

SHIV NADAR UNIVERSITY CHENNAI

(State Private University established under the Shiv Nadar University Act, 2018)
RAJIV GANDHI SALAI (OMR), KALAVAKKAM - 603 110 TAMIL NADU INDIA

SCHOOL OF SCIENCE AND HUMANITIES DEPARTMENT OF ECONOMICS

B Sc Economics (Data Science) Degree Program

Table 1: Course Structure (Number of Credits)

Semester	CC [E & DS]	AECC	SEC	EAA	Electives [E & DS]	Major Project/ Dissertation	Total Credits
I	16	4	1	1	-		22
II	16	3	3	1	-		23
III	16	-	5	-	4		25
IV	12	-	2		8		22
V	12		4		8		24
VI	-		-		12	6	18
Total Credits	72	7	15	2	32	6	134

NOTE:CC includes both Economics and Data Science

AECC: Ability Enhancement Compulsory Course

CC: Core Course

DS: Data Science

SEC: Skill Enhancement Course

DSC: Discipline Specific Course

E: Economics

EAA: Extra Academic Activity

Table 2: Number of Courses and Credit Distribution

Semester	CC [E & DS]	AECC	SEC	EAA	Electives [E & DS]	Major Project	No. of Courses (Total Credits)
I	4	1	1	1	-	-	7 (22)
II	4	1	2	1	-	-	8 (23)
III	4	-	2	-	1	-	7 (25)
IV	3	-	1	-	2	-	6 (22)
V	3	-	2	-	2	-	7 (24)
VI	-	-	-	-	3	1	4 (18)
No. of Courses (Total Credits)	18 (72)	2 (7)	8 (15)	2 (2)	8 (32)	1 (6)	39 (134)

Table 3: Course Structure for B.Sc. in Economics (Data Science)

Year	Sem	CORE COURSE	AECC	SEC	Discipline Specific Elective (DSE)
1	I	Microeconomics I (3-1-0-4)	Communication Skills in English (3-1-0-4)	MS Excel: Basics (0-0-2-1)	
		Macroeconomics I (3-1-0-4)			
		Mathematics- 1 (3-1-0-4)			
		Statistics I (3-1-0-4)			
	II	Microeconomics II (3-1-0-4)	Environmental Studies (3-0-0-3)	Programming in Python (0-0-4-2)	
		Macroeconomics II (3-1-0-4)		MS Excel: Advanced (0-0-2-1)	
		Mathematics- II (3-1-0-4)			
		Statistics II (3-1-0-4)			
2	III	Money and Banking (3-1-0-4)		SQL Programming (1-0-2-2)	DSE1 (3-1-0-4)
		Basics Econometrics (3-1-0-4)		Econometrics Lab- (0-2-2-3)	
		Introduction to Data Science (3-1-0-4)			
		Public Economics and Policy (4-0-0-4)			
	IV	Indian Economy (4-0-0-4)		Academic Writing (0-2-0-2)	DSE 1 (3-1-0-4)
		Introduction to Artificial Intelligence (4-0-0-4)			DSE 2 (3-1-0-4)
		Data: Sources, Issue and Socio-Economic Analysis (2-2-0-4)			
	3	V	Development Economics (4-0-0-4)		Internship/Mini Project (0-0-4-2)#
Basics of Finance (3-1-0-4)					
International Economics (3-1-0-4)				R Programming (0-0-4-2)	DSE 2 (3-1-0-4)
VI					DSE 2 (3-1-0-4)
					TS1 or TS2 (3-1-0-4)*
					TS1 or TS2 (3-1-0-4)*
					Project (0-0-12-6)
Number of Credits		72	7	15	38
Total Credits =132+2@= 134					

Note: @ 1 Credit courses on Extra Academic Activities (NSS/ NSO/YRS) in Semester 1 and Semester 2 are mandatory as per SNU rules and regulations.

Evaluation of Internship/Mini project is incorporated in grade sheet for Semester V. DSE1 is Electives in Economics and DSE2 is electives in Data Science.

*TS1 and TS2 are Track Specializations in Development Economics and Finance, respectively.

Courses in Semester I

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Microeconomics I	CC	3	1	0	4
2		Macroeconomics I	CC	3	1	0	4
3		Mathematics - I	CC	3	1	0	4
4		Statistics I	CC	3	1	0	4
5		Communication Skills in English	AECC	3	1	0	4
6		MS Excel: Basics	SEC	0	0	2	1
7		YRC/NSS/NSO	EAA	-	-	-	1
	Total			15	6	2	22

Courses in Semester II

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Microeconomics II	CC	3	1	0	4
2		Macroeconomics II	CC	3	1	0	4
3		Mathematics - II	CC	3	1	0	4
4		Statistics II	CC	3	1	0	4
5		Programming in Python	SEC	0	0	4	2
6		MS Excel: Advanced	SEC	0	0	2	1
7		Environmental Studies	AECC	3	0	0	3
8		YRC/NSS/NSO	EAA	-	-	-	1
	Total			15	4	6	23

Courses in Semester III

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
		Money and Banking	CC	3	1	0	4
		Basics Econometrics	CC	3	1	0	4
		Introduction to Data Science	CC	3	1	0	4
		Public Economics and Policy	CC	4	0	0	4
		Discipline Specific Elective	DSE1	3	1	0	4
		SQL Programming	SEC	1	0	2	2
			SEC	1	0	4	3
	Total			18	4	6	25

Note: Annexure Table 1 A provides the list of DSE1. DSE1 are Economics Electives.

Courses in Semester IV

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Development Economics	CC	4	0	0	4
2		Introduction to Artificial Intelligence	CC	4	0	0	4
3		Data: Sources, Issue and Socio-Economic Analysis	CC	2	2	0	4
4		Discipline Specific Elective	DSE 1	3	1	0	4
5		Discipline Specific Elective	DSE 2	3	1	0	4
6		Academic Writing	SEC	0	2	0	2
Total				16	6	0	22

Note: Annexure Table 1 A provides the list of DSE1 and DSE2. DSE 2 are Data Science Electives.

Courses in Semester V

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Indian Economy	CC	4	0	0	4
2		Basics of Finance	CC	3	1	0	4
3		International Economics	CC	3	1	0	4
4		Discipline Specific Elective	DSE 1	3	1	0	4
5		Discipline Specific Elective	DSE 2	3	1	0	4
6		Summer Internship/Mini Project	SEC	0	0	4	2
7		R Programming	SEC	0	0	4	2
Total				16	4	8	24

Note: Annexure Table 1 A provides the list of DSE1 and DSE2.

Courses in Semester VI

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Track Specific Elective	TS1/TS2	3	1	0	4
2		Track Specific Elective	TS1/TS2	3	1	0	4
3		Discipline Specific Elective	DSE 2	3	1	0	4
4		Project	Project	0	0	12	6
Total Credits				9	3	12	18

Note: Discipline Specific Electives (DSE) include both Economics and Data Science Electives given in Annexure Table 1A.

Annexure Table 2A gives the list of courses for Track Specializations (TS), Development Studies (TS1) and Finance (TS2). Students have to choose either TS1 or TS2.

Following is the list of electives from which the student will have to choose one elective in each of the semesters, viz., Sem 3, 4 and 5. A student will have to take **3 Electives from DSE1 and 3 electives from DSE2**. The syllabus of these courses is given at the end of this document. Offering of these electives will depend on the availability of faculty and the number of students opting for a course.

Annexure Table 1A: Discipline Specific Electives in Economics (DSE1) and in Data Science (DSE2)

Economics Electives (DSE1)	Data Science Electives (DSE 2)
1. Advanced Econometrics	1. Big Data Analytics
2. Agricultural Economics	2. Data Mining
3. Game Theory	3. Data Processing
4. Behavioural Economics	4. Data Science for Business
5. Industrial Economics	5. Machine Learning Techniques
6. Operations Research	6. Social Media Mining

Annexure Table 2A: Two Electives to be chosen from Any One-Track Specialization

Track Specialization 1 (TS1)	Track Specialization 2 (TS2)
Development Studies	Finance
1. Environmental Economics	1. Financial Markets
2. Gender Economics	2. Financial Economics
3. Health Economics	3. Auditing
4. Urban Economics	4. Investment Management
5. Global Political Economy	5. Agricultural Finance
6. Law and Economics	6. Financial Econometrics
7. Labour Economics	7. Derivatives and Risk Management
8. Demography and Social Statistics	8. Applied Financial Modelling

Extensions and Choices:

B.Sc. Economics (Data Science) Honours PROGRAM

Students, who have maintained a CGPA of 8.0 and above and have completed all curricular requirements up to Semester 3, may register for the B.Sc. Economics (Data Science) Honours program at the commencement of Semester 4. The total credits of the B.Sc, Economics (Data Science) Honours Program would be 150 over 6 semesters.

The **B.Sc. Economics (Data Science) Honours program** requires 2 additional Core courses of 4 credits each, in 4th and 5th Semester (total of 8 credits). In addition to this, one Research Paper/Project/Dissertation of 8 credits will have to be completed in the 6th Semester.

The two courses that are mandatory for the **B.Sc. Economics (Data Science) Honours program** are: International Trade [3-1-0-4 (L-T-P-C)] in the 4th Semester and History of Economic Thought [3-1-0-4 (L-T-P-C)] in the 5th Semester.

B.Sc. Economics (Data Science) Honours students need to maintain a CGPA of 8.0 and above throughout the program.

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Semester I

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Microeconomics I	CC	3	1	0	4
2		Macroeconomics I	CC	3	1	0	4
3		Mathematics - I	CC	3	1	0	4
4		Statistics I	CC	3	1	0	4
4		Communication Skills in English	AECC	3	1	0	4
5		MS Excel: Basics	SEC	0	0	2	1
6		YRC/NSS/NSO	EAA	-	-	-	1
		Total		15	6	2	22

CC is Discipline Specific Core, which includes both Economics and Data Science

Semester I

Microeconomics I

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Contents of Syllabus

Unit I: Microeconomics: Introduction

5 Hours

The Scope and method of economics; the economic problem: scarcity and choice; problems of economic organization; opportunity costs; economic systems; State vs Markets

Unit II: Consumer behaviour: Cardinal Approach

10 Hours

Utility analysis: Assumptions of Utility Analysis; Total Utility vs. Marginal Utility; The Law of Diminishing Marginal Utility; The Law of Equi-Marginal Utility. Demand and Law of Demand: factors Influencing Demand; an Individual's Demand Schedule and Curve; The Market Demand Curve and Schedule; Elasticity of demand: Price Elasticity of Demand; Cross Elasticity of Demand; Income Elasticity of Demand; Factors Affecting Price Elasticity of Demand; Importance of the Concept of Price Elasticity; Applications.

Unit III: Consumer's Behaviour: Ordinal Approach**15 Hours**

The Indifference Curve Theory: Assumptions of Indifference Curve Analysis; Properties of Indifference Curves; Marginal Rate of Substitution; Price-Income Line; Consumer's Equilibrium; Income Effect; Substitution Effect; Price Effect; The Separation of Substitution and Income Effect, To Derive Demand Curve from Price Consumption Curve; Compensated Demand Curve;

Unit IV: Theory of Producers' Behaviour**15 Hours**

Technology, Production Functions and Isoquants, short run and long run, production with one and two variable inputs, total average and marginal products, law of diminishing return, marginal rate of technical substitution, elasticity of substitution, economics of scale. Types of production functions- Cobb-Douglas, fixed-coefficient and CES functions

Cost: Types of cost, Determinants of Short run cost, Cost Curves, cost minimization and expansion path, Short run versus long run cost curves, economies of scope. concepts of total revenue, average revenue and marginal revenue - relationship between AR, MR, TR and price elasticity of demand- behavioural principles - Revenue: Total Revenue, Average revenue, Marginal Revenue - Relation between Average Revenue, Marginal Revenue and Price Elasticity of Demand, Profit maximization.

Unit IV: Market Structure**15 Hours**

Market Structure: Types of markets – classification of market – types of market structures – distinguishing features -Price Output Determination under Different Market Forms: Perfect Competition, Monopolistic, Monopoly and Oligopoly -Imperfect competition – features and price determination – equilibrium of the industry - equilibrium of the firm - Short-Run Profit Maximization by a Competitive Firm - Short run supply curve of the firm in a competitive market – super normal profits – normal profits - Long Run Equilibrium of a Competitive Firm – Monopoly: meaning – features - causes - Monopolist's Revenue Curves - Equilibrium of the a Monopoly Firm - Short run Equilibrium - Price Discrimination – meaning, conditions and objectives – equilibrium under price discrimination – economic effects of monopoly -

Imperfect competition-monopolistic competition – features – price and output determination - Conditions for the Equilibrium of an individual firm – Oligopoly: meaning – types – characteristics – price and output decisions – price leadership – kinked demand curve – other important market forms

Total: 60 hours including Tutorials**REFERENCE BOOKS**

1. Varian, Hal R. Intermediate Microeconomics: A Modern Approach. Paperback. United Kingdom: W.W. Norton, 2019.
2. Gravelle, H and Rees, R. Microeconomics. 3rd Edition, Paperback. Pearson Education India, 1 January 2007.
3. Koutsoyiannis, A. Modern Microeconomics. 2nd Edition, Paperback. Palgrave Macmillan, 1 May 1979.
4. Pindyck, Robert S., Rubinfeld, Daniel L. Microeconomics. 8th Edition, Paperback. United Kingdom: Pearson Education, 25 May 2017.
5. Maddala, G. S and Ellen M. Miller. Microeconomics: Theory and Applications Hardcover. McGraw-Hill Inc., US , 1 December 1989.
6. Lipsey, Richard G and Chrystal, Alec. Economics. 14th Edition, Paperback. United Kingdom: Oxford University Press, 2020.

Macroeconomics-I

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Contents of Syllabus

Unit I: Introduction to Macroeconomics and National Income Accounting

Basic issues in macroeconomics; Macroeconomic goals and policy instruments, measurement of national income and the circular flow; approaches to measure national income, national income identities; real versus nominal GDP; price indices; national income accounting for an open economy; balance of payments: current and capital accounts, trends and business cycles

15 Hours

Unit II: Money and Inflation

Properties and functions of money; demand for money and supply of money, measures of money stock and high-powered money, money multiplier, Inflation: definition and measurement, Demand pull and cost-push inflation, inflation categories by intensities, expected vs unexpected inflation, hyperinflation, social costs of inflation; Anti-inflationary policy

15 Hours

Unit III: Classical Macroeconomics

Say's Law, The Classical full employment model, Wage-Price Flexibility and The Classical Labor Market, Effect of Change in Money Supply, Shift of Labour Supply Function, Shift of Production Function, the Classical Dichotomy, The Classical theory of Saving, Investment and the Interest rate, Critique of Classical economics

15 Hours

Unit V: Simple Keynesian Model (15 Hours)

Components of Aggregate Demand, Consumption function and Savings functions, Concepts of propensities to consume, save and import; Simple Keynesian model of income determination, AD-AS model: Goods, money and labor markets, Multipliers- Investment, government expenditure multiplier and the tax rate multiplier; the balanced budget multiplier; Tax multiplier, Investment Multiplier, Critique of Keynesian model

Unit IV: Keynesian Models versus Classical Models IS-LM model for a closed economy, Synthesis between classical models and Keynesian models, interpretation and policy analysis

15 Hours

Total: 60 hours including Tutorials

Textbooks

1. Gregory Mankiw, N. Macroeconomics. 11th International Edition, Paperback. Worth Publishers Inc., U.S., 10 November 2021.
2. Froyen, Richard T. Macroeconomics: Theories and Policies. 10th Edition Paperback. Pearson Education India, 1 January 2013.

Mathematics – I

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Contents of Syllabus

Unit I: Functions, limits, derivatives

Product Sets - Relations and Functions - Domain and Range of a Function - polynomial, exponential, logarithmic, limits of functions, continuity, derivatives of standard functions (polynomials, rational functions, trigonometric and inverse trigonometric functions), differentiation of inverse functions

12 Hours

Unit II: Higher Order Differentiation

Derivative of a Function of Function - Implicit Functions - Parametric Equation - Logarithmic Differentiation – Higher-Order Differentiation -Taylor series - L'Hopital's rule, limits involving infinity-applications in economics and finance

12 Hours

Unit III: Single Variable Optimization

Maxima and Minima of functions of one variable – First Derivative Test, Rolle's Theorem, Mean Value Theorem, concavity, Second Derivative Test, curve sketching-Applications in economics and finance

12 Hours

Unit IV: Partial Differentiation

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Taylor's expansion (up to 3rd derivative) - Maxima and Minima functions of two variables - Lagrangean method of undetermined multipliers - Applications to Economics.

12 Hours

Unit V: Ordinary Differential Equations

Ordinary Differential Equations: 1st order and separable, logistic growth, 1st order and linear-applications in economics and finance

12 Hours

Total: 60 hours including Tutorials

Textbooks:

1. Manicavachagam Pillay, T. K, Natarajan, T and Ganapathy. K. S. Algebra Volume I. 2019th Edition, Hardcover. Viswanathan, S., Printers & Publishers Pvt Ltd, 30 July 2009.
2. Grewal, B. S. Higher Engineering Mathematics. 44th Edition, Perfect Paperback. India: Khanna Publishers, 1 January 1965.

Suggested Readings

1. Anthony, Martin., Biggs, Norman. Mathematics for Economics and Finance: Methods and Modelling. United States: Cambridge University Press, 2024.
2. Sydsaeter, Knut and Hammond, P. Mathematics for Economic Analysis. India: Dorling Kindersley, Pearson Education, 2013.

3. Dowling, Edward T. Schaum's Outline of Mathematical Methods for Business and Economics. United States: McGraw Hill LLC, 2009.
4. Narayan, Shanti and Mittal, P. K. Differential Calculus. India: S. Chand Limited, 2005.
5. Mittal, P. K and Narayan, Shanti. Integral Calculus. India: S. Chand Limited, 2005.
6. Soni, R. S. Business Mathematics with Applications in Business and Economics. India: Pitambar Publishing, 1996.
7. Chiang, A. C and Wainwright, Kevin. Fundamental Methods of Mathematical Economics. 4th Edition, Paperback. McGraw Hill Education, 1 July 2017.

Total: 60 hours including Tutorials

Statistics I

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Contents of Syllabus

Unit I: Organization and Presentation of Data 12 Hours

Statistical Representation of Data, Diagrammatic Representation of Data, Frequency Distribution, Graphical Representation of Frequency Distribution - Histogram, Frequency Polygon, Ogive, Pie-chart- Implementation in Excel

Unit II: Measures of Central Tendency and Dispersion 12 Hours

Measures of Central Tendency and Dispersion: Mean, Median, Mode, Mean Deviation, Quartiles and Quartile Deviation, Standard Deviation, Coefficient of Variation, Coefficient of Quartile Deviation- Implementation in Excel

Unit III: Correlation Analysis 12 Hours

Introduction - Bivariate Data - Correlation Analysis - Measures of Correlation - Karl Pearson's Coefficient of Correlation - Rank Correlation

Unit IV: Regression Analysis 12 Hours

Regression Analysis - Linear Regression - Relation between Correlation and Regression- method of least squares - Implementation in Excel

Unit IV: Probability 12 Hours

Probability, Axiom, Laws of Probability - Conditional Probabilities, Independent and Dependent Events - Mutually Exclusive Events - Total Probability - Bayes Theorem

Total: 60 hours including Tutorials

SUGGESTED READINGS:

1. Sweeney, Dennis J., Williams, Thomas Arthur., Anderson, David R. Statistics for Business and Economics. United Kingdom: Cengage Learning, 2020.

2. Levin, Richard I., David S. Rubin., Sanjay Rastogi and Masood Husain Siddiqui. Statistics for Management. Eighth edition. India: Pearson Education, 27 January 2017.
3. Spiegel, Murray R., Stephens, Larry J and Narinder Kumar. Statistics (Schaum's Outline Series) Paperback. McGraw-Hill Education, 1 July 2017.
4. Gupta, S.C. Fundamentals of Statistics. Seventh Edition, Paperback. Himalaya Publishing House, 1 May 2018.
5. Gupta, S.C and Kapoor, V.K. Fundamentals of Mathematical Statistics. India: Sultan Chand & Sons, 2020.

COMMUNICATION SKILLS IN ENGLISH

Course Category	L	T	P	C
AECC	3	1	0	4

Detailed Contents of Syllabus

Unit 1: 12 Hours

Reading: Short comprehension passages; Practice in skimming, scanning, and predicting
 Writing: Understanding text structure (Use of reference words and discourse markers, coherence markers, reordering jumbled sentences)
 Speaking: Introducing oneself; Exchanging personal information
 Listening: Comprehending formal and informal conversations
 Language Development: Asking and answering - Wh- and Yes/No questions; Prepositions; Conjunctions; Pronouns; Clauses
 Vocabulary Development: Prefixes and Suffixes

Unit 2: 12 Hours

Reading: Short narratives and descriptions from newspapers
 Writing: Instructions, recommendations; Paragraph writing (including compare and contrast)
 Listening: Telephonic conversations; short presentations and news
 Speaking: About oneself and others; Routine actions
 Language development: Tenses; Modal verbs
 Vocabulary development: Guessing meanings of words/expressions from the context

Unit 3: 12 Hours

Reading: Short texts and longer passages (Intensive reading)
 Writing: Letters (informal and formal); E-mails (personal and professional)
 Listening: Short dialogues and longer conversations
 Speaking: Expressing opinions; Making short presentations
 Language development: Degrees of comparison; subject-verb agreement
 Vocabulary development: Idioms and phrases; Single word substitutes; Adverbs

Unit 4: 12 Hours

Reading: Longer texts of different types (journalistic, literary); note-taking, note-making
 Writing: Essays (including analytical and issue-based)
 Listening: TED talks
 Speaking: Role-plays
 Language development: Passive voice
 Vocabulary development: Synonyms and Antonyms; Phrasal verbs

Unit 5:**12 Hours**

Reading: Longer academic texts

Writing: Interpreting charts and graphs; Reports

Listening: Listening to technical talks and academic lectures Speaking: Interviews and short group discussions Language development: Reported speech

Vocabulary development: Collocations

Total: 60 hours including Tutorials**REFERENCE BOOKS**

1. Richards, C. Jack. Interchange Level 2 Student's Book with Online Self-Study. 5th edition, Paperback. New Delhi: Cambridge University Press, 6 July 2017.
2. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Paperback. United Kingdom: Routledge Falmer, 2003.
3. Means, L. Thomas, and Elaine Langlois. English & Communication for Colleges. 4th edition, Paperback. South-Western Pub, October 2, 2006.
4. Redston, Chris & Gillies Cunningham. Face2Face (Pre-intermediate Student 's Book with Online Workbook). 2nd Edition, Paperback – Student Edition. New Delhi: Cambridge University Press, 25 June 2020.
5. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Paperback. Cambridge University Press, 9 June 1994.
6. Board of Editors. Using English: A Course Book for Undergraduate Engineers and Technologists. Orient Black Swan Limited, Hyderabad, 2015.
7. Dutt P, Kiranmai and Rajeevan Geeta. Basic Communication Skills. Foundation Books, 2007.

MS Excel: Basics

Course Category	L	T	P	C
SEC	0	0	2	1

Detailed Contents of Syllabus**Unit 1: Introduction to Excel**

Basic Excel functions: Structure of an excel function, functions such as SUM (), MIN (), MAX (), AVERAGE (), COUNT (), AUTOSUM, AUTOFILL. **Working with an Excel List:** Understanding Excel List Structure, Sorting a List Using Single Level Sort, Sorting a List Using Multi-Level Sorts, Using Custom Sorts in an Excel List, Filter an Excel List Using the AutoFilter, Creating Subtotals in a List, Format a List as a Table, Using Conditional Formatting to Find Duplicates, Removing Duplicates. **Excel Data Validation:** Understanding the Need for Data Validation, Creating a Validation List, Adding a Custom Validation Error, Dynamic Formulas by Using Validation Techniques

12 Hours**Unit 2: Conditional Functions and Working with Large Excel Data Sets**

Conditional Functions: Working with Excel Name Ranges, Using Excel's IF () Function, Nesting Functions, Using Excel's COUNTIF () Function, Using Excel's SUMIF () Function, Using Excel's IFERROR () Function.

Working with Large Sets of Excel Data: Using the Freeze Panes Tool, Grouping Data (Columns and/or Rows), Consolidating Data from Multiple Worksheets.

12 Hours

Unit 3: Look Up and Text Based Function

Excel's Lookup Functions: Using Excel's VLOOKUP() Function, Using Excel's HLOOKUP() Function, Using Excel's INDEX() and MATCH() Functions.

6 Hours

Total: 30 hours including Tutorials

Reference Books

1. Alexander, Michael., Kusleika, Richard., Walkenbach, John. Excel 2019 Bible. United States: Wiley, 2018.
2. Walkenbach, John. Excel 2007 Charts. Germany: Wiley, 2011.
3. Lalwani, Lokesh. Excel 2019 All-in-One: Master the New Features of Excel 2019 / Office 365. Paperback. India: BPB Publications, 2019.

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Semester II

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Microeconomics II	CC	3	1	0	4
2		Macroeconomics II	CC	3	1	0	4
3		Mathematics- II	CC	3	1	0	4
4		Statistics II	CC	3	1	0	4
5		Programming in Python	SEC	0	0	4	2
6		MS Excel: Advanced	SEC	0	0	2	1
7		Environmental Studies	AECC	3	0	0	3
8		YRC/NSS/NSO	EAA	-	-	-	1
		Total		15	4	6	22

Microeconomics-II

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus

Unit 1: Monopolistic Competition and Modern Theories of Firm

15 Hours

Product Differentiation and the Demand Curve-The Concepts of the 'Industry' and the 'Group' Equilibrium of The Firm -Comparison with Pure Competition, Average-Cost Pricing, Limit-Pricing, Monopol's Sales Revenue Maximisation

Unit 2: General Equilibrium and Welfare Economics

20 Hours

General Equilibrium and Economic Efficiency- Exchange, production and welfare, Pareto Optimality, Edgeworth box and contract curve, Pareto efficiency and perfect competition, Reasons for Market failure, Pareto efficiency, contract curve; efficiency and welfare economics: fundamental theorems of welfare economics.

Unit 3: Choice under Uncertainty**15 Hours**

Choice under Uncertainty and Intertemporal Choice -Choice under uncertainty – utility function and expected utility, risk aversion and risk preference; intertemporal choice: savings and borrowing, asymmetric information and moral hazard: principal agent problem, theory of lemon, credit market,

Unit 4: Input Markets**10 Hours**

Labour and land markets: Basic concepts (derived demand, productivity of an input, marginal productivity of labour, marginal revenue product); demand for labour; input demand curves; shifts in input demand curves; competitive labour markets; labour markets and public policy

Total: 60 hours including Tutorials**Textbooks**

1. Varian, Hal R. Intermediate Microeconomics: A Modern Approach. Paperback. United Kingdom: W.W. Norton, 2019.
2. Snyder, C and Nicholson, W. Fundamentals of Microeconomics. Indian edition, Paperback. India: Cengage Learning, 1 January 2011.
3. Osborne, Martin J. An Introduction to Game Theory. Indian Edition, 1st Edition, Paperback. India: Oxford University Press, 2 July 2012.

Macroeconomics II

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus**Unit 1: Aggregate Demand (AD) and Aggregate Supply (AS) Curves**

Interaction of aggregate demand and supply, 'Full employment' and 'Underemployment' equilibrium in the AD-AS model and adjustment process.

10 Hours

Unit 2. Inflation, Unemployment and Expectations: Phillips curve; Expectation Augmented Phillips curve, short-run trade-off and long-run relation between inflation and unemployment, adaptive and rational expectations; policy ineffectiveness debate.

10 Hours**Unit 3. Microeconomic Foundations of macroeconomics: Consumption Functions-**

Keynesian consumption function, life-cycle and permanent income hypotheses; rational expectations and random-walk of consumption expenditure; Fisher's theory of optimal intertemporal choice, Determinants of investment. Savings Paradox

10 Hours**Unit 4. Open Economy Macroeconomic Models**

Short-run open economy models; Mundell-Fleming model; Efficacy of monetary and fiscal policies with fixed and flexible exchange rates/capital im(mobility)

10 Hours

Unit 5. Economic Growth and Fluctuations: Harrod-Domar model; Solow model; golden rule; technological progress and elements of endogenous growth, Real Business Cycles

10 Hours

Unit 6: Money Supply and Monetary Frameworks: Monetary policy rules-Monetary targeting, inflation targeting and interest rate targeting, Public Debt and Deficit: Traditional View of Government Debt

10 Hours

Total: 60 hours including Tutorials

READINGS:

1. Dornbusch, Rudiger., Fischer, Stanley and Startz, Richard. Macroeconomics. 12th Edition, Paperback. India: McGraw Hill Education, 27 August 2018.
2. Gregory Mankiw, N. Macroeconomics. 11th International Edition, Paperback. Worth Publishers Inc., U.S., 10 November 2021.
3. Froyen, Richard T. Macroeconomics: Theories and Policies. 10th Edition Paperback. Pearson Education India, 1 January 2013.
4. Sikdar, Soumyen. Principles of Macroeconomics. 3rd Edition, Paperback. India: Oxford University Press, 14 October 2020.

Mathematics II

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Contents of Syllabus

Unit I: Indefinite Integrals

12 Hours

Basic Formulas – Integration by Substitution (change of variable), Integration by Parts
Bernoulli formula, Method of partial fractions

Unit II: Definite Integrals

12 Hours

Definite integrals, properties, Application-Area under the curve-Applications in economics

Unit III: Matrices

12 Hours

Algebra of matrices-determinants-inverse of a matrix – solution of system of linear equations-
Cramer's rule- method of cross multiplication-applications to business and economics

Unit IV: Input-Output Analysis

12 Hours

Leontief's input-output model-closed model- open model- applications in business and economics-
determination of output-equilibrium prices-primary input requirement-consumer demand-value added

Unit V: Eigen values

12 Hours

Matrices-Eigenvalues and Eigenvectors - Characteristic Equation - Properties of Eigenvalues and Eigenvectors

Total: 60 hours including Tutorials

TEXTBOOKS:

1. Grewal, B. S. Higher Engineering Mathematics. 44th Edition, Perfect Paperback. India: Khanna Publishers, 1 January 1965.
2. Sharma, S. K. and Kaur, Gurmeet. Business Mathematics, 2019th Edition, Paperback. India: Sultan Chand & Sons Private Limited, 12 February 2019.

SUGGESTED READINGS:

1. Anthony, Martin., Biggs, Norman. Mathematics for Economics and Finance: Methods and Modelling. United States: Cambridge University Press, 2024.
2. Simon, Carl P and Blume, Lawrence E. Mathematics for Economists. Hardcover. W. W. Norton & Company, April 17, 1994.
3. Sydsaeter, Knut and Hammond, P. Mathematics for Economic Analysis. India: Dorling Kindersley, Pearson Education, 2013.
4. Dowling, Edward T. Schaum's Outline of Mathematical Methods for Business and Economics. United States: McGraw Hill LLC, 2009.
5. Narayan, Shanti and Mittal, P. K. Differential Calculus. India: S. Chand Limited, 2005.
6. Mittal, P. K and Narayan, Shanti. Integral Calculus. India: S. Chand Limited, 2005.
7. Soni, R. S. Business Mathematics with Applications in Business and Economics. India: Pitambar Publishing, 1996.
8. Chiang, A. C and Wainwright, Kevin. Fundamental Methods of Mathematical Economics. 4th Edition, Paperback. McGraw Hill Education, 1 July 2017.

Statistics II

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Contents of Syllabus

Unit I: Random Variables

12 Hours

Random Variables: Discrete and Continuous Random Variables, Probability Mass and Density Functions - Cumulative Distributive Functions- Mean, Variance, Moments-skewness and kurtosis

Unit II: Theoretical Distributions

12 Hours

Binomial - Poisson – Geometric- Uniform-normal distributions

Unit III: Testing of Hypothesis of Large Samples

12 Hours

Sampling distributions – Estimation of parameters – interval estimation -Statistical hypothesis – Large sample tests based on Normal distribution for proportion, mean

Unit IV: Testing of Hypothesis of Small Samples**12 Hours**

Tests based on t distribution, confidence interval -Chi-square and F distributions for mean, variance– Contingency table (test for independent) – Goodness of fit- Implementation in Excel

UNIT V: Design of Experiments**12 Hours**

One way and Two-way classifications – Completely randomized design – Randomized block design – Latin square design

TOTAL: 60 hours including tutorials**SUGGESTED READINGS:**

1. Sweeney, Dennis J., Williams, Thomas Arthur., Anderson, David R. Statistics for Business and Economics. United Kingdom: Cengage Learning, 2020.
2. Levin, Richard I., David S. Rubin., Sanjay Rastogi and Masood Husain Siddiqui. Statistics for Management. Eighth edition. India: Pearson Education, 27 January 2017.
3. Spiegel, Murray R., Stephens, Larry J and Narinder Kumar. Statistics (Schaum's Outline Series) Paperback. McGraw-Hill Education, 1 July 2017.
4. Gupta, S.C. Fundamentals of Statistics. Seventh Edition, Paperback. Himalaya Publishing House, 1 May 2018.
5. Gupta, S.C and Kapoor, V.K. Fundamentals of Mathematical Statistics. India: Sultan Chand & Sons, 2020.

PROGRAMMING IN PYTHON

Course Category	L	T	P	C
SEC	0	0	4	2

Detailed Contents of Syllabus**Unit 1: Data, Expression, Statement, Conditional****10 Hours**

Data and types: int, float, boolean, string, list; variables, expressions, statements, simultaneous assignment, precedence of operators; comments; in-built modules and functions; Conditional: boolean values and operators, conditional (if), alternative (if-else), case analysis (if-elif-else).

Unit 2: Iteration, Function, Strings**10 Hours**

Iteration: while, for, break, continue, pass; Functions: function definition, function call, flow of execution, parameters and arguments, return values, local and global scope, recursion; Strings: string slices, immutability, string functions and methods, string module.

Unit 3: Lists, Tuples, Dictionaries**10 Hours**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, nested lists, list comprehension; Tuples: tuple assignment, tuple as return value, tuple operations. Dictionaries: operations and methods, looping and dictionaries, reverse lookup, dictionaries and lists

TEXT BOOKS

1. Downey, Allen. Think Python: How to Think Like a Computer Scientist. 2nd Edition, Paperback. Japan: O'Reilly Media, 2015.

REFERENCES

1. Gutttag, John V. Introduction to Computation and Programming Using Python, Third Edition: With Application to Computational Modeling and Understanding Data. United Kingdom: MIT Press, 2021.
2. Sedgewick, Robert., Wayne, Kevin., Dondero, Robert. Introduction to Programming in Python: An Interdisciplinary Approach. United Kingdom: Pearson Education, 2015.
3. Budd, Timothy. Exploring Python. Paperback. United States: McGraw Hill Higher Education, 29 July 2011.
4. Lambert, Kenneth A.. Fundamentals of Python: First Programs.3rd Edition, Paperback. United States: Cengage, 2023.
5. Dierbach, Charles. Introduction to Computer Science Using Python: A Computational Problem-solving Focus. Paperback. India: Wiley, 2015.
6. Gries, Paul., Campbell, Jennifer., Montoyo, Jason. Practical Programming: An Introduction to Computer Science Using Python 3. Second edition. United States: Pragmatic Bookshelf, 2013.

MS Excel: Advanced

Course Category	L	T	P	C
SEC	0	0	2	1

Detailed Contents of Syllabus

Unit 1: Data organization and management: Creating Simple and classic pivot tables, Choosing Field, Filtering Pivot Tables, Modifying PivotTable Data, Grouping based on numbers and Dates

7 Hours

Unit 2: Using basic formulae and basic functions, using advanced formulae Using Data Analysis tools for ANOVA, Correlation, Covariance, Descriptive Statistics, Exponential Smoothing, F-Test: Two Sample for Variances, Histogram, Random Number Generation Rank and Percentile, Regression, Sampling, t-Test, etc.

16 Hours

Unit 3: Preparation of various types of charts-line graphs, pie charts, hierarchical charts, stock and waterfall charts, radar charts, Combo Charts, scatter plots, etc.

7 Hours

Total Hours: 30

Reference Books

1. Alexander, Michael., Kusleika, Richard., Walkenbach, John. Excel 2019 Bible. United States: Wiley, 2018.
2. Walkenbach, John. Excel Charts. United Kingdom: Wiley, 2016
3. Lalwani, Lokesh. Excel 2019 All-in-One: Master the New Features of Excel 2019 / Office 365. Paperback. India: BPB Publications, 2019.

Environmental Studies

Course Category	L	T	P	C
AECC	3	0	0	3

Detailed Contents of Syllabus

Unit 1: Introduction and Natural Resources: Multidisciplinary nature of environmental studies Renewable and non-renewable resources: Natural resources and associated problems. Forest, water mineral, food, Energy, land resources overutilization, Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit 2: Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: - Forest ecosystem Grassland Ecosystem Desert Ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Biodiversity and its conservation Definition: genetic, species and ecosystem diversity. Biogeographical classification of India Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values Biodiversity at global, National and local levels. India as a mega-diversity nation Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 3: Environmental Pollution: Definition - Cause, effects and control measures - Air pollution - Water Pollution Soil Pollution Marine Pollution Noise Pollution Thermal Pollution Nuclear Hazards Solid Waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

Unit 4: Social Issues and the Environment: From Unsustainable to Sustainable Development Urban problems related to energy Water conservation, rainwater harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act Wildlife Protection Act Forest Conservation Act Issues involved in enforcement of environmental legislation - Public awareness

Unit 5 Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

Suggested Readings

1. Agrawal, K. C. Environmental Biology. Hardcover. India: Nidhi Publishers, 2008.
2. Bharucha, Erach. The Biodiversity of India. India: Mapin Pub., 2002.
3. Clark, Robert Bernard. Marine Pollution. 5th edition, Paperback. United Kingdom: OUP Oxford, 29 March 2001.

4. Cunningham, W.P. Cooper, T.H. Gorham, E and Hepworth, M.T. Environmental Encyclopedia. India: Jaico Publishing House, 1999.
5. Hawkins, R.E. Encyclopedia of Indian Natural History. Centenary Publication of the Bombay Natural History Society 1883-1983. First Edition, Hardcover. Oxford University Press, 1986.
6. Jadhav, H.V and Bhosale, V.M. Environmental Protection and Laws. 2015th edition, Hardcover. India: Himalaya Publishing House, 3 August 2015.
7. Kanagasabai, S. Environmental Studies. Paperback. Prentice Hall India Learning Private Limited. 1 January 2010.
8. Schoch, Robert M and McKinney, Michael L. Environmental Science systems & Solutions, Web enhanced edition. Jones & Bartlett Pub, October 17, 1997.
9. Odum, Eugene Pleasants and Barrett, Gary W. 5th edition, Paperback. Fundamentals of Ecology. Cengage India Private Limited, 15 November 2017.
10. Sapru, R.K. Environment Management in India. Vol. I & Vol. II. Hardcover. India: Ashish publishers house, 1 January 1987.
11. Townsend, Colin R., Harper, John L and Begon, Michael. Essentials of Ecology. 3rd edition, Paperback. John Wiley & Sons, 1 February 2008.
12. Trivedi, R.K. Handbook of Environmental Laws, Acts, Guidelines, Compliances & Standards. Third Edition, Hardcover. B.S. Publications, 1 January 2010.
13. Srivastava, Yogendra N. Environmental Pollution. Hardcover. India: Ashish Publishing House, 1 January 2009.

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SCHOOL OF SCIENCE AND HUMANITIES DEPARTMENT OF ECONOMICS

B Sc Economics (Data Science) Degree Program

Semester III

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Money and Banking	CC	3	1	0	4
2		Basics Econometrics	CC	3	1	0	4
3		Introduction to Data Science	CC	3	1	0	4
4		Public Economics and Policy	CC	4	0	0	4
5		Discipline Specific Economics Elective	DSE1	3	1	0	4
6		SQL Programming	SEC	1	0	2	2
7		Econometrics Lab	SEC	0	2	2	3
Total				16	6	4	24

Money and Banking

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus

Unit 1: Introduction: Evolution of money, Institutions and Policy: Metallic standards and their breakdown, Innovations in the forms of money

5 hours

Unit 2: Demand and Supply of Money: Money and the Financial System, Supply of money, Determinants of the Supply of Money, Demand for Money: Quantity Theory framework, Keynesian Model, Restatement of Quantity Theory of Money, Tobin Model, Baumol Model, Money Supply-Measures and components of money stock, determinants of money supply and money-multiplier, credit creation and commercial banks

15 hours

Unit 3: Central Banks and Objectives of Monetary Policy- money supply in a closed and open economy, Tools of Money Supply Control, Direct and indirect instruments of monetary

policy, Open market operations, Currency-Deposit-Ratio, Cash Reserve Ratio, Statutory Liquidity Ratio, interest rates - Repo Rate, Bank Rate, Reverse Repo rate, Term Structure of Interest Rates; Monetary Policy Rules-Inflation, interest rate and monetary targeting

15 Hours

Unit 4: Interlinkages between Monetary and Fiscal Sectors: Monetization of the fiscal deficits, Public debt and monetary policy.

15 Hours

Unit 5: Overview of the Indian Financial System. Banking Industry: Structure, Competition, and Regulation (with special reference to the Indian context). Banking Sector: The Role of Development. Banking Sector Reforms in India. Financial Crises and the Subprime Meltdown. Banking and the Management of Financial Institutions. Basel Norms and their implications.

10 Hours

60 hours including tutorials

Textbook

1. Ray, Partha. Monetary Policy: Oxford India Short Introductions. 1st Edition, Paperback. India: OUP India, 23 May 2013.

References:

1. Gurley, John G..., Shaw, Edward Stone. Money in a Theory of Finance. Hardcover. United States: Brookings Institution, 1 January 1960.
2. Mishkin, Frederic S. The Economics of Money, Banking, and Financial Markets. 13th Edition, Paperback. Pearson Education Ltd, 24 August 2021.
3. Black, Tyrone., Daniel, Donnie L. Money and Banking: Contemporary Practices, Policies, and Issues. 3rd edition, Hardcover. McGraw-Hill Inc., US, 1 January 1988.
4. Ministry of Finance, Government of India. Report of the Committee on Banking Sector Reforms, 1998.
5. Ritter, Lawrence S., Silber, William L and Udell, Gregory F. Principles of Money, Banking & Financial Markets. 12th edition, Hardcover. Pearson, November 30, 2011.
6. Gupta, Suraj B. Monetary Economics: Institutions, Theory and Policy. Paperback. India: S Chand & Company, 1 December 2010.

Basic Econometrics

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus

Unit 1: Introduction

10 Hours

Review of Statistics: Sampling Distribution, Estimation of Parameters, Hypothesis Testing

Unit 2: Classical Linear Regression Model

20 Hours

Classical Linear Regression Model: Assumptions, Two variable & Multiple Variable Regressions analysis, Properties of Least Squares estimates; tests of hypotheses and confidence intervals

Unit 3: Violations of Classical Assumptions

20 Hours

Violations of classical assumptions: Multi-collinearity; Heteroscedasticity; Auto-correlation; measurement error, omitted variables

Unit 4: Discrete Response Models**10 Hours**

Introduction to binary variables, Linear probability models and their limitations, Normal and Logistic curve, Probit and Logit models

Total: 60 hours including tutorials**Textbook**

1. Gujarati, Damodar N and Porter, Dawn C. Basic Econometrics. Fifth Edition, Hardcover. McGraw Hill Education, October 8, 2008

Reference Books

1. Greene, William H. Econometric Analysis. Eighth edition, Paperback. Pearson Education, 8 May 2018.
2. Johnston, Jack and DiNardo, John. Econometric Methods. 4th Revised Edition, Paperback. McGraw-Hill Education, 2007.

Introduction to Data Science

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus**Introduction to Data Science****Unit 1: Introduction to Data Science****12 Hours**

Introduction: Need for data science – Benefits and uses – Facets of data – Big data ecosystem – The data science process: Retrieving data – Cleansing, integrating and transforming data – Data analysis – Build the models – Presenting findings and building applications.

Unit 2: Toolboxes for Data Scientists**12 Hours**

Introduction to Python; Fundamental Python Libraries for Data Scientists : NumPy – SciPy – ScikitLearn – Pandas – Matplotlib; IDE; Data Manipulation with Python

Unit 3: Descriptive Statistics**12 Hours**

Introduction – Data Preparation – Exploratory Data Analysis: Data summarization – Data distribution – Outlier Treatment – Measuring asymmetry – Continuous distribution; Estimation: Mean – Variance – Sampling – Covariance – Correlation.

Unit 4: Statistical Inference**12 Hours**

Introduction – Frequentist Approach – Measuring the Variability in Estimates: Point estimates – Confidence intervals; Hypothesis Testing: Using confidence intervals – Using p-values.

Unit 5: Machine Learning**12 Hours**

Supervised Learning: Introduction – kNN classifier; Regression analysis: Linear regression – Logistic regression; Unsupervised Learning: Introduction – Clustering; Evaluation metrics.

Total Hours: 60

Textbooks

1. Cielen, Davy., Meysman, Arno D.B. and Ali, Mohamed. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools. Paperback. United Kingdom: Manning Publications, 2016.

Public Economics and Policy

Course Category	L	T	P	C
CC	4	0	0	4

Detailed Syllabus

Unit 1: Normative Approach to Public Finance 15 Hours

Welfare Economics-Pure Exchange Economy and Economy with Production- The Fundamental Theorem of Welfare Economics; Choosing among Pareto Efficient Points

Unit 2: Market Failure and Public Goods 13 Hours

Types of market failure- Public Goods-Samuelson's theory-Lindahl Model of Pareto Optimality- Free rider problem- Efficient provision of Public Goods-Externalities- Introduction to Public Choice

Unit 3: Principles of Taxation and Grant Theory 12 Hours

Benefit approach, Ability to Pay Principle-Progressive Taxation-Excess Burden-Direct vs. Indirect Taxes-Theory of Tax Incidence-Theory of Grant

Unit 4: Deficit Financing and Public Debt 10 Hours

Deficit financing-measures of deficit and their relation with public debt-causes and sources of public debt-consequences of high level debt-debt sustainability-solvency conditions-debt dynamics- relation between debt and growth-Ricardian view, Keynesian view and neo-classical view.

Unit 5: Indian Fiscal System 10 Hours

Constitutional Assignment of Tax powers and Expenditure Responsibilities to Union and States- Transfers Mechanism-Composition and Trends in Central and States Receipts and Expenditures-Fiscal issues in India and Tax Reforms-Deficits and Public Debt- FRBM Act

Total Hours: 60

Textbooks

1. Hillman, Arye L. Public Finance and Public Policy: A Political Economy Perspective on the Responsibilities and Limitations of Government. 3rd edition, Paperback. India: Cambridge University Press, January 10, 2019.
2. Jha, Raghubendra. Modern Theory of Public Finance. Paperback. India: New Age International Pvt. Ltd., 1 January 2019.
3. Musgrave, Richard A and Musgrave, Peggy B. Public Finance in Theory and Practice. 5th edition, Paperback. McGraw-Hill Education, 1 July 2017.
4. Hindriks, Jean and Myles, Gareth D. Intermediate Public Economics, Second Edition, Hardcover. United Kingdom: MIT Press, 2013.

5. Rosen, Harvey S and Gayer, Ted. Public Finance. 9th Edition, Paperback. McGraw-Hill Higher Education, 16 December 2009.
6. Stiglitz, Joseph E. Economics of the Public Sector, Third Edition, Hardcover. W.W. Norton & Company, 29 February 2000.

SQL Programming

Course Category	L	T	P	C
SEC	1	0	2	2

Detailed Syllabus

Unit 1: Structured English Query Language (SQL)- Introduction- Storing, Retrieving, and Manipulating Data in Databases, Looping, Logic Directives, Variables, Markup, Concept of Tables

Unit 2: SQL Language Elements: Keywords- Add, Join, View, Identifiers, Expressions, Search Conditions, Data Types, Nulls, Comments, etc

Unit 3: List of SQL Commands: **Creation of Database Tables**, Finding/Extraction of Data, Data Adjustments, Data Deletion, Removing Tables from Database, insertion of New Data into the Database, etc

Learning Resources:

<https://online.stanford.edu/lagunita-learning-platform>

[https://sqlzoo.net/wiki/SQL Tutorial](https://sqlzoo.net/wiki/SQL_Tutorial)

Econometrics Lab

Course Category	L	T	P	C
SEC	0	2	2	3

Detailed Syllabus

Unit 1: Linear Regression Model: Estimation of correlation coefficients, statistical significance, Testing of hypotheses with Two variable & Multiple Variable Regressions analysis **15 Hours**

Unit 2: Violations of Classical Assumptions: Examples on Multi-collinearity, Heteroscedasticity; Auto-correlation; measurement errors, omitted variables

15 Hours

Unit 3: Discrete Response Models

Estimation of models with binary variables, Linear probability models and demonstration of their limitations, Examples and exercises on Probit and Logit models

15 Hours

Total Hours: 45

Textbooks

1. Gujarati, Damodar N and Porter, Dawn C. Basic Econometrics. Fifth Edition, Hardcover. McGraw Hill Education, October 8, 2008

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DEPARTMENT OF ECONOMICS

B Sc Economics (Data Science) Degree Program

Semester IV

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Development Economics	CC	4	0	0	4
2		Introduction to Artificial Intelligence	CC	4	0	0	4
4		Data: Sources, Issue and Socio-Economic Analysis	CC	2	2	0	4
5		Discipline Specific Elective	DSE 1	3	1	0	4
6		Discipline Specific Elective	DSE 2	3	1	0	4
7		Academic Report Writing	SEC	0	2	0	2
		Total		16	6	0	22

Development Economics

Course Category	L	T	P	C
CC	4	0	0	4

Detailed Syllabus

Unit I: Development and Underdevelopment

Development Economics: Introduction, Alternative Measures and Indicators of Development: Economic Growth, Economic Development and Structural Changes, PQLI, HDI and its extensions, Development and growth- income as a measure of growth - Human development- Sens capability approach, development as freedom, Structural features of underdeveloped economies- International variations – development gap Underdevelopment as a low level equilibrium in a multiple equilibrium situation – low level equilibrium trap

15 Hours

Unit 2: Models of Growth and Development:

Endogenous growth models, Productivity and Growth Linkages, Determinants of growth; Big Push, Balanced and Unbalanced Growth, Dual Economy Models- Lewis Model, Harris-Todaro Migration Model.

20 Hours

Unit 3: Poverty and Inequality

Poverty and inequalities: Conceptual Underpinnings, Indicators of poverty, measurement of poverty and inequalities, ; characteristics of the poor; mechanisms that generate poverty traps, and path dependence of growth processes-Vicious circle of poverty, Kuznets curve

15 Hours

Unit 4: MDGs and SDGs

Cross Country Differences in Development Paths and New Development Challenges- Millennium Development Goals Sustainable Development Goals

10 Hours

Total Hours: 60

Text Books

1. Basu, Kaushik. Analytical Development Economics: The Less Developed Economy Revisited. United Kingdom: MIT Press, 2003.
2. Ray, Debraj. Development economics. 1st Edition, Hardcover. United Kingdom: Princeton University Press, 6 March 1998.

Introduction to Artificial Intelligence

Course Category	L	T	P	C
CC	4	0	0	4

Detailed Syllabus

Unit 1: Problem Solving by Searching

12 Hours

Introduction to AI - Intelligent agents, Searching - Uninformed, Informed, Stochastic search strategies.

Unit 2: CSPs and Gaming

12 Hours

Constraints satisfaction problems, Gaming: minimax algorithm, alpha-beta pruning.

Unit 3: Logic and Inference

12 Hours

Knowledge based agents, Knowledge representation using Propositional and First-Order logic, Resolution, Unification, Inference - Backward chaining, forward chaining.

Unit 4: Reasoning with Uncertainty

12 Hours

Quantifying uncertainty - Semantics and Inference of Bayesian Networks, Inference in Temporal Models - Hidden Markov Models, Markov Decision Processes.

Unit 5: Decision Making and Learning

12 Hours

Decision networks, Markov Decision Processes, Learning from examples, Reinforcement learning, Case study - Natural Language Processing.

Total Hours: 60

Text Book

1. Russell, Stuart and Norvig, Peter. Artificial Intelligence: A Modern Approach (Prentice Hall Series in Artificial Intelligence). 3rd Edition, Hardcover. Pearson Education, 16 February 2010.

References:

1. Patterson, Dan W. Introduction to Artificial Intelligence and Expert Systems. First Edition, Paperback. Pearson Education India, January 2015. (Unit-III).
2. Knight, Kevin., Rich, Elaine and Nair, Shivashankar B. ARTIFICIAL INTELLIGENCE. Third Edition, Paperback. McGraw Hill Education. 1 July 2017. (Unit- I, II, IV, & V).
3. Winston, Patrick Henry. Artificial Intelligence. Third edition, Paperback. Pearson India, 1 January 2009.
4. Khemani, Deepak. First Course in Artificial Intelligence. 6th Reprint 2018 Edition, Paperback. McGraw Hill Education, 1 July 2017.
5. WEB RESOURCES: <http://nptel.ac.in/>

Data: Sources, Issue and Socio-Economic Analysis

Course Category	L	T	P	C
CC	2	2	0	4

Detailed Syllabus

Unit 1: Importance of data

Assessment of policy outcomes vis-a-vis Policy objectives, Data sources: Government, Social Media, Private, etc. Data as a public good; personal data and the right to privacy; Awareness about sharing the data

10 Hours

Unit 2: Data collection agencies:

Government and private sources, Levels of data: (i) Micro, meso and macro data; (ii) Global, Regional and Country specific data; Methodologies of data collection: Surveys, official records, etc.

20 Hours

Sr. No.	Description of Data	Data Compilation and Released by Ministries and Departments of Govt of India
1	Demographic Data, standard of living data	Census Data Office, Registrar General & Census Commissioner, India, Ministry of (Mo)Home Affairs
	National Income, Savings, Investment, Sectoral Incomes, State Domestic Product,	Mo Statistics and Programme Implementation
2	Health and family welfare indicators	National Family Health Survey reports, -NFHS-Series, Mo Health & Family Welfare
3	Education	Mo Education DISE data
4	Periodic Labour Force Survey (PLFS) data	Ministry of Statistics and Programme Implementation
5	Industrial Production	Official Industrial Data from Ministry -CMIE data bases, Ministry of Statistics and Programme Implementation
6	Agricultural, food availability data	Directorate of Economics & Statistics, Department of Agriculture and Farmers Welfare.
7	Financial Markets Data	SEBI, NSE, BSE
8	Monetary and Banking	RBI
9	Fiscal Sector	Mo Finance
10	Prices and Inflation	Labour Bureau and MoSPI
11	Industrial Sector	Annual Survey of Industries, NSSO
12	Poverty data	Niti Aayog, ARIS/REDS Data NCAER, EPW Research Foundation Data Bases

Note: 'Ministry of' abbreviated as 'Mo'

Unit 3: Global data sources: International Monetary Fund, World Economic Outlook, Food and Agricultural Organization, World Bank, World Trade Organization, United Nations, etc.

15 Hours

Unit 4: Methods and Controversies-National Income Data in India, Qualitative Data and Analysis

15 Hours

Total Hours: 60

Web Resources

- Government of India Website, RBI website, BSE and NSE Websites, SEBI Websites, etc.
- Websites for Global Data: IMF, WTO, World bank, FAO, etc

Academic Writing

Course Category	L	T	P	C
SEC	0	2	0	2

Detailed Syllabus

Unit 1: Features of Academic Writing – Audience, Purpose, Style

Unit 2: Preliminary Aspects – Writing Definitions, Process Description, Passive Voice, Writing about Cause and Effect

Unit 3: Interpreting Data and writing about it – Charts, graphs and other patterns of data

Unit 4: Summarizing, Paraphrasing and Quoting, and aspects of Ethics and acknowledgment

Unit 5: Reviewing and Evaluating Primary and Secondary Sources (Books, Journal articles, other sources)

Unit 6: The Process of Writing: CODER

Total Hours: 30 hours (Each unit 5 lectures)

Textbook

- Swales, John M., Feak, Christine B. Academic Writing for Graduate Students: Essential Tasks and Skills (Michigan Series in English for Academic & Professional Purposes). 3rd edition, Paperback. United States: University of Michigan Press, 30 July 2012.

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RAJIV GANDHI SALAI (OMR), KALAVAKKAM - 603 110 TAMIL NADU

SCHOOL OF SCIENCE AND HUMANITIES

DEPARTMENT OF ECONOMICS

B Sc Economics (Data Science) Degree Program

Semester V

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Indian Economy	CC	4	0	0	4
2		Basics of Finance	CC	3	1	0	4
3		International Economics	CC	3	1	0	4
4		Discipline Specific Elective	DSE 1	3	1	0	4
5		Discipline Specific Elective	DSE 2	3	1	0	4
6		Summer Internship/Mini Project	SEC	0	0	4	2
7		R Programming	SEC	0	0	4	2
		Total		16	4	8	24

Indian Economy

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus

Unit 1: A Brief overview of the Indian Economy on the Eve of Independence, An overview of planning in India, India's development strategy. **5 Hours**

Unit 2: Overall Growth and Sectoral Performance of the Indian Economy: structural change and productivity, Issues pertaining to agricultural growth; Agricultural Commodity Markets,

Contract Farming, WTO and Agriculture; manufacturing growth and issues relating to productivity; services-led growth in India. Savings and Investment in the Indian Economy.

10 Hours

Unit 3: Trade and Balance of Payments in India: Merchandise trade performance and determinants, Dimensions of Services Trade, Exchange rate arrangements, Capital Flows and their impact, Balance of Payments and issues related to Accumulation of Foreign Exchange Reserves, Capital Account Convertibility, external sector reforms in India, India and WTO

10 Hours

Unit 4: Fiscal Policy in India: Tax and non-Tax Revenue trends in India, issues pertaining to fiscal deficits, Public debt sustainability, fiscal reforms and State finances, FRBM Act, GST-Concept and issues.

10 Hours

Unit 5: India's Financial Sector- An overview, Financial Sector Reforms in India – Issues relating to reforms in banking, insurance, pensions, capital market.

10 Hours

Unit 6: Employment, Poverty and Inequality in India – Measurement issues, Regional and sectoral dimensions of employment, poverty and inequality, Recent debates on poverty and employment during reforms, Issues relating to rural employment, livelihood security and NREGA.

10 Hours

Unit 7: Issues relating to Infrastructure in the Indian economy: Financing-private vs state, case studies on selected provision of infrastructure, e.g., roads, energy, railways, ports, irrigation, sanitation and water supply and their impact on development.

5 Hours

Total Hours: 60

Textbooks

1. Joshi, Vijay., Little, I. M. D. India: Macroeconomics and Political Economy 1964-1991. Paperback. India: Oxford University Press, 1998.
2. Kapila, Uma. Indian Economy Since Independence. 33rd Edition (2022-23), Paperback. India: Academic Foundation, New Delhi, 2 January 2022.
3. Kapila, Uma. Indian Economy: Performance and Policies. 23rd Edition, Paperback. India: Academic Foundation, New Delhi, 2 January 2022.

Suggested Readings

1. Ahluwalia, Isher Judge and Little, Ian Malcolm David. India's Economic Reforms and Development: Essays for Manmohan Singh. Second edition, Paperback. India: Oxford University Press, 13 April 2012.
2. Ahluwalia, Montek. S., Reddy, Y.V and Tarapore, S.S. Macroeconomics and Monetary Policy (Issues for a Reforming Economy), Paperback. India: Oxford University Press, 13 September 2004.
3. Balakrishnan, Pulapre. Economic Growth in India: History and Prospect. Hardcover. India: Oxford University Press, 4 August 2010.
4. Joshi, Vijay., Little, Ian Malcolm David. India's economic reforms, 1991-2001. 1st edition, Hardcover. Greece: Clarendon Press, 26 September 1996.

5. Mohan, Rakesh. Facets of the India Economy. New edition, Paperback. New Delhi: OUP, 22 April 2004.
6. Reddy, Y.V. Lectures on Economic and Financial Sector Reforms in India. Paperback. New Delhi: OUP, 1 October 2004.
7. Panagariya, Arvind. India: The Emerging Giant. Illustrated edition, Paperback. Oxford University Press, USA, 27 January 2011.

Basics of Finance

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus

Unit 1: Introduction to Finance

10 Hours

Basic forms of business organizations and financing of business. Objectives of a business organization – Profit Maximization vs Sales Maximization; Evaluation of financial decisions; Agency problems and its mitigation

Unit 2: Financial Accounting

10 Hours

Meaning, Accounting Concepts, Recording of Business Transactions, Double Entry System, Journal, Ledger, Preparation of Final accounts

Unit 3: Financial Statements and Cash Flow

10 Hours

Basics of financial statements; Balance sheet-assets, liabilities, and stockholders' equity; Income statement-profit and loss; the link between financial statements; Derivation of cash flows from financial statements; the sources and uses of cash flows.

Unit 4: Financial Statements Analysis

10 Hours

Application of financial statements: standardized statements; ratio analysis and the financial health of a firm; Financial ratios as proxies for the liquidity, leverage, profitability, financial ratios and the asset management

Unit 5: Time Value of Money

10 Hours

The basic concepts of time value of money: the present value, the future value, and the net present value; Various concepts of interest rates: quoted interest rate and effective annual rate; Patterns of cash flow-annuity and perpetuity. Applications of time value of money and business valuation, e.g., mortgage plan selection, insurance plans, pension plan choice, and investment decisions, etc.

Unit 6: Costing and Pricing:

10 Hours

Marginal cost vs Average Cost Pricing, Marginal Costing, Break even analysis, Cost, Volume, Profit analysis, Standard Costing and Variance analysis, Variance analysis and its usefulness: Variance analysis of Material and Labour Cost

Total Hours: 60

Textbooks:

1. Maheswari S.N. Management Accounting and Financial Control. 16th Revised Edition. New Delhi: Sultan Chand & Sons, 2015.
2. Shukla, M. C., Grewal, T. S and Gupta, S C. Advanced Accounts Volume-I. 19th Edition, Paperback. India: S. Chand Limited, 1 January 2016.

International Economics

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus

Unit 1: Introduction: Difference between internal and international trade, An overview of global trade, Trend and composition of global trade in goods and services, Capital inflows and their importance in global finance

15 Hours

Unit 2: International Trade and Competitiveness

Trade Theories and Comparative Advantage, New Trade Theories; Competitiveness, Outsourcing and Multinational Enterprises, WTO and International Trade.

15 Hours

Unit 3: Trade Policy

Instruments of trade policy, regional integration-free trade area and customs unions; political economy of trade policy; controversies in trade policy, Trade policy and WTO, WTO and Trade Disputes.

15 Hours

Unit 4: International Finance

International Monetary Systems, Exchange Rate Systems and arrangements, Fixed, flexible and hybrid systems exchange rates; adjustment and financing of deficits in fixed and flexible exchange rate regimes, financial globalization and financial crises. IMF and the World Bank

15 Hours

Textbook

- Salvatore, Dominick. International Economics: Trade and Finance. 11th Edition, Paperback. Wiley, 1 January 2014.

Readings:

1. Krugman, Paul R., Obstfeld, Maurice and Melitz, Marc J. International Economics: Theory & Policy. Tenth edition, Paperback. Pearson Education, 1 December 2017.

Web resources:

- www.imf.org,
- www.worldbank.org,
- www.wto.org,
- www.rbi.org.in

Total Hours: 60

Summer Internship or Mini-Project

Course Category	L	T	P	C
SEC	0	0	4	2

Students are encouraged to do summer internships with industry/other institutions including academic institutions. They can also opt for doing a mini project under the supervision of a faculty at SNUC with the approval of the appropriate authorities.

R Programming

Course Category	L	T	P	C
SEC	0	0	4	2

Detailed Syllabus

Unit 1: Introduction to R Programming – vectors – control statements – functions in R – matrices – Strings – Lists – Arrays in R – R factors – Data Frames in R – Data exploration and data cleaning - Data visualization with R – StringR, dplyR libraries, Practice Exercises and Assignments.

15 Hours

Unit 2: Application of Regression analysis- Principal Component Analysis- and Case Studies.

15 Hours

Total Hours: 30

R Programming

1. Kabacoff, Robert. R in action: Data analysis and graphics with R and Tidyverse. Simon and Schuster, 2022.
2. Wickham, Hadley, Mine Çetinkaya-Rundel, and Garrett Golemund. R for data science. " O'Reilly Media, Inc.", 2023.
3. Wickham, Hadley. Advanced R. chapman and hall/CRC, 2019.

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B Sc Economics (Data Science) Degree Program

Semester VI

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1		Track Specific Elective	TS1/TS2	3	1	0	4
2		Track Specific Elective	TS1/TS2	3	1	0	4
3		Discipline Specific Elective	DSE 2	3	1	0	4
4		Major Project	Project	0	0	12	6
	Total Credits			9	3	12	18

Major Project

Course Category	L	T	P	C
Major Project	0	0	12	6

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B Sc Economics (Data Science) Degree Program

List of Economics Electives (DSE1)

1. Advanced Econometrics
2. Agricultural Economics
3. Game Theory
4. Behavioural Economics
5. Industrial Economics
6. Operations Research

Advanced Econometrics

Course Category	L	T	P	C
DSE1	3	1	0	4

Detailed Syllabus

Unit 1: Introduction of Time Series

10 Hours

Introduction: Examples, simple descriptive techniques, trend, seasonality, the correlogram. Stochastic Process: Introduction and Stationary Process. Introduction to time series data, application of time series from various fields. Modelling time series as deterministic function plus IID Errors-Characteristics of Time Series Data Model identification/estimation/linear operators. Practice sessions

Unit 2: AR, MA ARMA Models and Forecasting

20 Hours

Basic models of Time Series Data -Probability models for time series: stationarity. Detrending and De-seasonalizing-Box-Jenkins modelling: Moving-average (MA) process and Autoregressive (AR) process of orders one and two.ACF and its graphical use in guessing the order of MA processes. Estimation of the parameters of AR (1) and AR (2) using least square and Yule-Walker equations. Basics of ARIMA models
ACF and PACF- Estimation & Forecasting - Estimating the autocorrelation function and fitting ARIMA models. Forecasting: Exponential smoothing, Forecasting from ARIMA models. Practice sessions

Unit 3: Panel Data Estimation**20 Hours**

Definition of panel data- representation of balanced-panel and unbalanced panel models- Pooled OLS Model-Panel data and pooled OLS model -The fixed effects model -The random-effects model - Further topics in the analysis of linear panel data models
Practice sessions

Unit 4: First Difference Estimator**10 Hours**

First difference estimator, random effects model, time fixed effects, Tests of hypothesis for pooled or fixed effects model, pooled and or random effects models (Breusch-Pagan Lagrange Multiplier Test) and fixed or random effects (Hausman test- Practice sessions

Total Hours: 60**References**

1. Wooldridge, Jeffrey M. Econometric Analysis of Cross Section and Panel Data. Second Edition, Hardcover. United Kingdom: MIT Press, 1 October 2010.
2. Cameron, A. Colin., Trivedi, Pravin K. Microconometrics: Methods and Applications. Hardcover. United States: Cambridge University Press, 9 May 2005.
3. Cameron, A. Colin., Trivedi, Pravin K. Microeconometrics Using Stata. Revised Edition, Paperback. Iran: Stata Press, 9 March 2010.
4. Kohler, Ulrich and Kreuter, Frauke. Data Analysis Using Stata, Third Edition Paperback. United States: Stata Press, 20 August 2012.
5. Chatfield, Chris. The Analysis of time series: An Introduction. Sixth Edition, Paperback. T&F India, 1 January 2017.
6. Kendall, Maurice George., Ord, J. K. Time Series (Charles Griffin Book). 3rd edition, Paperback. Oxford University Press, August 9, 1990.
7. Brockwell, Peter J and Davis, Richard A. Introduction to Time Series and Forecasting (Springer Texts in Statistics). 3rd Edition, Paperback. Germany: Springer International Publishing, 2016.
8. Shumway, Robert H and Stoffer, David S. Time Series Analysis and Its Applications: With R Examples. Fourth Edition, Paperback. Germany: Springer International Publishing, 19 April 2017.

Agricultural Economics

Course Category	L	T	P	C
DSE1	3	1	0	4

Detailed Syllabus**Unit I: Agriculture and Economic Growth****5 Hours**

Role of Agriculture in Economic Development, sectoral changes and agriculture, agriculture in rural development, farm and non-farm employment issues, inter-linkages between agriculture and other sectors; Schultz's hypothesis on traditional agriculture and its critique Mechanization of Indian Agriculture; Green revolution and its impacts

Unit II: Agricultural Marketing**20 Hours**

Agricultural price policy for a developing economy-objectives and effectiveness of agricultural price policy; elements of agricultural price policy; features of an ideal agricultural

price policy; agricultural price policy in India and public distribution system Agricultural marketing – need and criteria for assessing efficiency; agricultural marketing system in India; development of a national agricultural marketing platform-Role of Capital in Agriculture; Meaning; scope and significance – Factors determining demand for credit; Classification and sources of Agricultural Credit - Role of NABARD – Cooperation - Micro finance and SHGs – Capital formation in Agriculture - Crop Insurance

Unit III: Risk and Uncertainty in Agriculture

15 Hours

Difference between risk and uncertainty, types of uncertainty in agriculture, measures for mitigating risk and uncertainty in agriculture, new agricultural insurance scheme of India Rural credit in India, importance and estimates, agencies for rural credit, review of progress of institutional finance in rural India since independence

Unit V: Agriculture in Indian Planning

20 Hours

Agriculture in Indian Planning, Globalization and Indian agriculture, Case for and against privatization of agriculture, WTO and India's trade in agricultural commodities – Agriculture price and food policy-Agriculture Prices Functions and Fluctuations; Cobb-Web Model; Need for Government intervention; Objectives of Price policy; Types of Agriculture Prices: Minimum Support Prices and Statutory Minimum Support Price, Procurement Prices; Fixation of Minimum Support Price; Terms of Trade and Agriculture; Food Security and Food Subsidy; Food Corporation of India and Buffer stock; Public Distribution System (PDS) in India: Procurement and Distribution; Critics of PDS - National Food Security Act-Contemporary issues of primary sector in India.

Total Hours: 60

Textbook

1. Sony, R. N. Leading Issues in Agricultural Economics. 12th Edition, Paperback. Vishal Publishing Co, Jalandhar. 1 January 2015.
- 2.

Reference Book:

1. Amarjit Singh., Sadhu, A. N and Singh, Jasbir. Fundamentals of Agricultural Economics. Paperback. India: Himalaya Publishing House, 1 January 2015.
2. Acharya, S.S and Agarwal, N.L. Agricultural Marketing in India. 7th Edition, Paperback. CBS Publishers & Distributors, 28 February 2021.

Game Theory

Course Category	L	T	P	C
DSE1	3	1	0	4

Detailed Syllabus

Unit 1: Simultaneous Move Games with Complete Information

25 Hours

Introduction- Definition, types of game -representation of a game, the normal form; basic concepts; Dominated strategies Iterated dominance; Best responses; Rationality; Knowledge, common knowledge-solution concept: Iterated deletion of strictly and weakly dominated strategies; Best Response Functions and Nash equilibrium, mixed and pure strategies; applications –Finding pure strategy Nash equilibria in finite games; Applications.

Unit 2: Extensive Form Games with Perfect Information**20 Hours**

The game tree; strategies; subgame perfection; backward induction; commitment; bargaining; other Applications-Oligopoly model-applications

Unit 3: Simultaneous Move Games with Incomplete Information**15 Hours**

Incomplete information game structure- types, representation- Strategies; Bayesian Nash equilibrium; applications-Cournot duopoly with private information; Perfect Bayesian Nash equilibrium and sequential equilibrium

Total Hours - 60**Textbooks**

1. Osborne, Martin J. An Introduction to Game Theory. First Edition, Paperback. India: Oxford University Press, 2 July 2012.
2. Gibbons, Robert. A Primer in Game Theory. Paperback. Pearson, 1 January 2018.
3. Fudenberg, Drew and Tirole, Jean. Game Theory. Paperback. ANE Books, 1 December 2005.
4. Osborne, Martin J and Rubinstein, Ariel. A Course in Game Theory. Paperback. United Kingdom: MIT Press, 1994.

Behavioural Economics

Course Category	L	T	P	C
DSE1	3	1	0	4

Detailed Contents of Syllabus

Unit 1: Introduction: Behavioural Economics-Using this multidisciplinary approach- Integrating Economics with psychology, sociology, neuroscience, and evolutionary biology, limits to rational decision-making-concepts of bounded, ecological, and selective rationality; Behavioural economists in search of relevant and reliable data experimental and neuroscientific data through natural experiments and randomized controlled trials

10 Hours

Unit 2: Motivation and incentives: Incentives as the fundamental drivers in economic analysis; Money is often the main incentive, but a complex range of Incentives: socio-economic and psychological factors as drivers of decision-making; Other incentives and motivations- intrinsic and extrinsic; Pro-social choices and image motivation; Efficiency wage theory as a motivation to work.

8 Hours

Unit 3: Social lives: social influences and behaviour, aversion to unequal outcomes, trust and reciprocity, social learning, and peer pressure; the interplay between trust and reciprocity in cooperative and collaborative activities; Inequity aversion; Social norms as drivers of behaviour.

8 Hours

Unit 4: Quick Decision Making: Risky Choice and Time factor: Information and choice overload and decision-making; ‘Quick thinking’, Heuristics and the associated behavioural biases: availability, representativeness, and anchoring and adjustment; Habitual behaviours. Anchoring/adjustment

8 Hours

Unit 5: Risk, Uncertainty and Prospect Theory: Possibility of anomalous behaviour Paradoxes. certainty, reflection, and isolation Effects. Alternatives to prospect theory; mental accounting model and the regret theory

Present bias: disproportionate preference for smaller, immediate rewards vs delayed, larger rewards-underlying time inconsistency; the intertemporal tussle between patient and impatient selves, pre-commitment strategies, and self-control; The behavioural life cycle models of choice bracketing, framing, and mental accounting

8 hours

Unit 6: Personalities, moods, and emotions: psychological factors in economic and financial decision-making; measuring personality through OCEAN tests and the five dimensions: Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism; Somatic market hypothesis, dual-system models, and Neuroeconomics.

8 Hours

Unit 7: Behavioural microeconomic public policy, behaviour change— nudging for efficient and productive decision-making; Complementing conventional economic policy instruments with nudging. Behaviour and Macroeconomics: The role of social and psychological factors, optimism and pessimism in explaining macroeconomic fluctuations; the impact of confidence and social mood on macroeconomic outcomes; happiness and well-being.

10 Hours

Total Hours: 60

Textbooks

1. Baddeley, Michelle. Behavioural Economics: A Very Short Introduction. Paperback. United Kingdom: Oxford University Press, 26 January 2017.
2. Wilkinson, Nick., Klaes, Matthias. An Introduction to Behavioral Economics. 3rd edition, Paperback. Bloomsbury Academic, 27 December 2017.
3. Akerlof, George A and Shiller, Robert J. Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism. Revised Edition, Paperback. India: Princeton University Press, 21 February 2010.
4. Loewenstein. “Anticipation and the Valuation of Delayed Consumption”. Economic Journal (1987), 97(387): 666-684.
5. Oster, Emily., Shoulson, Ira and Dorsey, E. Ray. "Optimal Expectations and Limited Medical Testing: Evidence from Huntington Disease." American Economic Review (2013), 103(2): 804-30.
6. Brunnermeier, Markus K and Parker, Jonathan A. "Optimal Expectations." American Economic Review (2005), 95(4): 1092-1118.

Industrial Economics

Course Category	L	T	P	C
DSE1	3	1	0	4

Detailed Syllabus

Unit 1: Industrial Economics – Introduction: 8 Hours

Nature and Role of Industrial Economics. Theories of Firm- Behavioural Theory of the Firm, Managerial Theory of the Firm, Contestable Market theory of the Firm. 2.

Unit 2: Structural Analysis of Industry 18 Hours

Oligopoly – collusive and non-collusive models; Concentration –measurements of concentration and interpretation, trends in concentration and location of industry; systematic determinants of seller concentration – horizontal and vertical mergers, random growth hypothesis; barriers to entry – classification, structural barriers, entry deterring strategies, potential entry & contestability, entry and industry evolution; market structure, firm strategy and performance: empirical tests of the SCP paradigm, strategic groups, concept of profitability and measurement, sources of variation in profitability- industry, corporate and business unit effect, New Empirical Industrial Organisation (NEIO).

Unit 3: Industrial Efficiency and Productivity -Concepts & Measurement 4 Hours

Meaning, determinants, measurement of efficiency levels, efficiency conditions, efficiency and decision-making process.

Unit 4: Analysis of Firm Strategy 30 Hours

Pricing – cost plus pricing, price discrimination, peak-load pricing, transfer pricing; product differentiation-types, monopolistic competition-socially optimal amount of product differentiation, Lancaster's product characteristics model, Hotelling's & Salop's location model, advertising – determinants of advertising expenditure, advertising & product characteristics, advertising & profit maximization, advertising & barriers to entry, advertising, information search & quality signaling; R & D: Market structure, firm size and the pace of technological change, Investment in research and development; Investment in research and development: Motives for vertical integration: enhancement of market power, motives for vertical integration, agency & vertical relationships, motives for and types of vertical restraints; diversification: types, motives, corporate coherence, corporate focus and deconglomeration.

Total Hours: 60

Books Recommended:

1. Lipczynski, John., Wilson, John O. S and Goddard, John A. Industrial Organization: Competition, Strategy and Policy. 5th edition, Paperback. United Kingdom: Pearson Education Limited, 23 June 2017.
2. Barthwal, R. R. Industrial Economics: An Introductory Textbook. Fourth Edition, Paperback. India: New Age International Private Limited, 1 August 2021.
3. Church, Jeffrey R and Ware, Roger. Industrial Organization: A Strategic Approach. Paperback. Spain: Irwin McGraw Hill, 2000.
4. Clarke, Roger. Industrial Economics. 1st edition, Paperback. Wiley-Blackwell, 12 September 1985.

Operations Research

Course Category	L	T	P	C
DSE1	3	1	0	4

Detailed Syllabus

Unit I: Operations Research

12 Hours

Introduction of Operations Research - Operations Research Techniques and Tools - General Mathematical Formulation of LPP - Graphical Methods to Solve LPP - Some Exceptional Cases.

Unit II: Linear Programming Problems

12 Hours

Simplex Method - The Simplex Algorithm - Big M Method - Variants of Simplex Method.

Unit III: Transportation & Assignment Problem

12 Hours

Transportation problems – Initial solution by North West Corner Rule, Least Cost Method, Vogel's Approximation Method, Modified Distribution Method - Assignment Problems - Travelling Salesman Problem

Unit IV: Network Scheduling

12 Hours

Project Network - Diagram Representation - Floats - Critical Path Method (CPM) - PERT - Cost Considerations in PERT and CPM

Unit V: Statistical Quality Control

12 Hours

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling- Implementation in Excel

Total Hours: 60

Textbook

1. Taha, Hamdy A. Operations Research: An Introduction, Tenth edition, Paperback. United Kingdom: Pearson Education, 31 August 2019.

References

1. Swarup, Kanti., Gupta, P.K and Mohan, Man. Operations Research. Paperback. New Delhi: Sultan Chand Sons, 1 January 2010.
2. Sharma, J. K. Operations Research: Theory and Applications. 6th Edition. Laxmi Publications, 1 January 2017.
3. Hillier, Frederick S and Lieberman, Gerald J. Introduction to Operations Research. 11th Edition, Paperback. United Kingdom: McGraw-Hill Education, 2021.
4. Chandan, Jit S., Kawatra, Mahendra P and Kim, Ki Ho. Essentials of Linear Programming. Hardcover. India: Sangam Books Limited, 1995.

5. Ravindran, A., Phillips, D. T and Solberg, J. J. Operations Research: Principles and Practice, 2nd Edition, Paperback. India: Wiley India Pvt. Limited, 2007.

Data Science Electives (DSE 2)

1. Big Data Analytics
2. Data Mining
3. Data Processing
4. Data Science for Business
5. Machine Learning Techniques
6. Social Media Mining

Big Data Analytics

Course Category	L	T	P	C
DSE 2	3	1	0	4

Detailed Syllabus

Unit I: Introduction

12 Hours

Introduction to Intelligent data analysis: Nature of data - Modern Data analytics tools, Statistical concepts: Probability – Sampling – Statistical inference – Prediction & Prediction errors – Resampling.

Unit II: Statistical and Machine Learning Methods

12 Hours

Statistical Methods: Regression modelling – Classical Multi-Variant analysis, Bayesian Methods: Bayesian Inference – Modelling – Bayesian Network, SVM & Kernel Method: Overfitting & generalized bounds – SVM, Neural Network: Multi-layer feedforward – Learning & Generalization – Radial basic functions.

Unit III: Mining Data Streams

12 Hours

Introduction, Stream data model, Sampling data in a stream, Filtering streams, Counting distinct elements in a stream, Estimating moments, Counting oneness in a window, Decaying window.

Unit IV: Big Data Mining

12 Hours

Frequent Item Sets: Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream, Clustering Techniques: Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern-based clustering methods – Clustering in non-euclidean space – Clustering for streams and parallelism.

Unit V: Frameworks & Visualization

12 Hours

Frameworks: MapReduce – Hadoop Distributed file systems - NoSQL Databases, Visualization: Introduction - Classification of visual data analysis techniques - Data types to be visualized - Visualization techniques.

Text books

1. Berthold, Michael R and Hand, David J. Intelligent Data Analysis: An Introduction. 2nd edition, Paperback. Germany: Springer-Verlag Berlin and Heidelberg GmbH & Co., 2010. (Unit I & II).
2. Leskovec, Jure., Rajaraman, Anand., Ullman, Jeffrey David. Mining of Massive Datasets. Third Edition, Hardcover. United Kingdom: Cambridge University Press, 2020. (Unit III, IV & V).

References

1. Han, Jiawei., Pei, Jian., Tong, Hanghang. Data Mining: Concepts and Techniques. 4th Edition, Paperback. Netherlands: Elsevier Science, 2022.
2. Holmes, Dawn E. Big Data: A Very Short Introduction. Illustrated edition, Paperback. United Kingdom: Oxford University Press, 2017.
3. Hastie, Trevor., Tibshirani, Robert., Friedman, Jerome H. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. 2nd Edition, Paperback. United States: Springer, 2009.
4. Pries, Kim H and Dunnigan, Robert. Big Data Analytics: A Practical Guide for Managers. First Edition. New York: Auerbach Publications, 2015.

Data Mining

Course Category	L	T	P	C
DSE 2	3	1	0	4

Detailed Syllabus

MODULE 1: Data Warehousing, Business Analysis And On-Line Analytical Processing **12 Hours**

Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies - Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

MODULE 2: Data Mining – Introduction **12 Hours**

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Pre-processing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

MODULE 3: Data Mining - Frequent Pattern Analysis **12 Hours**

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns - Mining associations in real time data sets using WEKA / R.

MODULE 4: Classification**12 Hours**

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy - Classification of real time data sets using WEKA / R.

MODULE 5: Clustering**12 Hours**

Clustering Techniques – Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods - Clustering real time data sets using WEKA / R.

Total Hours: 60**TEXTBOOKS**

1. Han, Jiawei., Pei, Jian., Tong, Hanghang. Data Mining: Concepts and Techniques. 4th Edition, Paperback. Netherlands: Elsevier Science, 2022.

REFERENCES

1. Berson, Alex and Smith, Stephen J. Data Warehousing, Data Mining & OLAP. Paperback. McGraw-Hill Education (India) Pvt Limited, 1 July 2017.
2. Soman, K. P., Diwakar, Shyam and Ajay, V. Insight into Data Mining: Theory and Practice. 1st Edition (Eastern Economy Edition), Paperback. Prentice Hall of India, April 8, 2010.
3. Witten, Ian H., Frank, Eibe and Hall, Mark A. Data Mining: Practical Machine Learning Tools and Techniques. 3rd Edition, Paperback. Morgan Kaufmann Publishers In, 2011

Data Processing

Course Category	L	T	P	C
DSE 2	3	1	0	4

Detailed Syllabus**Unit 1: Toolboxes For Data Scientists****12 Hours**

Introduction to Python; Fundamental Python Libraries for Data Scientists: NumPy – SciPy – ScikitLearn – Pandas – Matplotlib; IDE; Data Manipulation with Python - Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing

Unit 2: Basics Of Data Visualization**12 Hours**

The Seven Stages of Visualizing Data – Different types of charts – Intro to tableau – Connections and Correlations - Scatterplot Maps - Trees, Hierarchies- Acquiring Data – Parsing Data – Calculated fields in tableau.

Unit 3: Advance Data Visualization**12 Hours**

Visualizing Geographic Data – Creating dashboards, Story boards and Animations – Level of Detail (LoD) calculations – Dual Axis charts in tableau – time series visualization.

Unit 4: Machine Learning**12 Hours**

Supervised Learning: Introduction – kNN classifier; Regression analysis: Linear regression – Logistic regression; Unsupervised Learning : Introduction – Clustering; Evaluation metrics.

Unit 5: Time Series, Text And Image Exploration**12 Hours**

Introduction to Time series –Algorithms for handling time series– Introduction to text processing – Regular Expressions – Basic text processing – Introduction to Image data exploration.

Total Hours: 60**References**

1. McKinney, Wes. Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. " O'Reilly Media, Inc.", 2012.
2. Lorna Brown, Tableau Desktop Cookbook: Quick & Simple Recipes to Help You Navigate Tableau Desktop, " O'Reilly Media, Inc.", 2021.
3. Müller, Andreas C., and Sarah Guido. Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.", 2016.
4. Nielsen, Aileen. Practical time series analysis: Prediction with statistics and machine learning. O'Reilly Media, 2019.

Data Science for Business

Course Category	L	T	P	C
DSE 2	3	1	0	4

Detailed Syllabus**Unit 1: Data and Analysis in Real World**

Introduction – types of data – conceptual business models – Information-action value chain – real world events and characteristics

Unit 2: Basic Statistics and Visualization

Basic Statistical Terms - Population and Sample (Theory), Understanding Data-Qualitative Vs Quantitative Data / Continuous vs Discrete (Theory) -Measurement Scales - Nominal, Ordinal, Interval & Ratio - Descriptive Statistics – Summary statistics - Importance of data visualization- types of charts - Bar/Pie Charts -Histogram -Box and Whisker Chart -Scatter Diagram

Unit 3: Probability Concepts and Distribution

Basic Probability Concepts – Types - Rules - Concept of Bayes' theorem Probability Distribution - Types (Discrete, continuous) -Random variable -Use of expected value in Decisions making - Binomial Distribution - Poison Distribution - Normal Distribution Theory

of Sampling-Types probability sampling, non-probability sampling - Introduction to Sampling Distribution (Concept of SE) - Sample Size Estimation Theory of Estimation- Types - Interval Estimates and Confidence Interval - Calculation Interval Estimates (C.I) for small & large samples

Unit 4: Data Mining & Business Intelligence

Data mining for business intelligence – concepts, definitions, applications, process, methods, Clustering methods, Business Intelligence – Introduction, Framework of Business Intelligence- Definition, History, Architecture of BI.

Unit 5: Machine Learning Introduction

Supervised Learning: Introduction – kNN classifier; Regression analysis: Linear regression – Logistic regression; Unsupervised Learning: Introduction – Clustering; Evaluation metrics.

Unit 6: Big Data for Business

Hadoop: History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS - Developing a Map Reduce Application-How Map Reduce Works - Anatomy of a Map Reduce Job run

References

1. Provost, Foster, and Tom Fawcett. Data Science for Business: What you need to know about data mining and data-analytic thinking. " O'Reilly Media, Inc.", 2013.
2. Taddy, Matt, Leslie Hendrix, and Matthew C. Harding. "Modern business analytics: practical data science for decision-making.", McGraw-Hill College (2022).

Machine Learning Techniques

Course Category	L	T	P	C
DSE 2	3	1	0	4

Detailed Syllabus

Unit 1: Machine Learning Basics

12 Hours

Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.

Unit 2: Machine Learning Methods

12 Hours

Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models —Unsupervised learning – Featurization

Unit 3: Machine Learning In Practice

12 Hours

Ranking – Recommendation System - Designing and Tuning model pipelines- Performance measurement – Azure Machine Learning – Open-source Machine Learning libraries – Amazon’s Machine Learning Tool Kit: Sagemaker

Unit 4: Machine Learning And Data Analytics**12 Hours**

Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration – Information based Learning – Similarity based learning – Probability based learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics.

Unit 5: Applications of Machine Learning**12 Hours**

Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection – Medical Diagnosis.

Total Hours: 60**TEXTBOOKS**

1. Joshi, Ameet V. Machine Learning and Artificial Intelligence. Second Edition, Hardcover. Switzerland: Springer International Publishing, 2022.

2. Kelleher, John D., Mac Namee, Brian and D'Arcy, Aoife. Fundamentals of Machine Learning for Predictive Data Analytics, Algorithms, Worked Examples, and Case Studies. Second Edition, Hardcover. United Kingdom: MIT Press, 20 October 2020.

REFERENCES

1. Bishop, Christopher M. Pattern Recognition and Machine Learning. Softcover reprint of the original 1st ed. 2006 Edition, Paperback. Switzerland: Springer New York, 23 August 2016.
2. Russell, Stuart Jonathan and Norvig, Peter. Artificial Intelligence: A Modern Approach. 4th edition, Paperback. Pearson Education, 31 May 2022.
3. Mueller, John Paul and Massaron, Luca. Machine Learning for Dummies. 2nd Edition, Paperback. United Kingdom: Wiley, 2021.

Social Media Mining

Course Category	L	T	P	C
DSE 2	3	1	0	4

Detailed Syllabus**MODULE 1: Introduction****12 Hours**

Introduction, Statistical properties of social networks: Static and dynamic properties, Random walk and their applications: Random walk on graphs - Algorithms for Computing Personalized Pagerank and Simrank – Text analysis

MODULE 2: Community Discovery And Node Classification**12 Hours**

Introduction, Communities in context, Core methods: KL algorithm– Agglomerative & divisive algorithm – Markov clustering, Node classification: Introduction- Node classification problem – Random walk based methods

MODULE 3: Evolution And Link Prediction In Social Networks**12 Hours**

Evolution: Introduction – Modeling a network actor across time frame – Challenges – Laws of evolution – Incremental mining, Link prediction: Introduction – Feature based linked prediction – Bayesian and Probabilistic relational models

MODULE 4: Privacy In Social Networks**12 Hours**

Introduction, Privacy breaches: Disclosure of identity, social links and attribute, Privacy definition for publishing data: k-anonymity, l-diversity & t-closeness – Differential privacy, Privacy preserving mechanisms for social networks

MODULE 5: Visualizing Social Networks**12 Hours**

Introduction, Taxonomy of visualization: structural- semantic – temporal, Visualization and analytics: Centrality-based Visual Discovery and Exploration

Total Hours : 60**TEXT BOOK**

1. Aggarwal, Charu C. Social Network Data Analytics. 2011 Edition, Paperback. Springer-Verlag New York Inc., 2014.

REFERENCES

1. Wasserman, Stanley and Faust, Katherine. Social Network Analysis: Methods and Applications (Volume 8 of Structural Analysis in the Social Sciences, ISSN 0954-366X). Hungary: Cambridge University Press, 1994.
2. Furht, Borko. Handbook of Social Network Technologies and Applications. 2010 Edition, Paperback. Springer-Verlag New York Inc., 28 November 2014.
3. Mika, Peter. Social Networks and the Semantic Web. Softcover reprint of hardcover 1st ed. 2007 Edition, Paperback. Springer-Verlag New York Inc., 29 November 2010.
4. Xu, Guandong., Zhang, Yanchun and Li, Lin. Web Mining and Social Networking: Techniques and Applications. 2011th edition, Paperback. Springer-Verlag New York Inc, 2012.
5. Breslin, John., Passant, Alexandre., Decker, Stefan. The Social Semantic Web. 2009th Edition, Paperback. Germany: Springer-Verlag Berlin and Heidelberg GmbH & Co. K, 31 October 2014.

Track Specialization 1 (TS1): Development Studies

1. Environmental Economics
2. Gender Economics
3. Health Economics
4. Urban Economics
5. Global Political Economy
6. Law and Economics
7. Labour Economics
8. Demography and Social Statistics

Environmental Economics

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content:

Unit 1: Economic approaches to environmental problems: Linkages between Economics and Environment, Macro aspects in environmental planning: sustainable development, economy and ecology, green/natural resource accounting, System of Economic and Environmental accounting. **10 Hours**

Unit 2: Micro foundations of environmental economics: Externalities and market failure, Baumol's Standards and Charges Approach, Pigouvian Taxes, Social and private costs. **10 Hours**

Unit 3: Alternative Policy Instruments, Command and Control vs. Market Based Instruments, Direct and Indirect Economic Instruments, Coase theorem and International Experience. **10 Hours**

Unit 4: Natural resource management: Exhaustible, renewable, common property resources, Coase Theorem and Institutional approach to environmental problems **10 Hours**

Unit 5: Valuation of Natural Resources: Direct and Indirect Methods, Environmental impact assessment. **10 Hours**

Unit 6: Environmental issues in the Global Context: GHG and Ozone Depletion, International protocols, global trade and Environmental standards and WTO. Pollution Control in India **10 Hours**

Texts/References:

1. Bhattacharya, Rabindra N. Environmental Economics: An Indian Perspective. Paperback. India: Oxford University Press, 12 June 2002.
2. Conrad, Jon M. Resource Economics. 2nd Edition, Hardcover. USA: Cambridge University Press, 14 June 2010. (Chapters 1, 2 and 5)

3. Hanley, Nick., Shogren, Jason F and White, Benedict. Environmental economics in Theory and Practice. Second Edition, Paperback. Palgrave Macmillan, 10 November 2006.
4. Kolstad, Charles D. Environmental Economics. 2nd Edition, Hardcover. USA: Oxford University Press, 31 March 2010.
5. Cropper, Maureen L., and Wallace E. Oates. "Environmental Economics: A Survey." Journal of Economic Literature 30, no. 2 (1992): 675–740.
<http://www.jstor.org/stable/2727701>.
6. Sankar, Ulaganathan. Environmental Economics. Paperback. India: Oxford University Press, 24 October 2001.
7. Siebert, Horst. Economics of the Environment: Theory and Policy. Softcover reprint of hardcover 7th ed. (2008 edition). Springer-Verlag Berlin and Heidelberg GmbH & Co. K, 19 October 2010

Gender Economics

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content:

Unit I: Fundamental Concepts of Gender Studies

10 Hours

Definition- Objectives and Importance of Gender Studies; Role of Women in Economic Development - Concept of engendering - Strategic Gender Needs - Practical Gender Needs – Liberal Feminism: Equality– Rationality - Freedom -Human Development Index – Methods of Activity at Gender Based Analysis – Gender Related Development Index - Gender Empowerment Measures – Mainstreaming Gender development policies – Paradigm shift from women wellbeing to Women’s Empowerment; Gender needs – practical and strategic.

Unit II: Gender Division of Labour

10 Hours

Concept of work – productive and reproductive - Invisibility of Women’s participation in work force- affecting and promoting the entry into the market - Women in organized and unorganized sector -SHG and Gender- Labor law relating to women - minimum wages act - Equal wages & Equal remuneration - Maternity benefit & child care – ESI - Sexual harassment at work place and visakha Judgement.

Unit III: Gender Division of Women’s Health

10 Hours

Health as a Gender Issue, Status of Women’s health in India, Maternal Morbidity, Maternal mortality, Infant Mortality, Life Expectancy, Fertility. Maternal and Child health Services in India, Food and nutrition, Anaemia, Pre-natal care, Factors Influencing Women’s Health. Menarche - Menstruation and Menstrual hygiene – menopause - Ailments related to pregnancy - Anemia and nutritional deficiency - issues and Gender Dimensions of Infertility - Contraception Prospects for improvement in reproductive health. Reproductive health, Mental health, Occupational health, Environmental health, Family planning, Impact of violence on women’s health. Health Care Needs of Women – Personal Hygiene.

Unit IV: Political Empowerment of Women**10 Hours**

Political participation of women – Political Socialization- Women leaders in politics- Barriers- Reservation policies- Women's Political Rights. Gender Budgeting- Gender and Local Governance- Gender Auditing – Gender sensitive approaches to development. Political Rights of Women in India - Electoral process - women as voters - candidates and leader - pressure group, Attitude of political parties towards women's issues- Problems of women in political process- Reservation for women in political process. Committees and commissions on women's participation in panchayatraj institutions.

Unit V: Poverty and Gender**10 Hours**

Feminization of poverty– Female Poverty and Poverty alleviation programmes; Status of Women farmers and land rights; Women Entrepreneurs; Impact of Globalization on working women; National Policy for the empowerment of women. Dalit Women movement – Women Movement against Poverty and Violence (MAPOVT)- Women development and empowerment – Programmes Central and State Government - IRDP – DWACRA – SGSY – Shreeshakti, MGNREGA- Employment Generation Schemes - Approaches and Access to Credit (from traditional form of credit to microcredit), Microfinance revolution - SHGs and Economic Empowerment.

Unit VI: Social Issues Regarding Women and Third Gender**10 Hours**

Issues of Girl child, Female, infanticide and foeticide, Sex Ratio child marriage, Dowry & Property Rights, Violence against Women, Domestic violence, Female Headed Households' , Women in the Unorganized sector of Employment, Women's work- Status and problems, problems of Dalit women-Issues of the rights of sexual minorities and transgender - Article 377 and beyond -Exploration and understanding of how COVID-19 has had gendered impacts. Lateral Thinking – Need for Creativity and innovation.

Total: 60 Hours**Texts/References:**

1. Jain, Devaki and Rajput, Pam. Narratives from the Women's Studies Family: Recreating Knowledge. First Edition, Paperback. India: Sage Publications, 30 March 2003.
2. Menon, Nivedita. Recovering Subversion: Feminist Politics beyond the Law. 1st Edition, Paperback. India: Orient Blackswan Private Limited - New Delhi, 1 January 2007.
3. Sangari, Kumkum and Vaid, Sudesh. Recasting Women: Essays in Colonial History. Paperback. India: Zubaan Books, 1 July 2013.
4. Lerner, Gerda. The Creation of Patriarchy. Reprint edition, Paperback. OUP USA, 18 February 1988.
5. Raj, Maithreyi Krishna. Women's Studies in India: Some Perspectives. Hardcover. India: Popular Prakashan, 1986.
6. Khullar, Mala. Writing the Women's Movement: A Reader. Paperback. India: Kali for Women, 2005.
7. Mies, Maria. Indian Women and Patriarchy. Hardcover. Humanities Pr, 1 November 1980.
8. Delamont, Sara. Feminist Sociology. Paperback. India: SAGE Publications, 2003.

Health Economics

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content:

Unit 1: Introduction to Health and Healthcare - Public health; community health and population health • Meaning of epidemiology • Incidence versus prevalence • Economic Epidemiology • Prevention (Education, Nutrition and Immunization) • Economics of Common Diseases in Developing Countries

12 Hours

Unit 2: Introduction to Health Economics - Disease, illness, sickness, and health • The nature of healthcare: need versus demand • Various models of health and disease (Biomedical model; Holistic health model; Biopsychosocial Model; Ethnomedical Cultural Model; and Ecological-Transactional Model) • Various issues considered by health economics – Scope of Health Economics (determinants of health (other than health care); measurement of health; the demand for health care; the supply of health care; microeconomic evaluation at the treatment level; the results of economic evaluation inform the choices of suppliers and purchasers and the creation of market equilibrium; the evaluation of the entire health system; and the evaluation of mechanisms to change the health system) • Health and healthcare

12 Hours

Unit 3: Demand and Supply of Health - Demand for health and health care • Determinants of demand for health and healthcare • The Grossman Model • Empirical measurement: RAND Health Insurance Experiment and Household Income and Expenditure Surveys 3.2) Supply and Cost functions for healthcare providers • Determinants of supply of healthcare • Production functions of healthcare • Adoption of medical technology and healthcare productivity • Cost functions including hospital cost and efficiency analysis

12 Hours

Unit 4: The Healthcare Market - Perfect competition • Comparative statics - shifts in demand and supply curves • Characteristics of healthcare goods and services • Healthcare as a public good • Positive and negative externalities in healthcare • Market failure • Asymmetric information (moral hazard and adverse selection) • Externalities in healthcare • Principal-Agent Model (Supplier-induced demand) • Role of government in healthcare • Markets for healthcare workers • Markets for pharmaceuticals • Pricing • Regulation • A model of equilibrium quality and price

12 Hours

Unit 5: Health Insurance - Theory of health insurance • The Demand for and Supply of Health insurance • Market failure in health insurance markets • Payment and reimbursement mechanisms • Managed care; National Health Insurance Fund/Scheme • Value-based purchasing.

12 Hours

Total: 60 Hours

Textbooks

1. Bhattacharya, Jay., Hyde, Timothy and Tu, Peter. Health Economics. 2013th edition, Paperback. Palgrave Macmillan, 30 October 2013.
2. Folland, Sherman., Goodman, Allen Charles and Stano, Miron. The Economics of Health and Health Care. International Student Edition, 8th Edition, Paperback. Routledge, 25 May 2017.
3. McPake, Barbara., et.al. Health Economics: An International Perspective. 4th Edition, Paperback. United Kingdom: Routledge, 2020.

4. Zweifel, Peter., Breyer, Friedrich and Kifmann, Mathias. Health Economics. 2nd edition (2009 edition), Paperback. Germany: Springer Berlin Heidelberg, 14 November 2014.

Urban Economics

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content:

Unit 1: Introduction and Overview

10 Hours

History of Human Settlement & Planning Principles -Understanding urbanization and development in past and present -Regional perspectives on urbanization and development- social, political and economic rationales for planning and implementing economic strategies for urban areas – Understanding the process of urbanization globally -urbanization in India.

Unit 2: Urban Infrastructure

10 Hours

Sustainable Urban Infrastructure-definition-need- Urban housing- Urban affairs- Urban Transportation—Urban Environment – Urban Energy – Carbon Footprint- --Drinking water availability - regulation and industry structure to improve the infrastructure's effectiveness, targeting, and efficiency. Issues related to the challenges of infrastructure development in a carbon smart way in keeping with India 's inclusive growth Objectives-Smart City Mission-

Unit 3: Urban Planning

10 Hours

Origin and evolution of planning: Impacts of Industrial revolution on town planning and regional Planning-Contemporary developments in planning in India --resettlement and rehabilitation issues, possible solutions to address constraints -Smart-city Mission-waste Management-

Unit 2: Urban Governance Structure in India

10 Hours

Governance frameworks - 74th Constitutional Amendment Act – the policies and the infrastructure provision and the regulatory framework this implies.

Initiatives from the government in the form of policy frameworks for various market and nonmarket forms/partnerships a. JNNURM – I

Unit 5: Urban Poverty

10 Hours

The fundamental problems of the city with respect to access to accommodation, health, water; Urban poverty- migration-livelihood-definition – Trends – Quality of Life indicators and assessment – the overarching policy paradigms –estimation of urban poverty-case studies.

Unit 6: Urban Finance

10 Hours

Urban finance-models- and other innovative arrangements such as PPP growth models of the future in power, telecom, transport, commercial and urban infrastructure, and social infrastructure - Public Private Participation - best practices in these sectors with case studies from India.

Total Hours: 60

Texts/References:

1. Sivaramakrishnan, K. C., Singh, B. N., Kundu, Amitabh. Handbook of Urbanization in India. 2nd Edition, Paperback. India: OUP India, 25 June 2007.
2. Eisner, Simon., Gallion, Arthur., Eisner, Stanley. The Urban Pattern. 6th Edition, Paperback. Wiley, 1993.
3. Hutchinson, B. G. Principles of Urban Transport Systems Planning. Hardcover. McGraw-Hill Inc., US, 1974.
4. Bhargava, Gopal. Socio-Economic and Legal Implications of Urban Land Ceiling and Regulation. Hardcover. India: Abhinav Publications, 1983.
5. Roy, Manoj., Cawood, Sally., Hordijk, Michaela and Hulme, David. Urban Poverty and Climate Change: Life in the Slums of Asia, Africa and Latin America. 1st Edition, Paperback. Routledge, 2018.

Reports:

1. Town and City Planning Organisation, GoI. <http://tcpo.gov.in/>
2. Smart City Mission Statement and Guidelines in Smart Cities Mission Guidelines. New Delhi, India: Ministry of Urban Development, Govt. of India, 2015.

Global Political Economy

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content:

Unit 1: Introduction and Overview of GPE: The context of GPE and its relevance

3 Hours

Unit 2: Managing the Global Economy: Global Economic Relations Before World War II, The Mercantilist Era; The Industrial Revolution, The British Hegemony and its decline; • World Wars and the Interwar Period, Institutional Frameworks: Multilateral Institutions, the IMF, World Bank, GATT, OECD, United Nations, North-South relations, Group formation of countries G5, G7, G8, G10, G20, G24, G77; Centrally Planned Economies, Non-state Actors, The 2008 Global Financial Crisis

15 Hours

Unit 3: Theoretical Perspectives on GPE: The Realist Perspective; The Liberal Perspective and the Critical Perspectives: The role of individual, State and societal groups; Theoretical perspectives on GPE and the linkages between economics and politics

15 Hours

Unit 4: The Issues in GPE: International Monetary Relations; Global Trade Relations; Regionalism and the Global Trade Regime; Multinational Corporations and Global Production; International Development; Foreign Debt and Financial Crises

15 Hours

Unit 5: Current Trends in the Global Political Economy:

Globalization and Triadization; Globalization and the State; Globalization Inequality, and Poverty Globalization and Democracy; Globalization and Civil Society; Globalization and “Newer Issues”: The Environment, International Migration, and Illegal Activity; The Role of

Texts/References:

1. Balaam, David N and Dillman, Bradford. Introduction to International Political Economy. Seventh Edition, Paperback. United Kingdom: Routledge, 14 August 2018.
2. Cohn, Theodore H and Hira, Anil. Global Political Economy: Theory and Practice. 8th Edition, Paperback. New York: Routledge, 2020.
3. Gilpin, Robert G. Global Political Economy: Understanding the International Economic Order. Paperback. Princeton University Press, 2001.
4. O'Brien, Robert and Williams, Marc. Global Political Economy: Evolution and Dynamics. 6th Edition, Paperback. India: Bloomsbury Academic, 3 April 2020.
5. Oatley, Thomas H. International Political Economy. 7th Edition, International Student Edition, Paperback. Routledge, 15 November 2022.

Law and Economics

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content:**Unit 1: Introduction****8 Hours**

legal concepts of contract, property, tort and crime and their interrelationship-meaning and jurisprudence, Law and Justice-Overview of Constitution, Constitutional Governance-Hierarchy of Courts: Supreme Court, High Courts, Business Courts, Alternative Dispute Resolution and Tribunals-Sources of Law, Law Making Process-Role of Executive, Judiciary and Legislature-System of Law: Civil and Common Law, Procedural and Substantive Law-Business and Human Rights Violation

Unit 2: Law and Development Economics**15 Hours**

Origins and History-Positive and Normative Law and Economics Nexus between Law and Economics-Production Possibilities, Opportunity Cost and Efficiency, Crime Production Possibility-Demand and Supply, Demand for Crime & Supply of Crime Concept of Market and Crime Market- land and property; market and non-market mechanisms for allocation and transfer of land; land markets; eminent domain – the land acquisition law; land-pooling. Labour Laws

Unit 3: Law and Public Finance**12 Hours**

Distinction between Public Finance and Private Finance Sources of Public Revenue- Tax and Non-tax Revenue Direct & Indirect Taxes- incidence and burden of taxation, Tax evasion and tax avoidance-Factors determining taxable capacity

Unit 4: Law, Welfare Economics and Public Policy**15 Hours**

Theories of justice of Rawls, Nozick, Dworkin, Sen & Nussbaum; efficiency criteria in welfare economics; Coase theorem; Prisoners' dilemma; Contracts; role of contracts for the functioning

of markets; efficient contracts; damages measure and their efficiency properties; property rights and their role in resource allocation; legal remedies for breach of property rights and their economic effects; liability for accidents and harms; product liability; efficiency of liability rules; efficiency-compensation trade-off. Litigation - its causes and consequences; benefits of legal certainty

Contracts for provisions of public goods: procurement contracts; government provisions vs. public-private partnerships; cost-quality trade-off.

Unit 5: Impact –Law & Economics

10 Hours

Law violation- Case studies, Minimum Wage Act & Economics-Partnership Act & Economics Sales of Goods Act & Economics Law of Contract & Economics, Intellectual Property Rights (IPRs): patents, copyright and trademarks. Cost and benefits of private IPRs; individual rights vs. common good.

Total Hours: 60

References

1. Cooter, Robert., Ulen, Thomas. Law and Economics. 6th edition. Pearson New International Edition, Paperback. Pearson Education Limited, 8 August 2013.
2. Hart, Oliver. Incomplete Contracts and Public Ownership: Remarks, and an Application to Public-Private Partnerships. The Economic Journal 113, no. 486 (2003): C69–76. <http://www.jstor.org/stable/3590047>.
3. Miceli, Thomas J. The Economic Theory of Eminent Domain: Private Property, Public Use. Illustrated edition, Paperback. United Kingdom: Cambridge University Press, 20 June 2011.

Labour Economics

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content:

Unit I: Introduction

8 Hours

Labour Market- Nature and Characteristics, Demand for Labour in relation to size and pattern of investment, Choice of technologies and labour policies Supply of Labour, Growth of Labour Force.

Unit 2: Agricultural Labour and Industrial

12 Hours

Agricultural Labour-the concept of surplus labour and disguised unemployment- Peasants and Dualism with and without surplus labour-Industrial Labour- Theories of labour movement, growth, pattern and structure of labour unions in India-Interdependence of agriculture and Industry (Lewis model, Ranis-Fei model) -Rural-Urban Migration (Harris-Todaro model)- Agricultural Labour Markets- Rural labour supply, Interlocking of factor markets, nature and trends in rural employment, Agricultural wages in India, Non-agricultural rural employment

Unit 3: Employment and Wage Determination

15 Hours

The supply and demand Framework-Labour Supply-Introduction-Application- Labour leisure trade-off-Income effects on labour supply employment and development relationship- poverty and unemployment, Wage Determination- Classical, Neo-classical; Concepts of minimum wage and efficiency wage; Non-wage component of labour remuneration, Productivity and wage relationship Facts about employment and earnings;

Unit 4: Labour Laws and Regulation

10 Hours

Labour Legislation, Enforcement and Adjudication in Indian Labour Markets: Origins, Consequences- Labour Laws and labour markets, Impact of reforms- Labour Market Policies, Mobility and Productivity-case studies

Unit 5: Social Security and Reforms

15 Hours

Reforms in Labour Market-State and Social Security- Concepts and evolution, Social assistance and insurance, Review and Appraisal of State Policies, Special Problems- Child labour, discrimination, bonded labour Labour market Reforms- Exit Policy, safety requirements, National Commission on Labour, Globalisation and labour markets, mobility of labour- Unemployment and unemployment insurance -Human capital, education- jobless growth, skill formation, social protection for unorganized labour during reforms; labour market discrimination , employment guarantee act and its impacts-case studies.

Total Hours: 60

Text Books:

1. Borjas, George J. Labor Economics. 5th Edition, Paperback. McGraw-Hill/Irwin, 2010.
2. Ahsan, Ahmad, Pages, Carmen and Roy, Tirthankar. Legislation, enforcement and adjudication in Indian Labor markets: origins, consequences and the way forward. In: Mazumdar, Dipak and Sarkar, Sandip, (eds.) Globalization, Labor Markets and Inequality in India. Routledge studies in the growth economies of Asia (79). Routledge, London, UK, pp. 247-282 (2008). ISBN 9780415436113.

References:

1. Cahuc, Pierre., Carcillo, Stéphane., Zylberberg, André. Labor Economics. 2nd edition, Hardcover. United Kingdom: MIT Press, August 1, 2014.
2. Bazen, Stephen. Econometric Methods for Labour Economics. 1st Edition, Hardcover. United Kingdom: OUP Oxford, 1 September 2011.
3. Ehrenberg, Ronald G., Smith, Robert Stewart and Hallock, Kevin F. A Modern Labor Economics: Theory and Public Policy. 14th Edition, International Student Edition, Paperback. United Kingdom: Routledge, 15 November 2021.
4. Datt, Gaurav. Bargaining Power, Wages and Employment: An Analysis of Agricultural Labor Markets in India. 1st Edition, Hardcover. India: SAGE Publications, 1996.
5. Binswanger H.P. and Rosenzweig M.R. (Eds.) (1984). Contractual Arrangements, Employment, and Wages in Rural Labor Markets in Asia. Yale University Press, New Haven.

Demography and Social Statistics

Course Category	L	T	P	C
TS1	3	1	0	4

Course Content

Unit 1: Introduction – Introduction to population studies, History of human population, Demographic transition, the balancing equation of population change, the structure of demographic rates, period rates and person years, principal period rates in demography, growth rates in demography, estimating period person-years, the concept of cohort, probabilities of occurrence of events.

Unit 2: Mortality – Mortality measurements, The epidemiological transition, Mortality in more developed nations, Mortality in less developed nations, Problems of mortality, Morbidity, Period life tables, Mortality as a continuous process, Decomposing a difference in life expectancies, Multiple decrement tables, Decomposition of difference in life expectations,

Unit 3: Fertility – Fertility measurements, Fertility transition, The proximate determinates of fertility, Stalled fertility transition, The second fertility transition: Low fertility societies, Period fertility rates, Cohort fertility, Birth interval analysis

Unit 4: Population – Growth measurements, “Population bomb”, Population momentum and population projection, Population projection methodology, Accuracy and uncertainty, Stable population model, Intrinsic growth rate and net production rate

Unit 5: Demographic relations in non-stable populations – Relations in continuous age and time, Deconstructing age specific growth rate, Use of variable r method in demographic estimation, Implications of demographic changes

Text Books

1. Lundquist, Jennifer Hickey, Anderton, Douglas L., Yaukey, David. Demography: The Study of Human Population. 4th Edition, Paperback. United States: Waveland Press, Incorporated, 2015.
2. Preston, Samuel, Heuveline, Patrick and Guillot, Michel. Demography: Measuring and Modeling Population Processes. First Edition, Paperback. United Kingdom: Wiley- Blackwell Publishers, 14 September 2000.

Track Specialization 2 (TS2): Finance

Finance
1. Financial Markets
2. Financial Economics
3. Auditing
4. Investment Management
5. Agricultural Finance
6. Financial Econometrics
7. Derivatives and Risk Management
8. Applied Financial Modelling

Financial Markets

Course Category	L	T	P	C
TS2	3	1	0	4

Detailed Contents of Syllabus

Unit 1: Global Financial Markets: Why Study Financial Markets and Institutions? Overview of the Financial System - Introduction to Global Financial Market - Role of Financial Market in Economic Development of a country - Stake holders in Financial Market (Domestic and Global) - Indian Financial Markets **12 Hours**

Unit 2: Interest Rates and Financial Institutions: Interest Rates Meaning and Role in Valuation - Changes in Interest Rates - Effect of Risk and Term Structure on Interest Rates. Reserve Bank of India. Conduct of Monetary Policy: Tools, Goals, Strategy, and Tactics central government securities: bonds, t-bills, state government bonds - Open market operations - Securities Trading Corporation of India - Primary dealers in Government Securities - Clearing Corporation of India **12 Hours**

Unit 3: Fixed Income markets: Money market, structure, instruments, functioning of money markets, Bond market structure, and term structure of interest rates. Long term debt securities, Corporate bonds, Zero Coupon bonds, bond features, identifying cashflows associated with a bond, valuation of bonds, Derivatives in Fixed Income markets, hedging interest rate risks, Forwards and Swaps Credit Default Swaps -Collateralized Debt Obligations (CDO) - Pricing of Credit Derivative Instruments. Credit Rating: Introduction - Rating Services -Objectives and types - Uses - Credit Rating Process -Credit Rating, Methodology - Rating Revisions - Credit Rating Agencies in India and abroad - Limitations with case studies Impact of various Policies of Financial Markets: Credit Policy of RBI - Fed Policy - Inflation Index, CPI, WPI, etc **12 Hours**

Unit 4: Equity Markets: Market Structure, functioning, primary and secondary markets, Institutions, SEBI, the features of equity securities, the cash flows associated with equity securities, Valuation of equity and preferred securities, dividend discount model, Derivatives in Equity Markets, Option pricing, Forward and Future contracts, trading venues, the mechanics of securities trading, terminology, types of orders like margin buying, short selling, settlement systems **12 Hours**

Unit 5 Currency Markets: The underlying theories, the instruments traded, the associated risks such as transaction exposure, operating exposure, translation exposure, etc. and how those risks are addressed/redressed using several techniques including using derivative instruments

such as currency options, currency futures and currency swaps. Treasury risk management policy, control and reporting requirements stop loss limits, VAR and Capital positions, Developing risk framework for organization

12 Hours

Total 60 hours including Tutorials

Suggested Readings

1. Mishkin, Frederic., Eakins, Stanley G. Financial Markets and Institutions. 10th Edition, Paperback. Brazil: Pearson, 24 August 2023.
2. Cecchetti, Stephen Giovanni and Schoenholtz, Kermit L. Money, Banking, and Financial Markets. 4th edition, Hardcover. McGraw-Hill/Irwin, 16 October 2014.
3. Shiller, Robert J. The New Financial Order: Risk in the 21st Century. Paperback. USA: Princeton University Press, 2004.
4. Siegel, Jeremy J. Stocks for the Long Run: The Definitive Guide to Financial Market Returns & Long-Term Investment Strategies. 5th Edition, Hardcover. United States: McGraw-Hill Education, 2014.
5. Gupta, Shashi K and Rang, Parneet. International Financial Markets and Foreign Exchange. Paperback. Kalyani Publishers.
6. Fabozzi, Frank J., Ferri, Michael G., Modigliani, Franco and Jones, Frank J. Foundations of Financial Markets and Institutions. Hardcover. United Kingdom: Prentice Hall, 2002.
7. Shiller, Robert J. Finance and the Good Society. Revised edition Princeton University Press, 21 April 2013.
8. Pathak, Bharati. V. Indian Financial System. 5th Edition, Paperback. Pearson Education India, 2 January 2018.
9. Singh, Preeti. Dynamics of the Indian Financial System: Markets, Institutions & Services. Paperback. United Kingdom: Global Professional Publishing Ltd., 17 May 2012.
10. Khan. M.Y. Indian Financial System. 11th Edition, Paperback. McGraw Hill Education (India) Private Limited, 15 July 2019.
11. Avadhani, V. A. Investment and Security Markets in India. Paperback. Himalaya Publishing House. 2 July 2019.

Financial Economics

Course Category	L	T	P	C
TS2	3	1	0	4

Detailed Syllabus

Unit I: Financial System-Introduction

10 Hours

The structure of the financial system- Functions of the financial Sector-Indicators of financial development; Financial System and Economic Development; financial inclusion: concept and its evolution; policy initiatives on financial inclusion.

Unit II: Interest Rate Policy

20 Hours

Theories of interest rate Determination-Level of interest Rates-Long period and short period Rates-Administered interest rates; Deregulation of interest rates; financial sector reforms in India. Determination; sources of interest rate differentials; theories of term structure of interest rates; interest rates in India.

Unit III: Money and Capital Market

20 Hours

Money Market: features; objectives; and importance of money market; composition of money market; money market institutions and instruments; features and problems of Indian money market. Capital market: composition; Primary and secondary market for securities. the capital asset pricing model; the beta of an asset and of a portfolio; security market line; -CAPM model in investment analysis -Functions of new issue-and secondary market; organizations of stock exchanges in India; defects in Indian stock exchange; SEBI; its objectives and functions.

Unit IV: Non-Banking Financial Companies

10 Hours

Non-Banking Financial Companies: Hire purchase Companies-Venture Capital Companies. Insurance Sector: objectives, functions, life insurance and general insurance; IRDA and its role and functions in financial markets.

Text Book:

1. Bhole, L.M and Mahakud, Jitendra. Financial Institutions & Markets: Structure, Growth & Innovation. 6th Edition, Paperback. India: McGraw-Hill Education (India) Pvt Limited, 25 June 2017.

Reference Books:

1. Gordon, E and Natarajan, K. Financial Markets and Services. 12th Edition, India: Himalaya Publishing House, 2023.
2. Luenberger, David G. Investment Science. 2nd Edition, Hardcover. India: Oxford University Press, 24 June 2013.
3. Hull, John C and Basu, Sankarshan. Options, Futures, and other Derivatives. 11th Edition, Paperback. India: Pearson India, 1 April 2022.
4. Copeland, Thomas E., Weston, John Fred and Shastri, Kuldeep. Financial Theory and Corporate Policy. 4th Edition, Paperback. Pearson Education, 2013.

AUDITING

Course Category	L	T	P	C
TS2	3	1	0	4

Detailed Contents of Syllabus

Unit 1: Basic Principles of Auditing: Definition - Nature and Scope of Auditing - Difference between Accounting, Auditing and Investigation - Objects of Audit - Qualities of an Auditor - Types of Audit.

Unit 2: Audit Planning and Internal Control: Preparatory steps to be followed in the commencement of a new audit - Audit Programme - Audit Notebook - Audit Working Papers - Audit Files- Audit report - Essentials of Effective Reporting. Internal Control: Elements - Objectives - Internal check - Objects of Internal Check - Duties of an auditor in connection with Internal check

Unit 3: Verification Procedures: Definition - Meaning - Auditors duty regarding vouching of various items of debit side of the cash book: cash in hand, collection from debtors, interest on investment and rent received- Credit side of the cash book: wages, payment to suppliers, cash purchases and purchase of land & buildings.

Unit 4: Audit of limited companies: Procedures, Audit Reports Company Auditor - qualification, disqualification, Appointment - Remuneration - rights and duties - removal of auditor - Liabilities of the auditor - Civil and Criminal liabilities

Unit 5: Auditing of computerized accounting and Other Types of Audit: EDP Audit - EDP Audit features and limitation - General approach to EDP Audit - Special Techniques for Auditing in EDP environment - Need for Computer Assisted Auditing Techniques (CAAT) - Types and Uses of CAAT - Green (Environmental) Audit: Definition - Objectives - Stages of Green Auditing. Special features of Cost audit, Tax audit, and Management audit;

Suggested Readings

Books

1. Messier, William F., Glover, Steven M and Prawitt, Douglas F. Auditing & Assurance Services: A Systematic Approach. 12th edition. McGraw-Hill Education, 15 October 2021.
2. Arens, Alvin A., Elder, Randal J., Beasley, Mark S and Hogan, Chris E. Auditing and Assurance Services: An Integrated Approach. 18th Edition. United Kingdom: Pearson, 2023.
3. Knapp, Michael C. Contemporary Auditing: Real Issues and Cases. 12th Edition, Paperback. United States: Cengage, 2021.
4. Pagare, Dinkar. Principles and Practice of Auditing. Paperback. Sultan Chand & Sons, 2020.
5. Gupta, Kamal. Contemporary Auditing. 6th Edition, Paperback. India: Tata McGraw-Hill, 2004.
6. Jain D P. Auditing. First Edition, Paperback. Vayu Education of India, 1 January 2013.
7. Kumar, Ravinder and Sharma, Virender. Auditing: Principles and Practice. 3rd Edition (Eastern Economy Edition), Paperback. India: PHI Learning, 2015.
8. Sharma T. R and Sahai, I. M. Auditing. Paperback. Agra : Sahithya Bhavan, 2021.
9. Sundar. K and Paari. K. Practical Auditing. 2nd Edition, Paperback. Chennai : Vijay Nicole Imprints Pvt. Ltd., 1 June, 2019.
10. Tandon B. N. Auditing. Revised Edition, Paperback. New Delhi: Sultan Chand and Sons, 4 February 2007.

Study Material

- ICAI

Investment Management

Course Category	L	T	P	C
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TS2	3	1	0	4
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Detailed Contents of Syllabus

Unit 1: Introduction: Returns and Risk; Some Basic Statistics, how securities are issued, interest rates, risky asset returns, historical evidence, dependence, active vs passive investing, risk adjusted return measures

Unit 2: Diversification: Choosing Optimal Portfolios; Asset Allocation Strategic allocation and Tactical asset allocation, combining a risk-free & a risky asset, Asset Allocation – Implementation, risk aversion and indifference curves

Unit 3: Estimating Risk and Return: Factor Models and Beta Estimation of risk, Describe measures of risk, including standard deviation and downside deviation, Describe reward-to-risk ratios, including the Sharpe and Treynor ratios - Asset Pricing Models, CAPM and APT macro factors), Identifying Additional Risk Factors / Factor Model Applications liquidity factor, Fama-French 3-factor model, Financial Market Anomalies, Some Issues in the Pricing of Fixed Income Securities Bond Valuation Principles, types of money market and fixed-income securities, term structure of interest rates, duration & immunization, Fixed Income Arbitrage, Default Rates and Low-Grade Bonds, Securitization

Unit 4: Performance Evaluation: Evaluating Managed Fund Performance, holding period and time weighted rates of return benchmarking, style analysis, performance attribution, concept of alpha, tracking error and information ratio Investment Strategy Implementation and Costs, Trading, Trader Behavior, Trading Costs Behavioral Finance. Implementation of Active Portfolio Quantitative Equity Investing, margin, short selling, Hedge Funds Market Timing

Unit 5: Alternative Investments: Hedge funds, private equity, real estate, commodities, and infrastructure, diversifications and higher returns

Suggested Readings

1. Bodie Zvi., Kane, Alex and. Marcus, Alan. J. Investments. 13th Edition, Paperback. McGraw-Hill Education, 21 March 2023.
2. Baxter, Martin., Rennie, Andrew. Financial calculus: An Introduction to derivative pricing. Hardcover. United Kingdom: Cambridge University Press, 1996.
3. Elton, Edwin J., Gruber, Martin J., Brown, Stephen J., Goetzmann, William N. Modern Portfolio Theory and Investment Analysis. 9th Edition, Paperback. United Kingdom: Wiley, 2014.
4. Hirt, Geoffrey A., Block, Stanley B. Fundamentals of Investment Management. 10th Edition, Hardcover. McGraw-Hill Education, 2011.
5. Leeds, Sanford., Reilly, Frank., Brown, Keith. Investment Analysis and Portfolio Management. 12th Edition, Hardcover. Cengage South-Western, 2024.
6. Markowitz, Harry M., Todd, G. Peter. Mean-Variance Analysis in Portfolio Choice and Capital Markets. Hardcover. Wiley, 2000.
7. Luenberger, David G. Investment Science. Hardcover. India: Oxford University Press, 2014.
8. Chandra, Prasanna. Investment Analysis and Portfolio Management. 6th Edition, Paperback. India: Tata McGraw-Hill Education, 27 August 2021.

9. Fischer, Donald. E., Jordan, Ronald. J and Pradhan, A.K. Security Analysis and Portfolio Management. 7th Edition, Paperback. India: Pearson Education, 30 October 2018.
10. Grinold, Richard C., Kahn, Ronald N. Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Selecting Superior Returns and Controlling Risk. 2nd Edition, Hardcover. United States: McGraw Hill LLC, 1999.
11. Kinlaw, William., Kritzman, Mark P., Turkington, David. A Practitioner's Guide to Asset Allocation. Hardcover. Wiley, 2017.
12. Swensen, David F. Pioneering Portfolio Management: An Unconventional Approach to Institutional Investment. Fully Revised and Updated, Hardcover. Free Press, 2009.

Agricultural Finance

Course Category	L	T	P	C
TS2	3	1	0	4

Detailed Syllabus

Unit 1: Evolution of Agricultural Finance in India and Policy Milestones, Trend in Agricultural Credit

10 Hours

Unit 2: Institutional vis-à-vis Non-Institutional Agricultural Credit, agencies for Institutional Credit to agriculture, Regional Disparity in Agricultural Credit, Agricultural Credit – Activity-wise

15 Hours

Unit 3: Inclusiveness and Innovation: Agricultural Credit under Priority Sector Lending, Interest Subvention Scheme and Short-term Crop Loans, Kisan Credit Card, Scale of Finance, SHG-Bank Linkage Model, Joint Liability Groups, Farmer Producer Organizations

15 Hours

Unit 4: Farm Loan Waivers-Genesis, farm loan waiver and farm distress, farm loan waivers and Agricultural Credit, farm loan waivers and State Finances

15 Hours

Unit 5: International Experience – Case Study of China

5 Hours

Study Material

1. Kanz, Martin. "What Does Debt Relief Do for Development? Evidence from India's Bailout for Rural Households." American Economic Journal: Applied Economics 8, no. 4 (2016): 66–99. <http://www.jstor.org/stable/26156183>.
2. Giné, Xavier, and Martin Kanz. "The Economic Effects of a Borrower Bailout: Evidence from an Emerging Market." The Review of Financial Studies 31, no. 5 (2018): 1752–83. <https://www.jstor.org/stable/48615484>.
3. Mukherjee, S and Subramanian, K and Tantri, P L. Borrowers' Distress and Debt Relief: Evidence from a Natural Experiment. The Journal of Law and Economics, 61 (4) (2018). pp. 607-635. ISSN 0022-2186.
4. Raghumanda, R., Shankar, R., and Singh, S. RBI Mint Street Memo no 4: Agriculture Loan Bank Accounts – A Waiver Scenario Analysis. (2017). Retrieved from https://rbi.org.in/scripts/MSM_Mintstreetmemos4.aspx.

5. Raj, Deepa. S and Prabhu, Edwin. A. Agricultural Loan Waiver: A Case Study of Tamil Nadu's Scheme. Reserve Bank of India Occasional Papers, Vol. 39, No. 1&2, 2018.
6. Ramakumar, R. Lessons from Agricultural Debt Waiver and Debt Relief Scheme of 2008. (2017)
7. RBI, Report of the Internal Working Group to Review Agricultural Credit, 2019
8. RBI, State Finances: A Study of Budgets of 2023-24 Shylendra, H. S. "Farm Loan Waivers: A Distributional and Impact Analysis of the Agricultural and Rural Debt Relief Scheme, 1990." Artha Vijnana: Journal of The Gokhale Institute of Politics and Economics 37 (1995): 261-275.

Financial Econometrics

Course Category	L	T	P	C
TS2	3	1	0	4

Detailed Syllabus

Unit I: Classical Linear Regression Model

10 Hours

Brief overview of classical linear regression model; Statistical Inference and hypothesis testing; Examples from financial markets; Data mining and true size of the test; Hedonic pricing model; Multicollinearity; Adopting the wrong functional form; Omission of an important variable; Inclusion of an irrelevant variable; Parameter stability tests; Measurement errors; A strategy for constructing econometric models; Determinants of sovereign credit ratings.

Unit II: Time Series Modeling and Forecasting

20 Hours

Understanding the Concepts; Moving average processes; Autoregressive processes; ARMA processes; Building ARMA models: The Box–Jenkins approach; Examples of time-series modelling in finance; Exponential smoothing; Forecasting in econometrics; Vector Autoregressive Models (VAR); Causality tests; VARs with exogenous variables; Impulse responses and variance decompositions; VAR Model example from finance.

Unit III: Modeling Volatility and Long-Run Relationship in Finance

20 Hours

Stationarity and Unit Root Testing; Tests for Unit Roots in the Presence of Structural Breaks; Cointegration; Equilibrium Correction or Error Correction Models; Testing for Cointegration in Regression: A Residuals-Based Approach; Methods of Parameter Estimation in Cointegrated Systems; Lead–Lag and Long-Term Relationships Between Spot and Futures Markets; Purchasing Power Parity; Cointegration Between International Bond Markets; Testing the Expectations Hypothesis of the Term Structure of Interest Rates; Models for Volatility; Implied Volatility Models; Autoregressive Conditionally Heteroscedastic (ARCH) Models; Generalised ARCH (GARCH) Models; Estimation of ARCH/GARCH Models; Extensions to the Basic GARCH Model; Asymmetric GARCH Models; The GJR model; The EGARCH Model; Tests for Asymmetries in Volatility; Volatility Forecasting: Some Examples and Results; Multivariate GARCH Models; A Multivariate GARCH Model for the CAPM; Estimating a Time-Varying Hedge Ratio

Unit IV: Switching and State Space Models

10 Hours

Seasonalities in Financial Markets; Modelling Seasonality in Financial Data; Estimating Simple Piecewise Linear Functions; Markov Switching Models; A Markov Switching Model for the Real Exchange Rate; A Markov Switching Model for the Gilt–Equity Yield Ratio; Threshold Autoregressive Models; Threshold Models for FTSE Spot and Futures; Regime Switching Models and Forecasting; State Space Models and the Kalman Filter

Text Book:

1. Introductory Econometrics for Finance by Chris Brooks, Fourth Edition; Cambridge University Press

Reference Books:

1. The Econometrics of Financial Markets by Andrew W. Lo, John Y. Campbell and A. Craig MacKinlay; Princeton University Press, Latest Edition.
2. Financial Econometrics: Models and Methods by Oliver Linton; Cambridge University Press, Latest Edition.
3. Basic Econometrics by Damodar N Gujarati and Dawn C. Porter; McGraw Hill Education, Latest Edition.
4. Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge; United Kingdom: MIT Press, Latest Edition.

Derivatives and Risk Management

Course Category	L	T	P	C
TS2	3	1	0	4

Detailed Syllabus

Unit I: Fundamentals of Derivatives

5 Hours

Introduction; Definition of derivatives; Different types of derivatives – forward, futures and options; Derivatives Market in India.

Unit II: Futures Market and Hedging Strategies

20 Hours

Forward vs futures contract; Specification of a futures contract; The operation of Margin accounts; Hedging strategies using futures; Cross hedging; Investment assets vs consumption assets; Short selling; Determination of forward and future prices; Stock index futures; Forward and future contracts on currencies; Commodity Futures with examples and case study analysis.

Unit III: Interest Rate Derivatives

10 Hours

Interest Rate Futures in India; Definition of swaps; Interest rate vs currency swaps; Valuation of interest rate swaps; Fixed-for-fixed currency swaps; Valuation of Fixed-for-fixed currency swaps; Other currency swaps: fixed-for-floating and floating-for-floating; Credit Exposures and Derivatives; Securitization and the financial crisis of 2007-08.

Unit IV: Option Contracts and Pricing

25 Hours

Types of options; Call vs put options; European vs American options; Factors affecting option prices; Put-call parity; Option Pricing and Hedging; Implied volatilities of call and put; Value at Risk (VaR); Price Volatility Approach for Measuring Price Risk, Using the excel spreadsheet for Measuring Price Risk.

Text Book:

1. Foreign Exchange, International Finance and Risk Management by A. V. Rajwade and H. G. Desai, Shroff Publishers, Latest Edition
2. Options, Futures, and Other Derivatives by John C. Hull and Sankarshan Basu, Pearson, 11th edition

Reference Books:

1. Handbook of Debt Securities and Interest Rate by A. V. Rajwade, McGraw Hill Education, latest edition.
2. Introduction to Derivatives and Risk Management by Don M. Chance, Robert Brooks, Sanjay Dhamija, Cengage India, latest edition.
3. Derivatives and Risk Management by N R Parasuraman, McGraw Hill India; latest edition.
4. Financial Engineering: Derivatives & Risk Management by Keith Cuthbertson & Dirk Nitzsche, Wiley; latest edition.

APPLIED FINANCIAL MODELLING

Course Category	Track Specialization 2: Finance (TS2 Elective)		Credits	4
Marks	Internal	ESE (Theory+ Practical)	Hours/Semester	60
	30	70	L : T : P	2-0-4
Course Objective	To equip students with the essential skills and knowledge required to effectively model financial scenarios, utilizing advanced spreadsheet techniques, forecasting methods, and dashboard design principles, to support informed decision-making in various business contexts.			
Course Outcomes	Use basic knowledge of principles of modelling, errors in spreadsheet, and best practices.			
	Review and apply advanced spreadsheet techniques for what-if analysis and identifying key variables.			

	Construct financial models and apply valuation using Discounted Cash Flow method.	
	Apply forecasting, risk analysis and scenario modelling, using Statistical Analysis.	
	Learn dashboard design principles and advanced charting techniques for creating interactive dashboards.	
	Compare and contrast charting with the fundamental analysis	
Unit 1	Introduction to Models	10 hours
	Specification of models, Single Equation and Multi-equation Modelling, constructing relationships between variables, identifying key variables and elasticities, Modelling principles, conventions and best practices, Spreadsheet errors and consequences, Error Trapping; Auditing and review of spreadsheet models	
Unit 2	Review of Advanced Spreadsheet Techniques	10 hours
	Review of Advanced Spreadsheet Techniques, formulae and functions, Array functions, Solver, goal seek, Data tables, scenario manager, evaluate business opportunities, what-if analysis, identification of key variables using sensitivity analysis	

Unit 3	Construction of a 3 Statement Model	10 hours
	Construction of a spreadsheet model for 3 statements, Balance Sheet, Profit and Loss Account and Cash flow: Analysis of historical data, Organizing the lay out reflecting assumptions, objectives, outcomes, sensitivities, create a basic 3 statement model, valuation using Discounted Cash Flow methods Linking cash flow models to projected financial statements.	
Unit 4	Forecasting and Scenario Modelling	10 hours
	Creating, validating, and using regression models to fit the trends of historical data; estimating the accuracy of forecasts; handling the risks inherent in forecasts; Analytical methods to model variable uncertainty, incorporating key risk elements in the model Modelling large multiple variables and high-risk variables using probability distributions, simulations using Monte Carlo methods	
Unit 5	Fundamental Analysis vs Charting	10 hours
	Modelling with Fundamental Analysis using macroeconomic variables such as growth rates, inflation rates, interest rates, exchange rates, etc. Charting: major types of charts used for financial analysis	
Unit 6	Creating Dashboards	10 hours
	Dashboard design principles, advanced charting, Form control, data validation, conditional formatting, adding interactivity, Pivot Tables, Slicers, Pivot charts	

SHIV NADAR UNIVERSITY CHENNAI

(State Private University established under the Shiv Nadar University Act, 2018)

RAJIV GANDHI SALAI (OMR), KALAVAKKAM - 603 110 TAMIL NADU

SCHOOL OF SCIENCE AND HUMANITIES

DEPARTMENT OF ECONOMICS

B Sc Economics (Data Science) Degree Program

Semester IV

INTERNATIONAL TRADE (For Honors Students Only)

Course Category	L	T	P	C
EC#	3	1	0	4

Detailed Syllabus

Unit 1: Introduction: The Globalization of the World Economy, Challenges of Globalization, International trade and standard of living, International flow of goods and services **10 Hours**

Unit 2: The Law of Comparative Advantage; The Mercantilists' Views on Trade and its contemporary relevance; Theory of Absolute and The Ricardian Model of Comparative Advantage **10 Hours**

Unit 3: Factor endowments and Heckscher–Ohlin Model; The Gravity model; Gains from trade **10 Hours**

Unit 4: New Trade Theory: Intra-Industry Trade Theory; Monopolistic Competition Model of Intra-Industry Trade, Smooth Adjustment Hypothesis; Technological Gap Theory; Product Cycle Theory; The Grubel–Lloyd Index of Intra-Industry Trade. **10 Hours**

Unit 5: The Political Economy of Trade: Stolper–Samuelson theorem and the Specific Factors Model. **5 Hours**

Unit 6: The World Trade Organization and Trade Policy: tariffs, quotas, and other non-tariff measures. It provides an introduction to anti-dumping and countervailing measures, Preferential Trade Agreements **10 Hours**

Unit 7: International Production; Multinational Enterprises and Foreign Direct Investment; Global Value Chains **5 Hours**

Textbooks

1. Södersten, Bo and Reed, Geoffrey. International Economics. 3rd edition, Paperback. India: Palgrave Macmillan, 21 March 1994.

2. Reinert, Kenneth A. An Introduction to International Economics: New Perspectives on the World Economy. 2nd edition, Paperback. India: Cambridge University Press, 27 August 2020.
3. Salvatore, Dominick. International Economics, An Indian Adaptation. 13th Edition, Paperback. Wiley India Pvt Ltd, 1 September 2021.

Semester V

HISTORY OF ECONOMIC THOUGHT

(For Honors Students Only)

Course Category	L	T	P	C
CC	3	1	0	4

Detailed Syllabus

Unit I: Introduction and Early Economic Thought **10 Hours**

Medieval Economic Thought -Mercantilism-main characteristics, Early Classicism: Adam Smith- Theory of Value, Division of labour, capital accumulation, distribution, views on trade and economic progress; David Ricardo-theory of value, theory of rent, distribution, ideas on international trade and development.

Unit II: Classicism **15 Hours**

Adam Smith (1723-1790)-Naturalism and Optimism, Division of Labour, Capital, Value, Distribution, Laissez Faire-T.R.Malthus (1766-1834)- Theory of Population, Other Views Thomas Malthus- population theory,-David Ricardo - Political Economy, Distribution of Wealth, Theory of Rent, Stationary State Concepts

Unit III: Marxism **15 Hours**

Background (Socialist Like Sismondi -1773-1842) -Tenets of Marxian Thought-Karl Marx-dynamic of social change, theory of value, surplus value, Theory of Surplus Value Capitalist Exploitation -Organizational Components -Class Struggle-Scientific Socialism-theory of profit, crisis of capitalism, Johns Stuart Mill- ideas on value, distribution, views as a synthesizer.

Unit III: The Marginalists' Revolution **10 Hours**

Neo-Classical Thought-Alfred Marshall – Marshall – Role of time element in price determination, ideas on consumer surplus, Economies and Diseconomies, Quasi Rent Pigou and Robertson-Welfare Economic; Keynes V/S Classical Ideas and Concepts-Schumpeter – Theory of Economic Development, Role of Innovations

Unit IV: Indian Economic Thought **10 Hours**

Main themes of Kautilya's Arthasashtra; Modern Economic Ideas: Dada Bhai Naoroji, M.K. Gandhi, village swaraj, non-violence, machines and labour, cottage industries; Comparison of Indian Economic thought with western Economic thought.

Text Book

1. Hunt and Lautzenheiser, History of Economic Thought, Routledge, 3rd Edition (or Latest Edition)
2. Roncaglia, Alexander (2017): A Brief History of Economic Thought, Cambridge University Press.
3. Kurz D. Heinz, Economic Thought: A Brief History, Columbia University Press, 2016 (or Latest Edition)

References

1. Ekelund, Robert B. and Robert F. Hebert (1990): A History of Economic Theory and Method, third edition, New York: McGraw Hill
2. Henry W. Spiegel (1991): The Growth of Economic Thought, 3rd ed. Durham: Duke University Press