understand the process of policy formulation and implementation (Test 1 and 2)
2. Be able to understand the role of various institutions and their relevance in the policy process (Test 1 and2)
3. Be able to analyze policy with respect to: rationale, objectives, outcomes and role and influence ofvarious stakeholders (Test 3)
4. Be able to appreciate the intersectoral linkages between various policies (Test 3)

Pedagogical approach:

The course will draw upon a wide variety of examples from existing policies and performance of the communities on various development parameters to enable the students to understand the complexities of policy formulation as well as implementation. The sessions will be a delivered through a mix of lectures, case studies and discussions. The course will include tutorials that will be used for case and group discussions.

Course Reading Materials

Module 1:

Hill, M., 2005, The Public Policy Process, Pearson Education, England Sabatier, P. (eds), 1999, Theories of the Policy Process, Westview Press, USA.

Allison, G., 1999, The Essence of Decision: Explaining the Cuban Missile Crisis, Boston: Little Brown

Kingdon, J.W., 2003, Agendas, Alternatives and Public Policies, Longman, New York Turner, M., and Hulme, D.,1997, Governance, Administration and Development-Making the State Work, Palgrave, New York

Stone, D., 2001, The Policy Paradox: The Art of Political Decision Making, Norton & Company

Module 2:

Austin, G., 2007, The Indian Constitution, Cornerstone of a Nation, Oxford University Press.

Godbole, M., 2003, Public Accountability and Transparency-The imperatives of Good Governance, Orient Longman, New Delhi

Harris, J., 2006, Power Matters-Essays on institutions, Politics and Society in India, Oxford University Press Chatterjee, P. (eds), 1999, State and Politics in India, Oxford university Press Evans, P., 2002, Beyond InstitutionalMonocropping: Institutions, Capabilities and Deliberative Development, November 2001. Revised Jan 2002.

Zucker, L.G., 1987, Institutional Theories of Organizations, Annual Review of Sociology, Vol.13, pp: 443-464 Moe, T.M., 1990, Political Institutions: The Neglected Side of the Story, Journal of Law, Economics and Organization, Vol. 6, pp-213-253.

Minogue, M., Charles P., and Hulme, D., 1998, Beyond the New Public Management- Changing Ideas and Practicesin Governance, Edward Elgar, UK.

Corbridge, S. and Harris, J., 2000, Reinventing India: Liberalization, Hindu Nationalism and Popular Democracy,Cambridge University Press

Barzelay, M., 2001, The New Public Management-Improving Research and Policy Dialogue, University of California Press and Russell Sage Foundation, New York.

Module 3:

Weimer, D. L. and Vining, A.R., 2004, Policy Analysis: Concepts and Practice, Prentice Hall, USA Hogwood, B.W., and Gunn, L.A., 1984, Policy Analysis for the Real World, Oxford University Press.

Grindle, M.S. and Thomas, J.W., 1991, Public Choices and Policy Change: The Political Economy of Reform inDeveloping Countries, John Hopkins University Press, Baltimore

Parsons, W., 1995, Public Policy-An Introduction to the Theory and Practice of Policy Analysis, Edward Elgar, UKMorse, K., and Struyk, R.J., 2006, Policy Analysis for Effective Development-Strengthening Transition Economies,Lynne Reiner, US

Module 4:

Grindle. M.S. (ed), 1980, Politics and Policy implementation in the Third World, Princeton University Press, NJ
Pressman, J. L. and Wildavsky, A., 1971, Implementation, California University Press, Berkeley

Hill, M. and Hupe, P., 2009, Implementing Public Policy-An Introduction to the Study of Operational Governance,Sage Publications, London

VCheema, G. S., and Rondinelli, D.A. (eds), 1983, Decentralization and Development: Policy Implementation in
Developing Countries, Sage Publications, Beverly Hills; London; New Delhi
Mooij. J., 1999, Food Policy and the Indian State: The Public Distribution System in South India, Oxford UniversityPress, Delhi

Module 5:

Lipsky M. 1980. Street-level bureaucracy: dilemmas of the individual in public services, Russell Sage Foundation, New York
Edwards, M. and Hulme, D., 1992, Making a Difference-NGOs and Development in Changing World, Earthscan, London
Bashevkin, S., 1996, Interest Groups and Social Movements, in Lawrence LeDuc, Richard Neimi and Pippa Norris (eds), 1996, Comparing Democracies: Elections and Voting in Global Perspective, Thousand Oaks, CA: Sage Publications
Sathe, S.P., 2002, Judicial Activism in India, Oxford University Press, New Delhi Marsh, D., 1998, The development of the policy network approach. In: Marsh D (ed.) Comparing policy networks, Oxford University Press, Oxford
Tantivess, S., and Walt, G., 2008, The Role of State and Non-State Actors in the Policy Process: the contribution of policy networks to the scale-up of anti-retroviral therapy in Thailand, Health Policy and Planning, Vol. 23. pp: 328- 338
Suggested readings will be given in class. For the rest, books can be referred from library (most of the books and materials mentioned in the list area available in the library), depending on interest and motivation of the student. However, students are encouraged to bring cases of policy making from their respective countries to the class to make the discussion richer and productive.

Recommended journals for reference
Policy Studies Journal World Development
Development an Change
Economic and Political Weekly

Additional information (if any)

Student responsibilities:
Students are required regular in attendance. At-least 75% attendance will be necessary to be able to appear for the final exam. While regular readings and class discussions are expected, additional readings and discussions will help to enhance the learning outcome

Course reviewers:

1. Dr S K Sarkar, DoPT
2. Prof. Debi Prasad Mishra, IRMA

Enclosure 2

M.Tech (Renewable Energy Engineering and Management): Couse list for second semester

Semester	Course Code	Course Title	Course Type	Credits
2	ENR XXX	Electric vehicle, energy storage system and Hydrogen technologies	Programme Core (PC)	3
2	ENR XXX	Energy and carbon markets	Programme Core (PC)	1
2	ENR XXX	Solar technologies	Programme Core (PC)	3
2	ENR XXX	Wind, biomass and other renewable energy technologies	Programme Core (PC)	3
2	ENR 111	Energy conservation and management	Programme Core (PC)	2
2	ENR 157	Energy lab - II	Programme Core (PC)	3
2	ENR 156	Renewable energy project management	Programme Core (PC)	3
2	ENR 103	Seminar on field visits to RE plants/sites	Programme Core (PC)	1

Course title: Electric Vehicle, Energy Storage System and Hydrogen technologies			
Course code: ENR 166	**No. of credits: 3**	**L-T-P: 38-7-0**	**Learning hours: 45**
Pre-requisite course code and title (if any): NA			
Department: Department of Sustainable Engineering			
Course coordinator: Prof Naqui Anwer	**Course Instructor:**		
Contact: naqui.anwer@terisas.ac.in			
Course type: Program Core	**Course offered in:** Semester 2		

Course description

This course is designed to provide a comprehensive understanding about electric vehicles, energy storage systems and hydrogen technologies. These three technologies are contemporary technologies contributing actively towards sustainable development. The use of electric vehicle for transportation and use of energy storage system in utility scale RE plants for improving stability and enhancing reliability is going to increase in the days to come. The hydrogen is rapidly being accepted as an alternate fuel and producing it using RE makes it even more lucrative. This course will provide an in-depth knowledge of these three important emerging filed covering technologies, management and their applications.

Course objective

- Recognize EV/HEV technical and economic objectives. Identify efficient EV/HEV architectures.
- Explain the mechanism of battery and motors in terms of functionality, control, and integration.
- Describe a basic coordinated control between different parts of EV.
- To study details of various energy storage systems along with applications
- Enabling to identify the optimal solutions to a particular energy storage application/utility.
- To provide comprehensive and logical knowledge of hydrogen production, storage and utilization

Course contents

Module	Topic	L	T	P
1	**Electric Vehicles (EV) and Hybrid Electric Vehicles (HEV) Developments:** Historical developments, recent developments, National Electric Mobility Mission Plan (NEMMP). Policies and regulations for EV adoption, Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) Scheme. State of art EVs and HEVs, EV configurations, EV parameters, HEV configurations, Power flow control. **Electric Propulsion:** Different types of power converter based DC motor drives, induction motor drives, permanent magnet motor drives, Switched reluctance motor drives. **Energy Sources:** Basics- Parameters-Capacity, Discharge rate, State of charge, state of Discharge of Batteries, Fuel cells, Ultra-capacitors, Flywheels. **EV auxiliaries:** EV charging standards like CCS, ChaDeMo (Japanese), GB/T (Chinese), Bharat AC-001 and DC-001 and other BIS standards; Battery characteristics	16	0	0

	and chargers, Battery indication and management, Temperature control units, Power steering units, Auxiliary power supplies, Navigation systems, Regenerative Braking systems. Safety aspects.			
2	**Necessity and types of energy storage system:** Necessity of energy storage, policy and regulatory developments in energy storage, recent standards for energy storage systems - MESA, IEC, IEEE. Different types of energy storage – mechanical, chemical, electrical, electrochemical, biological, magnetic, electromagnetic, and thermal. Comparison of energy storage technologies. **Energy Storage Systems:** Thermal energy storage, sensible and latent heat, phase change materials, Energy and exergy analysis of thermal energy storage, electrical energy storage-super-capacitors, magnetic energy storage-superconducting systems, Mechanical-Pumped hydro, flywheels and pressurized air energy storage, Chemical-Hydrogen production and storage, Principle of direct energy conversion using fuel cells, thermodynamics of fuel cells, Types of fuel cells, AFC, PEMFC, MCFC, SOFC, Microbial fuel cell, Fuel cell performance, Electrochemical Energy Storage- Cell design - principles of "anode, cathode and electrolyte", Construction and operation of Battery Storage Systems- primary, secondary and flow batteries.	10	4	0
3	**Hydrogen energy systems:** Policies and regulations for promotion of hydrogen, National Green Hydrogen Mission. Concept of grey, blue and green hydrogen; Properties of hydrogen as fuel, Hydrogen pathways, Introduction-current uses, general introduction to infrastructure requirement for hydrogen production, storage, dispensing and utilization, and hydrogen production plants **Hydrogen production processes:** Thermal-Steam reformation, thermo-chemical water splitting, gasification-pyrolysis, nuclear thermal catalytic and partial oxidation methods. Electrochemical- Electrolysis, photo electro chemical method. **Hydrogen storage and safety:** Physical and chemical properties, general storage methods, compressed storage-composite cylinders, metal hydride storage, carbon based materials for hydrogen storage. Hydrogen safety aspects, backfire, pre-ignition, hydrogen emission NOx control techniques and strategies, Hydrogen powered vehicles.	12	3	0
	Total	**38**	**7**	**0**

Evaluation criteria

Minor Test 1: 20% (at the end of module 1)
Minor Test 2: 20% (at the end of module 2)
Assignment: 10% (at the end of module 1, 2 & 3)
Major Test: 50% (at the end of the semester)

Learning outcomes

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

- Learn fundamentals of advanced batteries, super-capacitors and fuel cells for electrification of vehicles.
- Learn hybridization of various energy conversion devices for vehicle electrification.
- Understand battery management systems and state-of-charge estimation.
- Understand the overall operation of Electric vehicles.
- The student will be able to cope up with upcoming technologies in the energy storage systems.
- Minimize environmental hazards associated with the use of hydrogen storage and fuel cell technology

Pedagogical approach

A combination of class-room interactions, expert lecture, assignment, tutorial, practical and case study

Reference Books:

1. C. C. Chan, K. T. Chau, "Modern Electric Vehicle Technology" published by Oxford University Press, 2001.
2. Rodrego Garcia-valle and J. A. P Lopes "Electric Vehicle Integration into Modern Power Networks" Springer, 2012.
3. Chris Mi and M. Abul Masrur, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives" John Wiley Ltd. Publication, 2017.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design" CRC Press, 2004.
5. S. P. Sukhatme and J K Nayak, Solar Energy: Principles of thermal collection and storage, Tata McGraw-Hill, 2009.
6. H. P. Garg, S. C. Mullick and A. K. Bhargava, Solar Thermal Energy Storage, Springer, 1985.
7. Michael Hirscher, Hand Book of Hydrogen Storage, Wiley-VCN Verlag GmbH, 2010.
8. A.G.Ter-Gazarian, "Energy Storage for Power Systems", Second Edition, The Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), 2011.
9. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt," Energy Storage in Power Systems" Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016.
10. A. R. Pendse, "Energy Storage Science and Technology", SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN – 13:9789380090122), 2011.
11. Energy Storage - Technologies and Applications by Ahmed Faheem Zobaa, InTech, 2013.
12. Fundamentals of Energy Storage by J. Jensen and B. Sorenson, Wiley-Interscience, New York, 1984.
13. Thermal energy storage: Systems and Applications by Dincer I. and Rosen M. A., Wiley pub, 2010.

Additional information (if any): NA

Student responsibilities

Adopt peer learning and knowledge sharing within the class, attendance, feedback, discipline: as per university rules

Course Reviewer

Dr Shashank Vyas, Senior Associate Consultant (Energy and Utilities), Infosys

Dr Odne Stokke Burheim, Professor, Department of Energy and Process Engineering. NTNU, Norway

Course title: Energy and Carbon Markets			
Course code: ENR 167	**No. of credits:** 1	**L-T-P**: 14-01-00	**Learning hours:** 15
Pre-requisite course code and title (if any):			
Department: Department of Sustainable Engineering			
Course coordinator:		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course description

Energy sector is associated with significant contributions to a country's carbon emissions. All countries that have ratified the Kyoto Protocol, are supposed to report their emissions to UNFCCC. In this course, the students shall be provided with an overview on global climate agreements, energy specific emissions, and tools and methodologies for accounting and reporting the emissions. They shall be apprised on the Indian GHG inventory and the initiatives to reduce the same. Carbon trading has been identified as a tool to reduce emissions. In this context, the students shall be taught about the various trading mechanisms along with their pricing structures.

Course objectives

- Overview on Climate Change & international agreements
- Energy & associated GHG emissions
- Developing GHG Inventory & Carbon Footprint Assessment,
- Indian energy specific GHG inventory & mitigation strategies
- Role of Market based mechanisms in mitigation, including pricing, markets & trading.

Course content

Module	Topic	L	T	P
1	**Introduction – Climate Change** Climate change and greenhouse gas emissions International regime for climate stabilization Climate change Mitigation: NDCs and Net Zero Goal Market mechanisms under the Paris Climate Agreement Carbon capture, utilisation and storage (CCUS)	2	0	0
2	**Indian Context** National Action Plan on Climate Change Commitments under UNFCCC and Paris Agreement National GHG Inventory Estimation Existing energy related market mechanisms NDC goals for mitigation, Accounting and Reporting	3	0	0
3	**Carbon Assessment Techniques** Gases, Sectors, and methodologies Policies, regulations and protocols Estimation of carbon footprint IPCC guidelines for National GHG inventories Case Study	3	1	0

4	**Carbon Markets** Carbon Economics - Price incentive or cost Market Based Mechanisms – Cap & Trade, Carbon Trading Voluntary and compliance Carbon Markets Carbon Markets in India- existing mechanisms and future design Introduction to Internal Carbon Pricing & Carbon labeling Carbon Tax & Price Adjustments	6	0	0
		14	**1**	**0**

Evaluation criteria

Minor Test 1	20%
Minor Test 2	20%
Assignment / Tutorials	20%
Major Exam	40%

Learning outcomes

After completing this course, students would be able to:

- Estimate Carbon/ GHG emissions of a particular scenario
- Understand the concept of carbon pricing
- Understand working of carbon markets with the various trading techniques

Pedagogical approach

The course will be delivered through classroom lectures with relevant case studies

Materials

Textbooks

- UNDP, Carbon Handbook, United Nations Development Programme (2014)
- Gupta M. Restricting Greenhouse Gas Emissions: Economic Implications for India, New Delhi. (2006)
- Gilbert M. Masters and Wendell P. Ela. Introduction to Environmental Engineering and Science. 3rd edition. PHI learnings, New Delhi (2007)

Suggested readings

- BEE (India) - National Carbon Markets Scheme
- MoEFCC (India) GHG Inventory
- NAPCC, India
- UNFCCC - National Inventory Submissions
- World Bank - State and Trends of Carbon Pricing (Report)

Journals

- Climate Dynamics
- Combustion Technologies
- Energy Policy
- Global Environmental Change
- Renewable Energy
- Review of environmental economics and policy
- Sustainable and Renewable Energy reviews

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time.

Course reviewers

- Mr. RR Rashmi, IAS (Retd.), Distinguished Fellow and Director, Earth Science and Climate Change, TERI
- Dr Sacchidananda Mukherjee, Associate Professor, National Institute of Public Finance and Policy
- Mr. Jatin Kapoor, Head - Climate Transactions, Emergent Ventures India

Course title: Energy conservation and management			
Course code: ENR 111	**No. of credits:** 2	**L-T-P: 22-06-04**	**Learning hours:** 32
Pre-requisite course code and title (if any): NA			
Department: Department of Sustainable Engineering			
Course coordinator:	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course description

Energy Management has been identified as a key instrument to reduce greenhouse gas emissions, besides increasingthe cost competitiveness of the entity/ facility while enhancing the energy security of the nation. Policy makers and technology providers have been working towards the cause of energy efficiency and its overall management. This course is designed to educate students on the various dimensions of energy management across the entire value chain.

Course objectives

- To impart knowledge in the domain of energy conservation
- To bring out Energy Conservation Potential and Business opportunities across different user segments underinnovative business models
- To inculcate knowledge and skills about assessing the energy efficiency of an entity/ establishment

Course contents

Module	Topic	L	T	P
1	**Introduction to Energy Conservation** Overview - Global & Indian Energy Scenario Energy Sources, Supply & Demand Overview of Electrical and Thermal Energy Imperative for Energy Conservation	4		
2	**Policy & Regulations for Energy Conservation** Institutional Structure Overview – Global EE Programmes India - Energy Conservation Policies & Legislations including BEE' activities	4		
3	**Energy Conservation Opportunities – Electrical** Buildings & Lighting SystemsMotors, Pumps, Transformers Power Transmission & Distribution System	3		

4	**Energy Conservation Opportunities – Thermal** Boilers, Furnaces & Waste Heat Recovery SystemsCogeneration Systems HVAC, Cooling Towers & DG Systems	3		
5	**Energy Data Analysis** IT Tools and ApplicationsSmart Energy Systems Industrial Use Cases	4		
6	**Business Approaches** Market Opportunities Overview on EE Financing ESCO Business Models Case studies	4	6	
7	**Site Visit**			
	Power Distribution Utility/Industry/ Building			4
		22	**6**	**4**

Evaluation criteria

- Assignments: 20%
- Minor Test 1: 20%
- Minor Test 2: 20%
- Major Exam: 40%

Learning outcomes

- Obtain knowledge about energy conservation policy, regulations and business practices
- Analyse energy systems from a supply and demand perspective
- Recognize opportunities for enabling rational use of energy
- Apply knowledge of Energy Conservation Opportunities in a range of contexts
- Develop innovative energy efficiency solutions and demand management strategies

Pedagogical approach

A combination of class-room interactions, group discussions, tutorials, assignments and site visits

Materials

Text Books

LC Witte, PS Schmidt and DR Brown: **Industrial Energy Management and Utilization** (HemispherePublishing Corporation, Washington, 1998)

Reference Books

WC Turner and Steve Doty: **Energy Management Handbook**, Seventh Edition, (Fairmont Press Inc., 2007) Sumper Andreas and Baggini Angelo: **Electrical Energy Efficiency: Technologies and Applications** (JohnWiley 2012)
Frank Kreith: **Handbook on Energy Efficiency and Renewable Energy** (CRC Press, 2007)George Polimeros: **Energy Cogeneration Handbook** (Industrial Press, Inc., New York, 1981)

Websites

National Productivity Council (http://www.npcindia.gov.in)
Bureau of Energy Efficiency (https://www.beeindia.gov.in)
Petroleum Conservation Research Association (http://www.pcra.org)

Additional information (if any): N.A.

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

Course reviewers

1 Mr RP Gokul, Head (Energy Efficiency Division), ICF International
2 Mr Amit Kumar, Sr. Director, TERI

Course title: Solar technologies			
Course code: ENR XXX	**No. of credits:** 3	**L-T-P:** 43-2-0	**Learning hours:** 45
Pre-requisite course code and title (if any): NA			
Department: Department of Sustainable Engineering			
Course coordinator:	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course description

Solar energy, most abundant and freely available natural energy resources, is used for various applications including space heating, cooling, lighting, process heat for industrial purposes and also electricity generation through PV system and steam power plant. This course covers the basics of conversion technologies, system designing techniques and the methods of direct use of solar energy in daily life. The course has three parts. Part A deals with physics and technology of PV materials, devices, systems design and applications. Part B deals with Solar Thermal collector technologies and applications. Finally, under Part C, the method for harnessing solar energy through passive architecture is covered.

Course objectives

The objective of the course is to develop in-depth understanding of various technologies and applications to harness solar energy through active conversion methods such as photovoltaic & thermal and integration of passive architectures in building.

Course contents

Module	Topic	L	T	P
	Part-A: Solar Photovoltaic Technology (1 Credit)			
1	**Physics of solar cells** Crystal structure, band theory, energy band diagrams, Fermi level, intrinsic and extrinsic semiconductor, doping, n-type and p-type silicon, p-n junctions, drift and diffusion current, absorption of radiation and excess minority carriers, generation, recombination and carrier separation Standard solar cell structure, I-V characteristics, FF, Voc, I_{sc}, P_{max}, conversion efficiency, losses in solar cell, Rs, Rsh, impact of radiation and temperature, PC1D simulation of industrial solar cell structure Concepts of heterojunctions, multi junction and concentrated solar cell, Introduction to advanced softwares used in solar cell simulation	3	2	0

2	**Solar PV module technologies** ***First generation: Silicon wafer based technology:*** Materials and process requirements for solar cell fabrication, process flow, process control measures, quality control techniques Single and poly crystalline silicon solar cells, Materials and process requirements for module assembly, routine and type tests, qualification test standards, types of degradation. ***Second generation: Thin film technologies:*** Merits and demerits of thin film technologies, amorphous-Si, CdTe and CIGS solar cell module, manufacturing steps ***Third generation/emerging PV technologies:*** Organic PV, Dye sensitized PV, Quantum-dot, Hot-carrier, Up conversion and down conversion Latest benchmark efficiencies – laboratory and manufacturing, New technologiesin market – PERC, Bifacial, TOPCON, Half-cut cell etc.	5	0	0
3	**Solar PV systems** Balance of System (BoS) components: battery, PCU (charge controller, inverter, data logger), transformer, cables and connectors, switches/circuit breakers, energy meters, bypass and blocking diodes Types of PV systems: Standalone, grid-connected, hybrid, rooftop business models – CAPEX and RESCO, canal top, floating PV system System design: SPV system design guideline and methodologies, introduction to PVSyst, designing of standalone/grid-connected PV systems fordomestic/commercial use	4	0	0
4	**Solar PV applications** Lighting, agriculture, refrigeration, telecommunications, space, BIPV, fencing,water purification, navigation, defence, offshore, etc.	1	0	0
	Part –B: Solar Thermal Technology (1 Credit)			
5	**Solar Radiation review** Solar radiation on the collector, Liu & Jordan relation	2	0	0

6	**Solar Thermal collectors** ***Non concentrating collectors*** Flat plate collectors: general design features and characteristics, materials. Unglazed, Single and double glazed solar collectors, Optical losses and thermallosses, thermal analysis and performance characteristics. Design of water and air heating collectors: their specific features. Short term andlong term performance (utilizability) Evacuated tube collectors: general design features, characteristics, materials,thermal analysis Thermo siphon system and forced convection system, Concentrating solarcollectors: General description; concentrators, receivers, Orienting/tracking requirements,Materials General characteristics Optical features of solar concentrators: II Law of thermodynamics for solar concentrators. Optical and thermal losses, Thermal performance characteristics parabolic trough collectors (PTC), Parabolloid dish collectors, Scheffler dish, Linear Fresnel Reflector Collector	9	0	0
7	**Application** Solar hot water/steam systems, Solar cookers: box type, dish type and others; dryers; desalination systems; absorption cooling; furnace, Process heating systems, community cooking system Power generation: Concentrator based system, Fresnel system, central tower, distributed line focus and point focus systems, Hybrid solar thermal	4	0	0
	Part –C: Passive Architecture (1 Credit)			
8	**Climate and human thermal comfort** Factors affecting climate; climatic zones and their characteristics; urban climate; microclimate; implications of climate on building design; principles of energy conscious design, Building materials, embodied energy of building materials, alternative building materials	5	0	0
9	**Solar Geometry** Sun path diagram and shading design	2	0	0
10	**Passive concepts for heating and cooling** ***Passive heating:*** direct gain, indirect gain, thermal storage wall, roof topcollectors, isolated gain, solarium ***Passive cooling*:** nocturnal cooling, evaporative cooling, roof surface evaporative cooling (RSEC), direct evaporative cooling using drip-type (desert) coolers, nocturnal radiation cooling, earth	4	0	0

	coupling, ***Daylighting:*** basic principles and systems			
11	**Rating systems of energy efficient buildings** LEED, GRIHA, IGBC rating system for existing and new building	4	0	0
		43	**2**	**0**

Evaluation criteria

- Minor Test 1: 15% (after completion of Module 1, 2, 9, 10)
- Minor Test 2: 15% (after completion of Module 3, 5, 6 and 11)
- Major Test: 40% (after completion of module 4, 7, 8, 11)
- Assignments: 30% (after module 2, module 7 and 11)

Learning outcomes

After completing this course students will be able to:

- Understand the physics and technology of solar PV, solar thermal and passive architecture (Minor Test 1,2)
- Apply system design approaches for various application of solar PV and thermal technologies (Minor Test 2, Major Test and assignments)
- Design and integrate the concepts of passive architecture in existing and new buildings (Minor Test 2 and Major Test)

Pedagogical approach

A combination of class-room interactions, practical/simulation, assignments

Recommended readings

Text Books

Renewable Energy Engineering and Technology – A Knowledge Compendium, ed. VVN Kishore (TERI Press,2008).
CS Solanki: Solar Photovotaics – Fundamentals, Technologies and Applications, Third Ed (PHI Learning, 2015)

Reference Books

SM Sze, Kwok K Ng: Physics of semiconductor devices, third edition (John Wiley & Sons, 2007)
MA Green: Solar Cells Operating Principles, Technology, and System Applications (Prentice-Hall, 1981)MA Green:High Efficiency Silicon Solar Cells (Trans Tech Publications, 1987)
SJ Fonash: Solar Cell Device Physics (Academic Press, 1982)
Handbook of photovoltaic science and engineering, ed. Antonio Luque and Steven Hegedus (John Wiley andSons, 2011)
Anna Mani, S Rangarajan: Handbook of Solar Radiation Data for India, (Allied Publishers, 1980)

Richard C Neville, RC Neville, Bas Van Der Hoek: Solar Energy Conversion: The Solar Cell (Elsevier Science& Technology, 1995) Peter Würfel : Physics of Solar Cells: From Basic Principles to Advanced Concepts (Wiley-VCH, 2009) JF Kreider and F Kreith: Solar Heating and Cooling: Active and Passive Design (Hemisphere PublishingCorporation, 1982) Low Temperature Engineering Application of Solar Energy, ed. RC Jordan (ASHRAE, 2004) HP Garg and J Prakash: Solar Energy: Fundamentals and Applications (Tata McGraw Hill, 1997)AB Meinel & MP Meinel: Applied Solar Energy: An Introduction (Addison)1976 JA Duffie and WA Beckman: Solar Engineering of Thermal Processes, Third Edition (John Wiley & Sons, 2013) S Sukhatme and J Nayak: Solar Energy: Principles of Thermal Collection and Storage, Third Edition (TataMcGraw Hill, 2008)
Additional information (if any)
Student responsibilities Attendance, feedback, discipline: as per university rules.

Course reviewers

1. Dr. Birinchi Bora, Deputy Director (Technical), National Institute of Solar Energy (NISE)
2. Dr. Kunj Bihari Rana, Faculty, Rajasthan Technical University, Kota

Course title: Wind, biomass, and other renewable energy technologies			
Course code: ENR XXX	**No. of credits:** 3	**L-T-P:** 45-0-0	**Learning hours:** 45
Pre-requisite course code and title (if any): NA			
Department: Department of Sustainable Engineering			
Course coordinator:		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** Semester 2	

Course description

This course is designed to make the students conversant mainly with various Biomass, and Wind technologies. Other RE technologies, such as geothermal energy, tidal energy, wave energy and ocean thermal energy conversion will also be covered. The main topics covered are: biomass conversion technologies (both thermo-chemical and bio-chemical methods of conversion) and liquid bio fuels. Basic principles of the technologies, experience gained on the ground, levels of commercialization, challenges of integrating with conventional energy/power system are covered.

Course objectives

- To impart knowledge and insights on implementation of wind projects with modern windturbines
- To develop understanding the various routes to generate energy from biomass and other renewableresources
- Applications of biofuels
- To identify challenges and strength of various energy convention technologies

Course contents

Module	Topic	L	T	P
1.	**Wind technologies** Different types of wind turbines, Trends in development of wind turbines, Modern wind turbine, working principles, trends in evolution and worldwide development Offshore wind turbines, onshore vs offshore wind turbines, floating wind turbines Wind turbine manufacturing Transport, logistics, assembly and installation of wind turbines connection of power produced to grid transport	16	0	0
2.	**Biomass Technology:** **Thermo-chemical conversion:** Thermo-chemical conversion of biomass, biomass processing, briquetting, pelletisation, biomass combustion, biomass stoves, biomass carbonization, pyrolysis of biomass, biomass gasification, gasifiers: [updraft (forced draft & Natural draft), downdraft (Open core, throat type & modular)], Gasifier stoves, gasifier thermal applications, gasifier for engine applications: dual fuel and 100% gas mode operation, power generation systems: (decentralized, grid interactive).	8	0	0

	Bio-chemical conversion: Aerobic and anaerobic processes, activated sludge process, plug flow reactors, anaerobic fixed film reactor, UASB reactor, anaerobic fluidized bed reactor, estimation of methane yield, anaerobic digestion system for MSW, Vermi-composting, different designs of biogas plants for animal waste, Biogas for engine applications. **Liquid Bio Fuels:** Liquid biofuels, non-edible oilseeds, oil extraction, preprocessing, transesterification, biodiesel, characterization of liquid fuels, production of syngas from biomass, production of methanol from syngas, production of ethanol from ligno-cellulosic biomass, Liquid bio-fuel applications	8 6		
3.	**Other Renewable Energy Technologies** Geothermal technology, wave energy, tidal energy, ocean thermal energy, Considerations for power and heat generation, Status of commercialization Examples of operational projects and challenges Challenges of integrating renewable energy with conventional energy/power system	7	0	0
		45	**0**	**0**

Evaluation criteria

- Assignments: 20% (after Module 1 and 3 and 5)
- Minor Test 1: 15% (after Module 1)
- Minor Test 2: 15% (after Module 2)
- Major Test: 50% (after all module)

Learning outcomes

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

- Calculate Wind, Bio and Other Renewable Energy potentials (Minor Test 1 and 2)
- Identify the best solution (Minor Test 2, Major Test and assignments)
- Quantify the amount of Energy produced (Minor Test 2, Major Test)
- Translate theories into practice (Assignments)

Pedagogical approach

A combination of class-room interactions, tutorials, field visits, assignments and projects.

Materials Recommended readings text books

VVN Kishore, "**Renewable Energy Engineering and Technology – A Knowledge Compendium"**, ed.(TERI Press, *2008*).

Reference Books

Donald Klass, **"Biomass for Renewable Energy, Fuels, and Chemicals"**, (Entech International Inc.,USA)
Godfrey Boyle, **"Renewable Energy",** (Atlantic Publishing Company, 2008)

Thomas Read & Agua Das, **"Handbook of biomass downdraft gasifier engine systems"** (The BiomassEnergy Foundation Press, 1988) Klaus von Mitzlaff, **"Engines for Biogas – Theory, Modification, Economic Operation"** (DeutscheGesellschaft fur Entwicklungstechnologien GATE, 1988)
Additional information (if any): NA
Student responsibilities Attendance, feedback, discipline: as per university rules.

Course Reviewers

1. Prof. S. Maji, Department of Mechanical Engineering, SOET, IGNOU, New Delhi
2. Dr Oruganty Prasada Rao, Scientist, CSIR (Retired)

Course title: Renewable energy project management			
Course code: ENR 156	**No. of credits:** 3	**L-T-P**: 30-12-06	**Learning hours:** 48
Pre-requisite course code and title (if any):			
Department: Department of Sustainable Engineering			
Course coordinator: Dr. Sapan Thapar		**Course instructor(s):** Dr. Sapan Thapar	
Contact details: sapan.thapar@terisas.ac.in			
Course type: Programme Core		**Course offered in:** Semester 2	

Course description

The course is designed for the students to prepare them for the working in various renewable energy projects right from conceptualization to delivery of energy services/electricity. Students will discover the renewable energy project life cycle and learn how to build a successful project from pre-implementation to completion. It will introduce project management topics such as resources, costs, time constraints and project scoping, contract management.

Course objectives

- Understand and articulate the importance of Project Management in any renewable energy project
- Develop a manageable project schedule
- Use tools and techniques to manage a project during execution

Course content

Module	Topic	L	T	P
1	**Introduction – Project Planning & Management** Definition, needs & benefits Stages of a renewable energy project RE Project life cycle assessment	4	0	0
2	**Analysis** Market/ demand analysis Technical-commercial assessment Appraisal criteria for investment Cost benefit analysis	4	2	0
3	**Financing** Project financing, elements and parties of financing Sources & Type of fund - debt, equity Low-cost carbon funds including green bonds Fiscal & Financial instruments Financial Parameters / Ratios (IRR, NPV & LCOE) Project Models - Balance Sheet and SPV	6	6	0
4	**Contract Management** Analyzing Detailed Project Reports (DPRs) Contract development (tendering)	6	0	0

	Power Purchase Agreements (PPAs) Engineering, Procurement, Construction (EPC) contract Corporate PPA Analysis of RE Tenders			
5	**RE Projects - Business Models** Feed-in-Tariff / Auctions including e-Reverse auction Open Access/ REC + APPC Green Power Trading through exchanges Hybrid RE Projects, Bundling with thermal, RTC RE projects Rooftop Models – RESCO, CAPEX, VPP	4	4	0
6	**Risk Assessment & Management** Technical & Commercial Risk Assessment Risk Mitigation Tools, including insurance Sensitivity Analysis	2		
7	**Environmental and Social Impact Assessment** Policies and Regulations Case Studies & Best Practices	4	0	0
8	**Case Studies** Computing Financial Ratios for different business cases	0	0	6
		30	**12**	**6**

Evaluation criteria

Minor Test 1	20% (Module 1 to 3)
Minor Test 2	20% (Module 4 and 5)
Assignment / Tutorials	20%
Major Exam (all modules)	40%

Learning outcomes

After completing this course, students would be able to:

- Describe a renewable energy project life cycle, and can skillfully map each stage in the cycle
- Identify the resources needed for each stage, including tools and supplementary information
- Describe the time needed to successfully complete a renewable energy project, considering factors such astask dependencies and task lengths
- Demonstrate effective project execution and control techniques that result in successful project
- Evaluate different business models by determining the typical financial ratios

Pedagogical approach

The course will be delivered through classroom lectures. Relevant case studies shall be discussed in class sothat students are introduced to the latest stage of development in the subject.

Materials

Textbooks

Prasanna, C. (2008). *Projects, Planning, Analysis, Selection, Financing, Implementation and Review*. TataMcGraw-Hill Publishing Company Limited.
Finnerty, J. D. (2013). *Project financing: Asset-based financial engineering*. John Wiley & Sons.
Frigenti, E., & Comninos, D. (2002). *The Practice of Project Management: a guide to the business-focusedapproach*. Kogan Page Publishers.
Lewis, J. P. (2002). *Fundamentals of project management: developing core competencies to help outperformthe competition*. AMACOM Div American Mgmt Assn.
Scott, B. (2005). The Art of Project Management. *California USA. O'Relly Media Inc.*

Suggested readings

- CEA Reports – RE Generation
- DPRs - Utility scale and Rooftop projects
- ESIA Reports - Solar Parks India
- Global Landscape of Climate Finance 2021, CPI
- IREDA - Financing schemes and appraisal techniques for RE projects
- IRENA Report - Power Generation Costs, 2021
- MNRE Schemes & Tenders by Agencies such as SECI, NTPC, etc.
- Reports by Climate Policy Initiative & RECAI
- Reports/ Blogs by Bridge to India, GENSOL and JMK Advisory

Journals

Project Management Journal
International Journal of Project Management
Renewable Energy

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time.

Course reviewers

1. Mr Alok Jindal, General Manager, Tractebel Engineering Pvt. Ltd.
2. Mr Mudit Jain, Head- Research, Tata Cleantech Capital Ltd.

Course title: Energy lab – II			
Course code: ENR 157	**No. of credits:** 3	**L-T-P:** 11-0-68	**Learning hours:** 79
Pre-requisite course code and title (if any): NA			
Department: Department of Sustainable Engineering			
Course coordinator:	**Course instructor(s):**		
Contact details:			
Course type: Core	**Course offered in:** Semester 2		

Course description

In order to supplement various topics related to energy aspects in class-room lectures, some laboratory experiments are needed as a part of curriculum development of energy studies programme for better understanding of the subjects. The experiments based on science/engineering principles are so designed so as to provide students enough stimulation for further investigation.

Course objectives

The aim of Energy Laboratory II is to ground the analytical subject material in a practical problem, meaning that the skills and knowledge students learn throughout the programme will be applied in real renewable energy engineering work.

Module	Topic	L	T	P
1	**Solar radiation measurement** Measurement of total and diffuse solar radiation on a horizontal surface and comparison of computed values of total solar radiation on an inclined plane with experimental measured value, estimation of role of reflected component	1	0	4
2	**Box type solar cooker** Thermal testing of a box type solar cooker: Determination of first and second figure of merit To determine the top heat loss factor of a box type solar cooker	1	0	6
3	**Paraboloid concentrator solar cooker** Cooling test on paraboloid concentrator solar cooker to determine its F'U_L Heating test on paraboloid concentrator solar cooker to determine its F'η_0	1	0	6
4	**Solar thermal collector and storage** Determination of heat loss factor F'U_L of linear solar absorber Estimation of energy storage by phase change material	1	0	6
5	**Solar PV module characterization** Dark and illuminated I-V characterization and spectral response of solar cells. I-V and P-V characteristics of PV modules under simulator and field radiations & temperature condition, different shading conditions.	1	0	6
6	**Power flow calculation for a stand-alone PV**			

	Power flow calculation for a stand-alone PV system with DC load and a batteryPower flow calculation of stand- alone PV system with AC load and a battery Power flow calculation of stand-alone PV system with DC & AC load with andwithout battery	1	0	6
7	**Battery and Inverter performance analysis** Charging and discharging characteristics of a battery Performance analysis of inverter, impact of weather conditions onperformance.	1	0	6
8	**Biomass for energy (Combustion Lab)** Estimation of volatile matter and fixed carbon in biomassEstimation of calorific value of solid fuels Energy and environment performance testing of cook stove: Water Boiling Test (WBT) and Kitchen Performance Test (KTP)	2	0	16
9	**Wind energy convertor** Determination of cut-in speed of wind turbine Determination of Tip Speed Ratio (TSR) at different wind speedsDetermination of coefficient of performance of wind turbine Evaluation of power curves	1	0	6
10	**Performance evaluation of Solar PV Wind Hybrid System with DC/ACmicro-grid** Study of system performance (a) with change in wind speed/pitch angle, and (b) with change in irradiance Study of integration of DC micro-grid to the main AC grid using 3-phaseinverter Power flow control in DC micro-grid for various loading	1	0	6
	Total	**11**	**0**	**68**

Evaluation criteria

- Performance during experiments - 30%
- Viva-voce (at the end of the semester) - 30%
- Practical Exam (at the end of the semester) - 20%
- Practical Records (spread over the entire semester) - 20%

Learning outcomes

After completing this course, students would be able to:

- Measure solar radiations and test the performance of different solar thermal applications
- Characterize solar cells and analyse different parameters such as power flow, efficiency of differentcomponents such PV module, battery, inverter and PV system
- Characterize the properties of solid biofuels along with performance testing of cook stove
- Analyse the performance of wind energy converter and hybrid systems with DC and AC micro-grids.

Pedagogical approach Students complete a procedure given in the laboratory manual to determine the behaviour of the equipments/prototypes/experimental set ups and produce the expected characteristics.
Materials Garg, H. P., and Kandpal, T. C. (1999). *Laboratory manual on solar thermal experiments.* Narosa PublishingHouse, New Delhi. (self-study) Doebelin, E.O. 2004. *Measurement Systems Application and Design*, 5th ed. McGraw-Hill, New York. (self-study) D.P.Kothari and D.K.Sharma (2000), *Energy Engineering: Theory and Practice*. S. Chand Publisher, NewDelhi. (self-study) http://cleancookstoves.org/technology-and-fuels/testing/protocols.html
Additional information (if any): NA
Student responsibilities Attendance, feedback, discipline: as per university rules.

Course Reviewers

Professor S. K. Samdarshi, Centre for Energy Engineering, Central University of Jharkhand, Ranchi
Dr. S. K. Tyagi, Centre for Energy Studies, India

Enclosure 3

Course title: Major Project			
Course code: BBP 108	**No. of credits: 16**	**L-T-P:** 0-0-512	**Learning hours:** 512
Pre-requisite course code and title (if any):			
Department: Department of Biotechnology			
Course coordinator(s):		**Course instructor(s):**	
Contact details:			
Course type: Core		**Course offered in:** Semester 4	

Course description:

The major project is a core credit course, for the students of the M.Sc. Biotechnology during the 4th semester. This is to widen the students' research perspective by providing them exposure to scientific research ideas in a real-life situation. At the end of the major project, the student is expected to submit a dissertation and make a presentation in front of a committee for evaluation.

The suggested learning hours is minimum expected time to be spent by the student for self-learning, interaction with experts training at the organization, dissertation writing etc. over a duration of 16 weeks.

Course objectives:

1. To provide the students an opportunity to work on basic and applied live research and development and policy related projects
2. To allow students to apply appropriate technical skill sets learnt during prior course work
3. To promote creativity and innovativeness for solving real-life problems
4. Create capacities to address research questions using multi-disciplinary approach.

Course content

Module	**Topic**	**L**	**T**	**P**
1.	The student carries out the major project dissertation/thesis either in an organization/institution/industry or internally within TERI SAS. The student works on a research idea of his/her interest relevant to the Program.	0	0	512

Evaluation criteria:

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

a. Timeline adherence (10 marks) (consisting of: joining report (1), progress reports (4) and submission of dissertation (1).
b. All the reports including joining, progress, feedback etc. should be uploaded on the student portal account.
c. External supervisor's feedback from the Host Organization/Supervisor (20 marks)
d. Dissertation (40 marks)
e. Presentation and viva (30 marks)
(The presentation will be evaluated based on the content, delivery (structure and flow), research component and timing of the presentation)
f. The students scoring less than or equal to 50% (or ≤ 50%) overall marks in the evaluation would be considered fail.
g. If the student fails to appear for the Major Project presentation on the presentation date assigned by the TERI SAS then the candidate will be assigned zero marks for the presentation and will be graded accordingly.
h. If plagiarism is detected through the use of Turnitin software, it will be referred to the MPEC, which would take a decision and penalty to be imposed/ disciplinary action to be taken. **The MPEC may refer to the following guidelines:**

Percentage of similarity	**% marks deducted from Dissertation**
> 20	Thesis rejected; the student is asked to resubmit
> 10≤20	10
≤ 10	No deduction, thesis accepted

i. Grading of the Major Project would be done as per the following criteria:

>90	A+
>85≤90	A
>80≤85	B+
>70≤80	B
>60≤70	C+
>55≤60	C
>50≤55	D
≤50	F

Late submission

(a) Joining report: No monthly progress report will be accepted until the completely filled joining report has been submitted.
(b) Monthly progress report: The reports have to be submitted as per the dates mentioned on portal.
(c) Submission of draft dissertation for evaluation: The softcopy for evaluation has to be submitted on or before the due date informed through portal or through email. Dissertations that are submitted after the due date won't be considered for evaluation and "0" marks would be awarded for the same. Further, the regulations of the TERI School of Advanced Studies apply as laid down in the student handbook (available at the TERI School of Advanced Studies web page (https://www.terisas.ac.in/pdf/student-handbook.pdf)
(d) Final Dissertation: The major project is completed after the Final Dissertation is submitted. Incomplete projects will lead to non-release of the final degree.

Learning outcomes:

1. Students will be able to-

- define a research problem
- design appropriate experiments
- undertake data collection and analysis
- draw logical inferences -report outcomes in a systematic manner
- innovate solutions to societal problems

2. Students will be able to work independently as well as part of a team

3. Students will be able to make effective presentations before a diverse audience

4. Students will acquire transferable problem-solving skills using multi-disciplinary approaches

Pedagogical Approach: Regular discussions and mentoring with internal supervisors.

Course Reading Materials:

Peer reviewed scientific journals and books relevant to the topic of research idea

Additional Information:

Operational aspects of Major Project are governed and guided by "Generic guideline Major Project TERI SAS" and also provided to students.

Employability:

1. Research and Development (academic and industrial sectors)

2. Bio-business companies, breweries, seed industries, pharmaceutical companies, dairies, food processing.

3. Agro-Industries

4. Forensics

5. Diagnostic centres

6. Regulatory and funding agencies, law firms and knowledge processing offices (KPOs) for Intellectual Property (IP) management. 7. Teaching and training (Academic Institutions, Industries, KPOs and NGOs).
Student responsibilities: Following the issued instructions and guidelines of the minor project in entirety. Regular updating the progress of work to the mentor/supervisor. Timely submission of all required documents through portal.

Course Reviewers:

The course was reviewed by BoS members