

**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**

**2022**

**Curriculum & Syllabus**

# 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
<b>Total Credits</b>	<b>72</b>	<b>7</b>	<b>15</b>	<b>2</b>	<b>32</b>	<b>6</b>	<b>134</b>

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)
<b>No. of Courses (Total Credits)</b>	<b>18 (72)</b>	<b>2 (7)</b>	<b>8 (15)</b>	<b>2 (2)</b>	<b>8 (32)</b>	<b>1 (6)</b>	<b>39 (134)</b>

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)			
		Introduction to Data Science (3-1-0-4)		Econometrics Lab (0-2-2-3)	
		Public Economics and Policy (4-0-0-4)			
	IV	Indian Economy (3-1-0-4)		Academic Writing (0-2-0-2)	DSE 1 (3-1-0-4)
		Introduction to Artificial Intelligence (4-0-0-4)			
		Data: Sources, Issue and Socio-Economic Analysis (2-2-0-4)			DSE 2 (3-1-0-4)

Year	Sem	CORE COURSE	AECC	SEC	Discipline Specific Elective (DSE )
3	V	Development Economics (4-0-0-4)		Internship/Mini Project (0-0-4-2)#	DSE 1 (3-1-0-4)
		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)	
<b>Number of Credits</b>		<b>72</b>	<b>7</b>	<b>15</b>	<b>38</b>
<b>Total Credits =132+2@= 134</b>					

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	EC1005	Microeconomics I	CC	3	1	0	4
2	EC1007	Macroeconomics I	CC	3	1	0	4
3	MA1009	Mathematics - I	CC	3	1	0	4
4	MA1011	Statistics I	CC	3	1	0	4
5	EN1007	Communication Skills in English	AECC	3	1	0	4
6	CS1805	MS Excel: Basics	SEC	0	0	2	1
7	EA1001T	YRC/NSS/NSO	EAA	-	-	-	1
<b>Total</b>				<b>15</b>	<b>6</b>	<b>2</b>	<b>22</b>

### Courses in Semester II

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC1006	Microeconomics II	CC	3	1	0	4
2	EC1008	Macroeconomics II	CC	3	1	0	4
3	MA1012	Mathematics - II	CC	3	1	0	4
4	MA1014	Statistics II	CC	3	1	0	4
5	CS1802	Programming in Python	SEC	0	0	4	2
6	CS1806	MS Excel: Advanced	SEC	0	0	2	1
7	BS2001	Environmental Studies	AECC	3	0	0	3
8	EA1001T	YRC/NSS/NSO	EAA	-	-	-	1
<b>Total</b>				<b>15</b>	<b>4</b>	<b>6</b>	<b>23</b>

### Courses in Semester III

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC2005	Money and Banking	CC	3	1	0	4
2	EC2003	Basics Econometrics	CC	3	1	0	4
3	CS2013	Introduction to Data Science	CC	3	1	0	4
4	EC2007	Public Economics and Policy	CC	4	0	0	4
5		Discipline Specific Elective	DSE1	3	1	0	4
6	CS2809	SQL Programming	SEC	1	0	2	2
7	EC2801	Econometrics Lab	SEC	0	2	2	3
<b>Total</b>				<b>17</b>	<b>6</b>	<b>4</b>	<b>25</b>

**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	EC2004	Development Economics	CC	4	0	0	4
2	CS2014	Introduction to Artificial Intelligence	CC	4	0	0	4
3	EC2002	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	EN2002	Academic Writing	SEC	0	2	0	2
<b>Total</b>				<b>16</b>	<b>6</b>	<b>0</b>	<b>22</b>

**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	EC3001	Indian Economy	CC	3	1	0	4
2	EC3003	Basics of Finance	CC	3	1	0	4
3	EC3005	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	EC3851	Summer Internship/Mini Project	SEC	0	0	4	2
7	EC3801	R Programming	SEC	0	0	4	2
<b>Total</b>				<b>15</b>	<b>5</b>	<b>8</b>	<b>24</b>

**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	EC3998	Project	Project	0	0	12	6
<b>Total Credits</b>				<b>9</b>	<b>3</b>	<b>12</b>	<b>18</b>

**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)**

Sl. No	Course Code	Economics Electives (DSE1)	Course Code	Data Science Electives (DSE 2)
1	EC2998	Advanced Econometrics	CS2998	Big Data Analytics
2	EC2696	Agricultural Economics	CS2990	Data Mining
3	EC2692	Game Theory	CS2996	Data Processing
4	EC2694	Behavioural Economics	CS2988	Data Science for Business
5	EC2690	Industrial Economics	CS2994	Machine Learning Techniques
6	MA2998	Operations Research	CS2992	Social Media Mining

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

Sl. No	Course Code	Track Specialization 1 (TS1)	Course Code	Track Specialization 2 (TS2)
		<b>Development Studies</b>		<b>Finance</b>
1	EC3698	Environmental Economics	EC3672	Financial Markets
2	EC3686	Gender Economics	EC3694	Financial Economics
3	EC3682	Health Economics	EC3676	Auditing
4	EC2688	Urban Economics	EC3670	Investment Management
5	EC3684	Global Political Economy	EC3678	Agricultural Finance
6	EC3696	Law and Economics	EC3674	Financial Econometrics
7	EC3680	Labour Economics	EC3692	Derivatives and Risk Management
8	EC3688	Demography and Social Statistics	EC3790	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 4<sup>th</sup> and 5<sup>th</sup> Semester (total of 8 credits). In addition to this, one Research Paper/Project/Dissertation of 8 credits will have to be completed in the 6<sup>th</sup> 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 4<sup>th</sup> Semester and History of Economic Thought [3-1-0-4 (L-T-P-C)] in the 5<sup>th</sup> Semester.

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

### Annexure Table : Honour's Elective Sem IV, V & Sem VI

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC2598	International Trade (Sem IV)	CC (H)	3	1	0	4
2	EC3599	History of Economic Thought (Sem V)	CC (H)	3	1	0	4
3	EC3598	- Honour's Project / Dissertation (Sem VI)					

**SCHOOL OF SCIENCE AND HUMANITIES  
DEPARTMENT OF ECONOMICS**

**Programme Outcomes (PO)**

On successful completion of the B.Sc Economics (Data Science) Programme, the students will be able to:

PO1. Apply the principles and theories in Economics and quantitative tools from Data Science to solve economic problems<sup>1</sup>.

PO2. Apply knowledge of related Social Sciences<sup>2</sup>, Mathematics and Statistics in the field of Economics and Data Science.

PO3. Analyse socio-economic issues using scientific approaches.

PO4. Use analytical and logical methods for evaluation of developmental policies and programs.

PO5. Communicate effectively in written, oral and visual forms to a variety of readers/audience.

PO6. Use resources and technology with due consideration for sustainable development.

PO7. Evaluate ideas using the norms of professional competence, ethics, and social responsibility.

PO8. Recognize the need for, have the preparation and ability to engage in independent and life-long learning in the context of evolving socio-political-economic/technological/natural environment.

PO9. Work effectively in a team environment for solving problems.

-----  
<sup>1</sup> Economic problems can range from microeconomic problems (profit/sales/utility maximization subject to constraints), macroeconomic problems (exchange rate determination, optimum level of foreign exchange reserves, inflation or monetary targeting, etc.) and global economic problems (such as, air pollution, climate change).

<sup>2</sup> Other Social sciences include psychology, sociology, political science, etc.

## B Sc Economics (Data Science) Degree Program

### Semester I

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC1005	Microeconomics I	CC	3	1	0	4
2	EC1007	Macroeconomics I	CC	3	1	0	4
3	MA1009	Mathematics - I	CC	3	1	0	4
4	MA1011	Statistics I	CC	3	1	0	4
4	EN1007	Communication Skills in English	AECC	3	1	0	4
5	CS1805	MS Excel: Basics	SEC	0	0	2	1
6	EA1001T	YRC/NSS/NSO	EAA	-	-	-	1
<b>Total</b>				<b>15</b>	<b>6</b>	<b>2</b>	<b>22</b>

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

### Semester I

## EC1005 - 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. 8<sup>th</sup> 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.

#### **Course Outcomes (CO)**

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

CO1: Explain the fundamentals of individual choices based on the assumption of rationality by individuals to describe the significance of incentives in the decision-making process and scope of Microeconomics.

CO2: Acquire knowledge about different factors that determine equilibrium in a market economy and productive and allocative efficiency in resource allocation process.

CO3: Describe the concepts of various types of costs, nature of production and its relationship to Business operations and differentiate between labour, land, capital, entrepreneurship, technology as factors of production.

CO4: Apply marginal analysis to the “firm” under different market conditions to explain diminishing marginal product and diminishing marginal returns in production process.

CO5: Analyse the causes and consequences of different market conditions in determining firm’s short term and long-term decision-making process in optimum sales, pricing, profitability, market strategies for competitiveness and sustainability.

CO6: Explain the concept of price competition, output determination and other nonprice strategies for the firms under imperfectly competitive market structure.

CO7: To develop skills to apply the theory to evaluate contemporary economic problems and come up with solutions in a group project through Presentation/Case study/Term paper/small Study Oriented Project.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC1007 - 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 IV: Simple Keynesian Model

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

**8 Hours**

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

**7 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. 10<sup>th</sup> Edition Paperback. Pearson Education India, 1 January 2013.

## Course Outcomes (CO)

After completing the course students should be able to:

CO1: Explain and discuss fundamental concepts for measuring performance of an economy from a macroeconomic perspective.

CO2: Explain, analyse, and interpret the relationship between money supply, output, interest rates and prices using both theoretical frameworks, quantitative methods and empirical data.

CO3: Comprehend the phenomenon of inflation and classify inflation according to intensities, causes, consequences for devising an anti-inflationary policy.

CO4: Explain the assumptions and tenets of classical school of economic thought in the context of determination of output, employment, prices and interest rates and assess the applicability of Classical Economics in the contemporary context.

CO5: Explain Keynesian Economics, outline the Keynesian multiplier model under different assumptions and critically evaluate these models.

CO6: Analyse the effectiveness of fiscal and monetary policy measures using the IS-LM model in the context of a closed economy.

CO7: Empirical testing of a theoretical macro model (Example, price level is determined by the stock of money supply and quantity of output, Demand for money depends on the level of income and interest rates, Consumption expenditure is a function of income and interest rates)

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## MA1009 - 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 3<sup>rd</sup> 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.

### Course Outcomes:

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

CO1: Recall sets and functions

CO2: Compute higher order differentiation

CO3: Learn optimization of functions using various tests

CO4: Find derivatives of functions of several variables

CO5: Solve ordinary differential equations of first order

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"><li>• CAT 1 (10 %)</li><li>• Mid-Sem (30 %)</li><li>• CAT 2 (10 % )</li></ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

### 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. 4<sup>th</sup> Edition, Paperback. McGraw Hill Education, 1 July 2017.

## MA1011 - 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.

## Course Outcomes (CO)

After completing the course students should be able to:

- CO1: Know how to represent data through charts, diagrams, and graphs.
- CO2: Know how to compute various measures of central tendency and dispersion.
- CO3: Compute the correlation and analyse.
- CO4: Construct regression equations using software.
- CO5: Gain knowledge of the use of probability.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to <ul style="list-style-type: none"><li>• CAT 1 (10 %)</li><li>• Mid-Sem (30 %)</li><li>• CAT 2 (10 %)</li></ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EN1007 - COMMUNICATION SKILLS IN ENGLISH

Course Category	L	T	P	C
AECC	3	1	0	4

## Detailed Contents of Syllabus

### Unit I:

**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 II: 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 III: 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 IV: 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 V: 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). 2<sup>nd</sup> 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.

## Course Outcome (COs)

- CO1: Developing foundational reading comprehension by analysing texts, asking questions and seeking clarifications. Enhancing writing skills through structured exercises, focusing on coherence and grammar
- CO2: Improving the ability to comprehend academic lectures, discussions, and formal conversations through active listening strategies.
- CO3: Building fluency in spoken English for real-world contexts, including presentations and discussions.
- CO4: Expanding vocabulary through extensive reading (newspapers, magazines, short stories, etc.) and targeted vocabulary exercises.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS1805 - MS Excel: Basics

Course Category	L	T	P	C
SEC	0	0	2	1

### Detailed Contents of Syllabus

#### Unit I: Introduction to Excel

**12 Hours**

**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

#### Unit II: Conditional Functions and Working with Large Excel Data Sets

**12 Hours**

**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.

#### Unit III: Look Up and Text Based Function

**6 Hours**

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

**Total: 30 hours**

#### 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.

### Course Outcomes (CO)

CO1: Apply basic Excel functions for data manipulation, formatting, and summarization.

CO2: Use conditional and lookup functions to analyse structured data.

### Assessment Scheme:

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> Assignments - 25marks Mid-Sem (40 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 165 marks
Marks Scaled to <ul style="list-style-type: none"> <li>• Assignments (25 %)</li> <li>• Mid-Sem (25 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## Semester II

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC1006	Microeconomics II	CC	3	1	0	4
2	EC1008	Macroeconomics II	CC	3	1	0	4
3	MA1012	Mathematics- II	CC	3	1	0	4
4	MA1014	Statistics II	CC	3	1	0	4
5	CS1802	Programming in Python	SEC	0	0	4	2
6	CS1806	MS Excel: Advanced	SEC	0	0	2	1
7	BS2001	Environmental Studies	AECC	3	0	0	3
8	EA1001T	YRC/NSS/NSO	EAA	-	-	-	1
<b>Total</b>				<b>15</b>	<b>4</b>	<b>6</b>	<b>22</b>

### EC1006 - Microeconomics-II

Course Category	L	T	P	C
CC	3	1	0	4

### Detailed Syllabus

#### Unit I: 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, Bromol's Sales Revenue Maximisation

#### Unit II: 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 III: 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 IV: 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, 1<sup>st</sup> Edition, Paperback. India: Oxford University Press, 2 July 2012.

## Course Outcomes (CO)

Upon successful completion of the course a student will be able to:

CO1: Explain modern theories of the firm such as Average-Cost Pricing, Limit Pricing, and Baumol's Sales Revenue Maximization, and illustrate their applications to real-life economic problems.

CO2: Examine the nature and implications of general equilibrium with a focus on Pareto optimality in multi-agent economic systems.

CO3: Analyse individual decision-making under uncertainty using expected utility theory and evaluate economic agents' behavior based on risk aversion and preference frameworks.

CO4: Describe the structure and dynamics of input markets, particularly the labor market, and differentiate among various market conditions and outcomes.

CO5: Apply theoretical models to real-world scenarios through projects and assignments and evaluate outcomes using empirical or case-based approaches.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-Sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC1008 - Macroeconomics II

Course Category	L	T	P	C
CC	3	1	0	4

### Detailed Syllabus

#### **Unit I: 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 VI: 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.

## Course Outcomes (CO)

After completing the course students should be able to:

**CO1:** Explain and discuss the concepts of Aggregate demand and supply. Explain determination of equilibrium output and prices in Classical and Keynesian Theory.

**CO2:** Explain the Classical and Keynesian theories as regards determination of output (growth), price level (inflation) and (un)employment.

**CO3:** Explain the trade-off between inflation and unemployment using the frameworks of Classical and Keynesian Theories. Understand and explain the contributions of A.W. Phillips and the validity of Phillips Curve using Adaptive and Rational Expectations. Critically evaluate contributions of Monetarists and New Classical Economists.

**CO4:** Learn, explain and critically evaluate the determinants of consumption using alternative theoretical frameworks.

**CO5:** Explain the Mundell-Fleming Model and determinants of slopes of IS-LM-BP curves and explain the efficacy of monetary and fiscal policies under alternative assumptions regarding the exchange rate arrangements and capital mobility.

**CO6:** Understand and explain the alternative models of economic growth (Harrod-Domar model, Solow model) and the concepts in growth theory, such as, ICOR and ACOR, technological progress, golden rule, endogenous growth, etc., and the causes for business fluctuations, as highlighted by the Real Business Cycle theory.

**CO7:** Learn and Explain the Monetary Policy Frameworks, viz., monetary targeting, inflation targeting and interest rate targeting. Understand the link between monetary policy and fiscal policy through the concepts of Public Debt and Fiscal Deficits.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## MA1012 - 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.

## Course Outcomes (CO)

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

- CO1: Compute Indefinite integrals.
- CO2: Evaluate definite integrals and area under the curve.
- CO3: Solve linear equations through matrix methods.
- CO4: Analyze the input-output model.
- CO5: Find Eigenvalues and Eigenvectors of matrices

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"><li>• CAT 1 (10 %)</li><li>• Mid-Sem (30 %)</li><li>• CAT 2 (10 %)</li></ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	<b>Total</b> <b>50 %</b>	<b>100 %</b>

## MA1014 - 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 12Hours

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.

## Course Outcomes

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

CO1: Understand and apply the concept of random variables to solve problems.

CO2: Identify the standard distributions and apply them in solving problems.

CO3: Apply suitable testing to test the hypothesis of large samples.

CO4: Apply suitable testing to test the hypothesis of small samples.

CO5: Perform analysis of variance.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS1802 - PROGRAMMING IN PYTHON

Course Category	L	T	P	C
SEC	0	0	4	2

### Detailed Contents of Syllabus

#### Unit I: 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 II: 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 III: Lists, Tuples, Dictionaries Hours

10

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

**Total Hours: 30**

### TEXT BOOKS

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

### REFERENCES

1. Guttag, 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. 3<sup>rd</sup> 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., Montojo, Jason. Practical Programming: An Introduction to Computer Science Using Python 3. Second edition. United States: Pragmatic Bookshelf, 2013.

## Course Outcomes (CO)

After completing the course students should be able to:

CO1: Understand Python fundamentals: data types, expressions, and conditionals.

CO2: Apply iteration, functions, and string operations in Python.

CO3: Implement Python's lists, tuples, and dictionaries for problem-solving.

## Assessment Scheme:

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> Assignments - 25marks Mid-Sem (40 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> <b>165</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• Assignments (25 %)</li> <li>• Mid-Sem (25 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS1806 - MS Excel: Advanced

Course Category	L	T	P	C
SEC	0	0	2	1

## Detailed Contents of Syllabus

**Unit I: 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 II:** 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 III:** 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.

## Course Outcomes (CO)

CO1: Create and manage pivot tables for data organization.

CO2: Apply advanced formulae and data analysis tools effectively.

CO3: Design various charts for data visualization and interpretation.

## Assessment Scheme:

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> Assignments - 25marks Mid-Sem (100 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 225 marks
Marks Scaled to • Assignments (25 %) • Mid-Sem (25 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## BS2001 - Environmental Studies

Course Category	L	T	P	C
AECC	3	0	0	3

## Detailed Contents of Syllabus

**Unit I: 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. **8 Hours**

**Unit II: 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.

**10 Hours**

**Unit III: 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. **10 Hours**

**Unit IV: 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. **10 Hours**

**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. **7 Hours**

**Total Hours: 45**

## 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.

## Course Outcomes (CO)

CO1: Understand the multidisciplinary nature of environmental studies and analyze issues related to the overutilization of natural resources, along with sustainable strategies for their conservation.

CO2: Demonstrate knowledge of ecosystem structure, function, and biodiversity, and evaluate the importance of biodiversity conservation at local, national, and global levels.

CO3: Identify various types of environmental pollution, assess their causes and effects, and propose effective control measures and disaster management strategies.

CO4: Examine contemporary environmental issues including climate change, sustainable development, environmental legislation, and population dynamics, and evaluate the role of individuals and technology in addressing these challenges.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## Semester III

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC2005	Money and Banking	CC	3	1	0	4
2	EC2003	Basics Econometrics	CC	3	1	0	4
3	CS2013	Introduction to Data Science	CC	3	1	0	4
4	EC2007	Public Economics and Policy	CC	4	0	0	4
5		Discipline Specific Elective	DSE1	3	1	0	4
6	CS2809	SQL Programming	SEC	1	0	2	2
7	EC2801	Econometrics Lab	SEC	0	2	2	3
Total				17	6	4	25

### EC2005 - Money and Banking

Course Category	L	T	P	C
CC	3	1	0	4

### Detailed Syllabus

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

**5 hours**

**Unit II: 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 III: 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 IV: Interlinkages between Monetary and Fiscal Sectors:** Monetization of the fiscal deficits, Public debt and monetary policy.

**15 Hours**

**Unit V: 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. 1<sup>st</sup> 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. 13<sup>th</sup> 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.
14. Gupta, Suraj B. Monetary Economics: Institutions, Theory and Policy. Paperback. India: S Chand & Company, 1 December 2010.

## COURSE OUTCOMES

CO1. Explain and discuss fundamental concepts in money, banking and financial markets

CO2. Explain, analyse and interpret the concept of interest rate, with its applications in bond markets

CO3. Explain and discuss the role and functions of central bank in an economy

CO4. Explain and analyse theories in monetary policy

CO5. Explain the fundamental principles in banking management

CO6. Explain the basic tenants in stock market pricing

CO7. Comprehend and discuss the tenants of Basel norms

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

### EC2003 - Basic Econometrics

Course Category	L	T	P	C
CC	3	1	0	4

### Detailed Syllabus

**Unit I: Introduction** **10 Hours**

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

**Unit II: 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 III: Violations of Classical Assumptions** **20 Hours**

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

**Unit IV: 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

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

### Reference Books

- Greene, William H. Econometric Analysis. Eighth edition, Paperback. Pearson Education, 8 May 2018.

- Johnston, Jack and DiNardo, John. *Econometric Methods*. 4th Revised Edition, Paperback. McGraw-Hill Education, 2007.

## COURSE OUTCOMES

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

CO1. Build a knowledge base of the fundamental principles, techniques and approaches used for statistical inferences. (PO1, PO2, PO3)

CO2. To describe the fundamental concepts related to different types of variables, data (Cross-sectional, Time Series, Panel Data), regression analyses. (PO1, PO2, PO3, PO4, PO9)

CO3. To formulate the hypothesis and to perform various hypothesis-tests in empirical context. (PO1, PO2, PO3, PO4)

CO4. To apply OLS (Ordinary Least Square) estimation method in regression problems, as well as to derive the estimators, R-squared and assumptions of Classical Linear Regression Model. (PO1, PO2, PO3, PO4, PO5, PO9)

CO5. To use qualitative variables in the model and interpretation of those variables. (PO3, PO4, PO5, PO9)

CO6. To construct various functional forms of regression model and to identify the cases of violations of CLRM through appropriate tests and to learn the remedial measures and to develop basic idea on Binary Response Models. (PO3, PO4, PO7, PO9)

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to		

<ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul>	Total 50 %	100 %
<b>Total Internal Continuous Assessment (ICA) 50 %</b>		

## CS2013 - Introduction to Data Science

Course Category	L	T	P	C
CC	3	1	0	4

### Detailed Syllabus

#### Introduction to Data Science

##### **Unit I: 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 II: 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 III: 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 IV: 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 V: Machine Learning 12 Hours**

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

**Total Hours: 60 including tutorials**

### 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.

### Course Outcomes

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

CO1: Explain the core concepts of data science, the steps involved in the data science process, and the role of data in the big data ecosystem. (KL2)

CO2: Use Python and its essential libraries to perform data manipulation tasks. (KL3)

CO3: Apply exploratory data analysis and descriptive statistics to summarize and visualize data, identify patterns, and handle outliers. (KL3)

CO4: Analyze data using statistical inference techniques such as hypothesis testing and confidence intervals to draw meaningful conclusions. (KL4)

CO5: Implement and evaluate supervised and unsupervised machine learning models to solve real-world problems. (KL3, KL5)

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC2007 - Public Economics and Policy

Course Category	L	T	P	C
CC	4	0	0	4

## Detailed Syllabus

**Unit I: 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 II: 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 III: 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 IV: 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 V: 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, Raghendra. 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. 9<sup>th</sup> 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.

**Course Outcomes:**

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

CO1: Articulate the scope and need of the domain of public finance, role of government in presence of market failure through identifying the existence of public goods, externalities.

CO2: Identify the sources of public revenue, expenditure, public debt, fees, and taxes.

CO3: Comprehend the representation of public budget statements for national and sub-national levels.

CO4: Apply the concepts and theories related to public policy and rationale of fiscal federalism to analyse the intricacies of Indian public finance and effectiveness of public policies.

CO5: Develop analytical skills to understand the real-life problems related to public finance, evaluate the need of the policy implementation and corrective measures through projects/term papers/research papers.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS2809 - SQL Programming

Course Category	L	T	P	C
SEC	1	0	2	2

### Detailed Syllabus

**Unit I:** Structured English Query Language (SQL)- Introduction- Storing, Retrieving, and Manipulating Data in Databases, Looping, Logic Directives, Variables, Markup, Concept of Tables. **15 Hours**

**Unit II:** SQL Language Elements: Keywords- Add, Join, View, Identifiers, Expressions, Search Conditions, Data Types, Nulls, Comments, etc **15 Hours**

**Unit III:** 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 **15 Hours**

## Learning Resources:

<https://online.stanford.edu/lagunita-learning-platform>  
[https://sqlzoo.net/wiki/SQL\\_Tutorial](https://sqlzoo.net/wiki/SQL_Tutorial)

## Course Outcomes (CO)

After completing the course students should be able to:

CO1: Construct and manage relational databases using SQL commands effectively.

CO2: Apply SQL queries for efficient data retrieval and manipulation.

## Assessment Scheme:

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> Assignments - 25marks Mid-Sem (100 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 225 marks
Marks Scaled to <ul style="list-style-type: none"> <li>• Assignments (25 %)</li> <li>• Mid-Sem (25 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC2801 - Econometrics Lab

Course Category	L	T	P	C
SEC	0	2	2	3

## Detailed Syllabus

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

**15 Hours**

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

**15 Hours**

### Unit III: 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

## Course Outcomes (CO)

CO 1: Students will use softwares like STATA/R/Python to do regression analysis

CO2: Understand and apply the basic concepts of linear regression analysis, estimate correlation coefficients, and conduct hypothesis testing in both two-variable and multiple-variable regression contexts.

CO3: Identify and analyze violations of classical linear regression assumptions, including multicollinearity, heteroscedasticity, autocorrelation, and issues arising from measurement errors and omitted variables.

CO4: Interpret and estimate discrete response models, particularly linear probability models, Probit and Logit models and evaluate their limitations in empirical applications

## Assessment Scheme:

Evaluation Scheme		
Internal Continuous Assessment (ICA)	End Examination 100 marks	Total marks
<b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## Semester IV

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC2004	Development Economics	CC	4	0	0	4
2	CS2014	Introduction to Artificial Intelligence	CC	4	0	0	4
4	EC2002	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	EN2002	Academic Report Writing	SEC	0	2	0	2
<b>Total</b>				<b>16</b>	<b>6</b>	<b>0</b>	<b>22</b>

### EC2004 - 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 II: 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 III: 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 IV: 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. 1<sup>st</sup> Edition, Hardcover. United Kingdom: Princeton University Press, 6 March 1998.

## Course Outcomes:

**After completion of the course, student will be able to:**

CO1: Identify the characteristics and problems of developing economies and apply concepts and measurement techniques related to development indicators like GDP, HDI etc.

CO2: Differentiate between growth and development and interpret the relationship between the two using various frameworks in theory of development economics

CO3: Apply theoretical and empirical concepts related to theory of economic growth

CO4: Apply theoretical and empirical concepts related to poverty and inequality

CO5: Comprehend the role of government and non-government institutions in the process of economic development including the UN's Sustainable Development Goals

CO6: Articulate and critically discuss policies that surround the various issues of economic development – in different contexts and forums through reports and presentations

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS2014 - Introduction to Artificial Intelligence

Course Category	L	T	P	C
CC	4	0	0	4

### Detailed Syllabus

#### Unit I: Problem Solving by Searching 12 Hours

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

#### Unit II: CSPs and Gaming 12 Hours

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

#### Unit III: Logic and Inference 12 Hours

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

#### Unit IV: Reasoning with Uncertainty 12 Hours

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

#### Unit V: 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. 6<sup>th</sup> Reprint 2018 Edition, Paperback. McGraw Hill Education, 1 July 2017.
5. WEB RESOURCES: <http://nptel.ac.in/>

## Course Outcomes (CO)

After completing the course students should be able to:

- CO1. Explain basic concepts of Artificial Intelligence.
- CO2. Identify the problems where AI is required as a solution provider.
- CO3. Compare and contrast different AI techniques available.
- CO4. Understand learning algorithms.
- CO5. Apply the basic concepts to various elementary and advanced applications.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to <ul style="list-style-type: none"><li>• CAT 1 (10 %)</li><li>• Mid-Sem (30 %)</li><li>• CAT 2 (10 % )</li></ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC2002 - Data: Sources, Issue and Socio-Economic Analysis

Course Category	L	T	P	C
CC	2	2	0	4

### Detailed Syllabus

#### Unit I: 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 II: 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**

Data collection, Compilation and Dissemination for the Indian Economy

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

**15 Hours**

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

**15 Hours**

**Total Hours: 60 including tutorials**

## 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

## Course Outcomes (CO)

After completing the course students should be able to:

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

CO1: Explain the importance of data from the perspective of individuals, governments, and businesses.

CO2: Describe the interlinkage and data sharing among the above entities for efficient handling of large datasets and associated risks.

CO3: Practice the privacy policies and develop the ability to follow privacy, maintain ethics, and avoid misuse of data sharing.

CO4: Explain the data collection process and methodologies through the public reports.

CO5: Use different regional and global data sources to analyze the socio-economic issues.

CO6. Discuss the broader qualitative outcomes of policy and discuss the dilemmas and problems in policy making.

CO7: Apply the various datasets to evaluate contemporary economic problems and come up with solutions in a group project through Presentation/Case study/Term paper/ Study Oriented Project.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	<b>Total</b> <b>50 %</b>	<b>100 %</b>

## EN2002 - Academic Writing

Course Category	L	T	P	C
SEC	0	2	0	2

### Detailed Syllabus

**Unit I:** Features of Academic Writing – Audience, Purpose, Style **5 Hours**

**Unit II:** Preliminary Aspects – Writing Definitions, Process Description, Passive Voice, Writing about Cause and Effect  
**5 Hours**

**Unit III:** Interpreting Data and writing about it – Charts, graphs and other patterns of data  
**5 Hours**

**Unit IV:** Summarizing, Paraphrasing and Quoting, and aspects of Ethics and acknowledgment  
**5 Hours**

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

**Unit VI:** The Process of Writing: CODER  
**5 Hours**

**Total Hours: 30 hours (Each unit 5 lectures) including tutorials**

## 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.

## Course Outcomes (CO)

CO 1: Learning the features of academic writing – audience, purpose method and style

CO 2: Building preliminary aspects of academic writing – writing definitions and process description, and using passive voice and writing cause and effect

CO 3: Interpreting data and writing about it – charts, graphs, diagrams and other patterns of data

CO 4: Learning to summarize, paraphrase and quote, and develop aspects of ethics and acknowledgment.

CO 5: Reviewing and evaluating primary and secondary sources of literature (books, journal articles and others)

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) 100 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

<b>Internal Continuous Assessment (ICA)</b> <b>Assignment 1 (Abstract 20 Marks)</b> <b>Assignment 2 (Transcript 80 Marks)</b>	<b>Total</b> <b>100</b> <b>marks</b>
Marks Scaled to • <b>Assignment 1 (Abstract 20 %)</b> • <b>Assignment 2 (Transcript 80%)</b>	100 %

## Semester V

Sl. No.	COURSE CODE	Course Title	Category	L	T	P	C
1	EC3001	Indian Economy	CC	3	1	0	4
2	EC3003	Basics of Finance	CC	3	1	0	4
3	EC3005	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	EC3851	Summer Internship/Mini Project	SEC	0	0	4	2
7	EC3801	R Programming	SEC	0	0	4	2
<b>Total</b>				<b>16</b>	<b>4</b>	<b>8</b>	<b>24</b>

### EC3001 - Indian Economy

Course Category	L	T	P	C
CC	3	1	0	4

### Detailed Syllabus

**Unit I:** 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 II:** 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 III:** 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 IV:** 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 V:** India's Financial Sector- An overview, Financial Sector Reforms in India – Issues relating to reforms in banking, insurance, pensions, capital market. **10 Hours**

**Unit VI:** 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 VII:** 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 including Tutorials**

## 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. 23<sup>rd</sup> 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.

## Course Outcomes:

**Students are able to-**

CO1: Apply theoretical and empirical concepts including measurement techniques and data sources relevant to the Indian economy and economic system in general

CO2: Interpret the structure of the Indian economy along with its historical evolution in different economic, social and political situations

CO3: Identify and explain the key socio-economic issues in the Indian economy surrounding economic development, education, health, poverty and inequality

CO4: Interpret and analyse the economic policies undertaken to address the various issues associated with Indian economy especially related to growth, inflation, unemployment, poverty, inequality etc.

CO5: Comprehend the role of government institutions in matters related to fiscal and monetary policies

CO6: Articulate and critically discuss policies that surround the various socio-economic issues in India in different contexts and forums - through reports/presentations

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3003 - Basics of Finance

Course Category	L	T	P	C
CC	3	1	0	4

### Detailed Syllabus

#### **Unit I: 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 II: Financial Accounting**

**10 Hours**

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

#### **Unit III: 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 IV: 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 V: 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 VI: 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 including tutorials**

### **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.

## Course Outcomes

CO1: Identify various business organizations, their financing methods, and evaluate financial decisions to maximize profit and sales while mitigating agency problems.

CO2: Utilize fundamental accounting concepts, double entry systems, and prepare key financial documents, including journals, ledgers, and final accounts.

CO3: Construct, analyze, and interpret balance sheets, income statements, and cash flow statements, and conduct financial ratio analysis to assess the financial health of a firm.

CO4: Utilize present value, future value, and net present value concepts in financial decision-making and business valuation.

CO5: Conduct marginal costing, break-even analysis, and variance analysis for effective cost management and pricing strategies.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	<b>Total</b> <b>50 %</b>	<b>100 %</b>

## EC3005 - International Economics

Course Category	L	T	P	C
CC	3	1	0	4

## Detailed Syllabus

**Unit I: 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 II: International Trade and Competitiveness**

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

**15 Hours**

## **Unit III: 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 IV: 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**

**Total Hours: 60 including tutorials**

## **Textbook**

- Salvatore, Dominick. International Economics: Trade and Finance. 11<sup>th</sup> 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](http://www.imf.org),
- [www.worldbank.org](http://www.worldbank.org),
- [www.wto.org](http://www.wto.org),
- [www.rbi.org.in](http://www.rbi.org.in)

## **Course Outcomes (CO):**

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

CO1: Comprehend the main economic theories and models of international trade and finance.

CO2: Interpret the political economy of trade and explain how international economic theory has been shaped by real world events.

CO3: Acquire basic knowledge of trade policy, regional integration, and financial crises in the context of economic efficiency and welfare.

CO4: Identify trade patterns, get familiarized with trade data, and apply them in trade policy analysis.

CO5: Interpret the theoretical frameworks of open-economy macroeconomics and the determinants of exchange rates and the balance of payments.

CO6: Articulate and critically apply the theoretical concepts learned in the course to analyse real-life case studies on international trade and finance.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3851 - 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.

## EC3801 - R Programming

Course Category	L	T	P	C
SEC	0	0	4	2

## Detailed Syllabus

**Unit I:** 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 II:** 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.

## Course Outcomes (CO)

After completing the course students should be able to:

CO1: Implement basic R programming for data manipulation, exploration, and visualization.

CO2: Develop and evaluate machine learning/econometric models using R.

## Assessment Scheme:

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> Assignments - 25marks Mid-Sem (100 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 225 marks
Marks Scaled to • Assignments (25 %) • Mid-Sem (25 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## 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	EC3998	Major Project	Project	0	0	12	6
<b>Total Credits</b>				<b>9</b>	<b>3</b>	<b>12</b>	<b>18</b>

### EC3998 - Major Project

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

## B Sc Economics (Data Science) Degree Program

### List of Economics Electives (DSE1)

Sl. No	Course Code	Economics Electives (DSE1)
1	EC2998	Advanced Econometrics
2	EC2696	Agricultural Economics
3	EC2692	Game Theory
4	EC2694	Behavioural Economics
5	EC2690	Industrial Economics
6	MA2998	Operations Research

## EC2998 - Advanced Econometrics

Course Category	L	T	P	C
DSE1	3	1	0	4

### Detailed Syllabus

#### Unit I: 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 II: AR, MA ARMA Models and Forecasting Hours

20

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 III: 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 IV: First Difference Estimator Hours

10

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 including tutorials**

### 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. Microeconometrics: 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). 3<sup>rd</sup> 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.

## Course Outcomes:

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

CO1: Identify, differentiate and organise different data structures used for economic analysis

CO2: Identify different issues in Time series, Panel Data and related data structures used economic analysis

CO3: Apply the estimation methods that help solve the issues that arise in different data structures used in economic analysis

CO4: Analyse the differences across estimation methods and forecasting methods in economic analysis

CO5: Articulate and use econometric methods and analyses in economic problems through reports and presentations

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul>	Total 50 %	100 %

Total Internal Continuous Assessment (ICA) 50 %		
---	--	--

## EC2696 - 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 including tutorials**

### Textbook

1. Sony, R. N. Leading Issues in Agricultural Economics. 12<sup>th</sup> Edition, Paperback. Vishal Publishing Co, Jalandhar. 1 January 2015.

## 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.

## Course Outcomes

CO1: Understand the basic principles, concepts and theoretical model of economics as applied to agriculture.

CO2: Analyse the structure and functioning of agricultural product and input markets and interpret price mechanisms and market behaviour in India

CO3: Evaluate the role of agriculture in economic development and the impact of various agricultural policies and programs in India

CO4: Apply economic tools and models to assess farm-level decisions related to production, costs, and resource allocation.

Critically assess contemporary issues in agriculture such as food security, environmental sustainability, and trade policy.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC2692 - Game Theory

Course Category	L	T	P	C
DSE1	3	1	0	4

### Detailed Syllabus

#### Unit I: 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 II: Extensive Form Games with Perfect Information 20 Hours

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

#### Unit III: 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 including tutorials**

### 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.

### Course Outcomes (CO)

After completing the course students should be able to:

CO1: Understand and explain fundamental concepts of game theory, including definitions of players, strategies, payoffs, representation, equilibrium.

CO2: Apply the concepts of pure strategy Nash equilibrium, mixed strategy Nash equilibrium, and Pareto optimality to analyze strategic interactions in various scenarios.

CO3: Apply game theory principles to economic contexts, demonstrating an understanding of how strategic interactions can shape market behaviour, pricing strategies, and competition dynamics among firms.

CO4: Explain the extensive-form game trees to represent sequential decision-making situations, identifying subgames and using backward induction to find equilibrium outcomes.

CO5: Demonstrate the applications of extensive form games and apply the theory of strategic interactions in solving various decision-making problems.

CO6: Analyze games with incomplete information, considering players' beliefs and strategies using Bayesian Nash equilibrium.

CO7: Develop skills and apply the overall theoretical concepts through group projects/ presentation/ case studies/ term paper/ small study oriented projects.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC2694 - Behavioural Economics

Course Category	L	T	P	C
DSE1	3	1	0	4

### Detailed Contents of Syllabus

**Unit I: 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 II: 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 III: 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 IV: 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 V: 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 VI: 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 VII: 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 including tutorials**

## 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.

## Course Outcomes (CO)

After completing the course students should be able to:

CO1: Explain and discuss the drawbacks/shortcomings of Standard Economic Model and to introduce the need for concepts in Behavioural Economics.

CO2: Explain and broaden the concept of utility and its policy implications.

CO3: Analyse predictable nature of errors in decision making due to heuristics and biases.

CO4: Explain, analyse, and interpret the process of decision making under uncertainty.

CO5: Comprehend the concept of mental accounting and analyse its impact on decision making.

CO6: Evaluate and analyse the social aspects of revealed preferences and how one decides as a social being.

CO7: Design and conduct an experiment to analyse the bias in decision making among decision makers.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC2690 - Industrial Economics

Course Category	L	T	P	C
DSE1	3	1	0	4

### Detailed Syllabus

**Unit I: 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 II: 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 III: Industrial Efficiency and Productivity -Concepts & Measurement 4 Hours**

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

**Unit IV: 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 including tutorials**

## **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.

## **Course Outcomes (CO):**

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

CO1: Apply the classical theory of markets in the analysis of firms and explain the relationship between market outcomes, social welfare, and the conduct of firms

CO2: Interpreting the functioning of the markets and analysing the interaction between different stakeholders (firms, consumers, and regulators) involved in them.

CO3: Acquire basic knowledge of competition policy, market concentration and regulatory framework in the context of economic efficiency and welfare.

CO4: Apply game theory knowledge to analyze strategic interaction in markets with imperfect competition and discuss how mergers, cartels and innovation can create barriers to entry.

CO5: Interpret the theoretical frameworks of different complex pricing rules that are applied by firms to make them competitive in the market.

CO6: Articulate and critically apply the theoretical concepts learned in the course to analyse real-life case studies on non-competitive firm-behaviour.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## MA2998 - 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 including tutorials**

### 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. 6<sup>th</sup> Edition. Laxmi Publications, 1 January 2017.
3. Hillier, Frederick S and Lieberman, Gerald J. Introduction to Operations Research. 11<sup>th</sup> 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.

### Course Outcomes (CO)

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

CO1: Familiarize graphical approaches in solving optimization problems

CO2: Introduce different Simplex methods for solving LPP

CO3: Solve problems involving transportation and resource allocation.

CO4: Apply the concepts network scheduling.

CO5: Perform statistical quality control

### Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## Data Science Electives (DSE 2)

Sl. No	Course Code	Data Science Electives (DSE 2)
1	CS2998	Big Data Analytics
2	CS2990	Data Mining
3	CS2996	Data Processing
4	CS2988	Data Science for Business
5	CS2994	Machine Learning Techniques
6	CS2992	Social Media Mining

### CS2998 - 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.

**Total 60 Hours including tutorials**

## **Text books**

1. Berthold, Michael R and Hand, David J. Intelligent Data Analysis: An Introduction. 2<sup>nd</sup> 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. 4<sup>th</sup> 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.

## **Course Outcomes (CO):**

- CO1: Understand Big Data concepts and apply them in real-world analytics scenarios
- CO2: Analyze Big Data frameworks like Hadoop and NoSQL for storage and processing
- CO3: Design algorithms using the MapReduce paradigm to handle large-scale data
- CO4: Develop and implement Big Data solutions using Apache Spark
- CO5: Execute Big Data tasks using tools like Hive and Docker

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS2990 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 including tutorials**

## **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. 3<sup>rd</sup> Edition, Paperback. Morgan Kaufmann Publishers In, 2011

## **COURSE OUTCOMES (CO)**

CO1: Understand and explain the fundamental concepts of data warehousing, OLAP systems, and their architectures to support decision-making processes.

CO2: Apply data mining techniques including data preprocessing, frequent pattern mining, and classification methods to extract meaningful knowledge from large datasets.

CO3: Evaluate and implement various classification algorithms such as decision trees, Bayesian classifiers, and support vector machines to solve real-world problems.

CO4: Analyze and apply different clustering techniques and outlier detection methods to group data and identify anomalies effectively.

CO5: Utilize data mining tools like WEKA and R to perform practical data analysis tasks and interpret the results for business intelligence applications.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS2996 - Data Processing

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

### Detailed Syllabus

#### Unit I: 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 II: 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 III: 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 IV: Machine Learning**

**12 Hours**

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

## **Unit V: 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 including tutorials**

## **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.

## **Course Outcomes (CO)**

Upon completion of this course, the students should be able to:

- CO1: Understand the basics of Data Processing including extracting the different measures/ statistics which characterize a dataset.
- CO2: Pre-process the data; cleaning of dataset including data imputation, removing outliers and be able to do standardization and scaling of dataset.
- CO3: Process and visualize the data using Python language.
- CO4: Data visualization using Tableau software and graph analysis.
- CO5: To develop and execute preliminary machine learning models and calculate known parameters.
- CO6: Handle time series, text and image data.

## **Assessment Scheme:**

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS2988 - Data Science for Business

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

### Detailed Syllabus

#### **Unit I: Data and Analysis in Real World 5 Hours**

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

#### **Unit II: Basic Statistics and Visualization 5 Hours**

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 III: Probability Concepts and Distribution 10 Hours**

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 IV: Data Mining & Business Intelligence 7 Hours**

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 V: Machine Learning Introduction 8 Hours**

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

## Unit VI: Big Data for Business

10 Hours

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

**Total Hours: 45 including tutorials**

## 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).

## Course Outcomes (COs)

CO1: Understand the role of data in business decision-making by identifying types of data, conceptual models, and the information-action value chain.

CO2: Apply basic statistical techniques and data visualization methods to summarize and interpret business data effectively.

CO3: Analyze business problems using probability theory, statistical distributions, sampling methods, and estimation techniques.

CO4: Demonstrate knowledge of data mining, clustering techniques, and business intelligence frameworks to extract actionable insights from business data.

CO5: Explain the fundamentals of machine learning and big data technologies, including Hadoop and MapReduce, and their applications in solving real-world business problems.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS2994 - Machine Learning Techniques

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

### Detailed Syllabus

#### Unit I: 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 II: Machine Learning Methods

12 Hours

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

#### Unit III: 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 IV: 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 V: Applications of Machine Learning

12 Hours

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

**Total Hours: 60 including tutorials**

### 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. 2<sup>nd</sup> Edition, Paperback. United Kingdom: Wiley, 2021.

## Course Outcomes (CO)

After completing the course students should be able to:

CO1. Interpret the fundamental concepts of machine learning.

CO2. Identify and analyze appropriate machine learning methods for solving real-world problems based on time, dimensionality, linearity, and non-linearity considerations.

CO3. Compare different machine learning models such as linear regression, classification, neural networks, decision trees, and support vector machines, and evaluate their performance.

CO4. Develop and fine-tune machine learning models using open-source libraries and cloud-based platforms.

CO5. Apply machine learning techniques to specific applications such as image recognition, speech recognition, fraud detection, and medical diagnosis.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## CS2992 - 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 including tutorials**

### 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.

## Course Outcomes:

CO1: Understand Statistical network properties and search techniques.

CO2: Detect and classify communities using algorithms.

CO3: Implement link prediction and network evolution models.

CO4: Investigate privacy challenges and privacy – preserving mechanisms in networks.

CO5: Implement visualization techniques for social network exploration.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## Track Specialization 1 (TS1): Development Studies

SI. No	Course Code	Track Specialization 1 (TS1)
		<b>Development Studies</b>
1	EC3698	Environmental Economics
2	EC3686	Gender Economics
3	EC 3682	Health Economics
4	EC2688	Urban Economics
5	EC3684	Global Political Economy
6	EC3696	Law and Economics
7	EC3680	Labour Economics
8	EC3688	Demography and Social Statistics

### EC3698 - Environmental Economics

Course Category	L	T	P	C
TS1	3	1	0	4

#### Course Content:

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

**10 Hours**

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

**10 Hours**

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

**10 Hours**

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

**10 Hours**

**Unit VI: 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**

**Total Hours: 60 including tutorials**

### **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. 2<sup>nd</sup> 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

### **Course Outcomes:**

- CO1: To familiarise on linkages between Economics and Environment, sustainable development, system of environmental accounting and to model environmental problems with economic perspective
- CO2: To link environmental problems with theory of choice, externalities and the selection of economic instruments to address them
- CO3: To examine and apply various methods of valuation of natural resources and environmental services using Total Economic Value (TEV) model.
- CO4: To identify and examine the economics of climate change

### **Assessment Scheme:**

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3686 - 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 including tutorials****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. 1<sup>st</sup> 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.

**Course Outcomes (CO):**

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

CO1: Understand key concepts of gender economics such as division of labour within households and various measures of women empowerment and gender inequality.

CO2: Analyze the role of institutions, such as families, schools, labour market and legal framework to understand gender disparities.

CO3: Apply gender-based economic theories to interpret labor market trends and gender disparities in employment and income and unfair labour.

CO4: Analyze the intersection of poverty, health, education and gender.

CO5: Evaluate the impact of economic policies and globalization on women’s work and livelihoods in both formal and informal sectors.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3682 - Health Economics

Course Category	L	T	P	C
TS1	3	1	0	4

### Course Content:

**Unit I: 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 II: 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 III: 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 IV: 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 V: 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 including tutorials**

## 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. 4<sup>th</sup> 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.

## Course Outcomes:

After the completion of the course, the students should

CO1: Understand the various concepts used in Health Economics.

CO2: Understand the various models of Healthcare, in the context of demand and supply of health care.

CO3: Apply the Economic theory to healthcare market with reference to output, costs and price of health care.

CO4: Critically evaluate the market paradigm for health care and the issues of market failure in healthcare provision.

CO5: Understand the various issues related to health insurance.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC2688 - Urban Economics

Course Category	L	T	P	C
TS1	3	1	0	4

### Course Content:

#### Unit I: 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 II: 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 III: 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 II: 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 V: 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 VI: 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 including tutorials**

## **Texts/References:**

1. Sivaramakrishnan, K. C., Singh, B. N., Kundu, Amitabh. Handbook of Urbanization in India. 2<sup>nd</sup> Edition, Paperback. India: OUP India, 25 June 2007.
2. Eisner, Simon., Gallion, Arthur., Eisner, Stanley. The Urban Pattern. 6<sup>th</sup> 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. 1<sup>st</sup> 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.

## **Course Outcomes (CO)**

After completing the course students should be able to:

CO1: Apply the principles of economics that explain the process of urbanisation under different historical and geographic contexts

CO2: Identify and explain, using economic-geography models, different aspects of urban change – size, growth, decay and stagnation

CO3: Interpret and analyze the process of urbanization, urban governance and planning policies in India

CO4: Identify the socio-economic issues in India's urban landscape by analysing various indicators associated to quality of urban life in India

CO5: Articulate and critically discuss policies that surround the various socio-economic issues and process of urbanisation India in different contexts and forums - through reports/presentations

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3684 - Global Political Economy

Course Category	L	T	P	C
TS1	3	1	0	4

## Course Content:

**Unit I: Introduction and Overview of GPE:** The context of GPE and its relevance

**3 Hours**

**Unit II: 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 III: 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 IV: 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 V: 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 International Institutions; North–South Relations and the Changing Concepts of Development

**12 Hours**

**Total Hours: 60 including tutorials**

## **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. 8<sup>th</sup> 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. 6<sup>th</sup> Edition, Paperback. India: Bloomsbury Academic, 3 April 2020.
5. Oatley, Thomas H. International Political Economy. 7<sup>th</sup> Edition, International Student Edition, Paperback. Routledge, 15 November 2022.

## **Course Outcomes (CO):**

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

CO1: comprehend the main economic theories and relevance of global political economy.

CO2: interpret the evolution and the changing dynamics of global political economy of trade and explain how international economic policies have been shaped by political outcomes.

CO3: acquire basic knowledge of regionalism, multilateralism, and financial crises in the context of international trade and global production network.

CO4: understand recent trends in geo-political occurrence and apply them in development and trade policy analysis.

CO5: articulate and critically apply the theoretical concepts learned in the course to analyse real-life case studies on global economic environment.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3696 - Law and Economics

Course Category	L	T	P	C
TS1	3	1	0	4

### Course Content:

#### Unit I: 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 II: Law and Development Economics Hours

**15**

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 III: 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 IV: 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 V: 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 including tutorials**

## **References**

1. Cooter, Robert., Ulen, Thomas. Law and Economics. 6<sup>th</sup> 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.

## **Course Outcomes**

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

- CO1: Understand law from the lens of economics using concepts of positive and normative economics.
- CO2: Apply methods of transaction cost, efficiency and game theory in the analysis of law and courtroom decisions.
- CO3: Analyse liability rules to achieve different outcomes.
- CO4: Explain economic theories of crime, contract and property law.
- CO5: Evaluate how law impacts economic outcomes.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3680 - 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 II: 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 III: 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 IV: 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 V: 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 including tutorials**

### **Text Books:**

1. Borjas, George J. Labor Economics. 5<sup>th</sup> 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. 2<sup>nd</sup> edition, Hardcover. United Kingdom: MIT Press, August 1, 2014.
2. Bazen, Stephen. Econometric Methods for Labour Economics. 1<sup>st</sup> 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. 14<sup>th</sup> 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. 1<sup>st</sup> 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.

### **Course Outcomes (COs):**

After completion of the course the students will be able to-

CO1: Explain fundamental labour market theories including labour supply and demand, wage determination, and employment dynamics across agricultural and industrial sectors.

CO2: Analyse and interpret the structure and functioning of labour markets using theories such as Lewis-Ranis-Fei and Harris-Todaro and evaluate the implications of rural-urban migration and labour dualism.

CO3: Assess the impact of labour laws, regulations, productivity and critically examine the role of government, trade unions, and labour institutions in addressing issues like discrimination, reforms in labour market-state and social security, Human capital, education- jobless growth, skill formation etc.

CO4: Analyse the dynamics of labour issues through presentations, project reports, and case-based discussions to demonstrate applied understanding of labour economics concepts.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)- Projects, Presentation, Research Paper etc.</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3688 - Demography and Social Statistics

Course Category	L	T	P	C
TS1	3	1	0	4

## Course Content

**Unit I: 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. **12 Hours**

**Unit II: 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, **12 Hours**

**Unit III: 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 **12 Hours**

**Unit IV: 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 **12 Hours**

**Unit V: 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 **12 Hours**

**Total Hours: 60 including tutorials**

## Text Books

1. Lundquist, Jennifer Hicke., Anderton, Douglas L., Yaukey, David. Demography: The Study of Human Population. 4<sup>th</sup> 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.

## Course Outcomes (COs):

**CO1:** Explain the basic concepts of demography, like population dynamics, demographic transition, and period-cohort analysis, and apply them to interpret patterns of population change.

**CO2:** Explain patterns and determinants of mortality and morbidity using life tables, mortality decompositions, and epidemiological frameworks across different country contexts.

**CO3:** Evaluate fertility trends and transitions, and assess factors influencing fertility using indicators like period and cohort fertility rates, proximate determinants, and birth interval analysis.

**CO4:** Explain population measurements and projection methodologies in a stable population model.

**CO5:** Apply demographic models and estimation techniques such as population projection, and the variable-r method to assess implications of demographic change in non-stable populations.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b>	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
<b>CAT 1 (20 marks)</b>		
<b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>		
Marks Scaled to	Total	100 %
<ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> </ul>	50 %	

<ul style="list-style-type: none"> <li>CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>		
--	--	--

## Track Specialization 2 (TS2): Finance

Sl. No	Course Code	Track Specialization 2 (TS2)
<b>Finance</b>		
1	EC3672	Financial Markets
2	EC3694	Financial Economics
3	EC3676	Auditing
4	EC3670	Investment Management
5	EC3678	Agricultural Finance
6	EC3674	Financial Econometrics
7	EC3692	Derivatives and Risk Management
8	EC3790	Applied Financial Modelling

### EC3672 - Financial Markets

Course Category	L	T	P	C
TS2	3	1	0	4

### Detailed Contents of Syllabus

**Unit I: 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 II: 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 III: 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 IV: 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. 5<sup>th</sup> 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. 5<sup>th</sup> 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. 11<sup>th</sup> 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.

## Course Outcomes (CO):

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

CO1: Get a significant grasp of the role of financial markets

CO2: Understand how the collective action of the Central Bank, the Banking System, and the public determine prices of financial and real assets.

CO3: Understand factors influencing prices of bonds, stocks, and exchange rates.

CO4: Understand the valuation of debt and equity instruments

CO5: Appreciate the functioning of the currency market

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3694 - 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.

**Total 60 hours including Tutorials**

### 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. 12<sup>th</sup> 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. 11<sup>th</sup> 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.

## Course Outcomes (CO):

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

CO1: Apply the basic knowledge in finance like interest rates, annuity and cashflows in the analysis of Indian financial markets, instruments, and institutions.

CO2: Understand the role played by time, uncertainty, information, and inflation in evaluating financial instruments and markets.

CO3: Acquire basic knowledge of how securities are priced, the risk and return trade-off in financial markets and possible regulatory responses.

CO4: Interpret the theoretical frameworks of different capital budgeting techniques that are applied by firms while making capital investment decisions.

CO5: Articulate and critically apply the theoretical concepts learned in the course to analyse real-life case studies on financial decision-making process.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"><li>• CAT 1 (10 %)</li><li>• Mid-Sem (30 %)</li><li>• CAT 2 (10 % )</li></ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	<b>Total</b> <b>50 %</b>	<b>100 %</b>

## EC3676 - AUDITING

Course Category	L	T	P	C
TS2	3	1	0	4

### Detailed Contents of Syllabus

**Unit I: 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. **12 Hours**

**Unit II: 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 **12 Hours**

**Unit III: 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. **12 Hours**

**Unit IV: 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 **12 Hours**

**Unit V: 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; **12 Hours**

**Total 60 hours including Tutorials**

### 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. 18<sup>th</sup> Edition. United Kingdom: Pearson, 2023.
3. Knapp, Michael C. Contemporary Auditing: Real Issues and Cases. 12<sup>th</sup> Edition, Paperback. United States: Cengage, 2021.
4. Pagare, Dinkar. Principles and Practice of Auditing. Paperback. Sultan Chand & Sons, 2020.
5. Gupta, Kamal. Contemporary Auditing. 6<sup>th</sup> 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. 3<sup>rd</sup> 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. 2<sup>nd</sup> 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

## Course Outcomes (CO):

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

- CO1: Get familiar with auditing standards and guidance notes of the ICAI.
- CO2: Have a good understanding of the audit planning and execution.
- CO3: Carry out risk assessment for better internal control.
- CO4: Understand the issues involved in the audit of listed entities.
- CO5: Understand the considerations in preparing audit reports and carrying out forensic audits.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> <b>CAT 1 (20 marks)</b> <b>Mid-sem (50 Marks)</b> <b>CAT 2 (20 Marks)</b>	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 % )</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3670 - Investment Management

Course Category	L	T	P	C
TS2	3	1	0	4

### Detailed Contents of Syllabus

**Unit I: 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 **12 Hours**

**Unit II: 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 **12 Hours**

**Unit III: 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 facto, 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 **12 Hours**

**Unit IV: Performance Evaluation:** Evaluating Managed Fund Performance, holding period and time weighted rates of return bench marking, 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 **12 Hours**

**Unit V: Alternative Investments:** Hedge funds, private equity, real estate, commodities, and infrastructure, diversifications and higher returns **12 Hours**

**Total 60 hours including Tutorials**

### Suggested Readings

1. Bodie Zvi., Kane, Alex and. Marcus, Alan. J. Investments. 13<sup>th</sup> 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. 9<sup>th</sup> Edition, Paperback. United Kingdom: Wiley, 2014.
4. Hirt, Geoffrey A., Block, Stanley B. Fundamentals of Investment Management. 10<sup>th</sup> Edition, Hardcover. McGraw-Hill Education, 2011.
5. Leeds, Sanford., Reilly, Frank., Brown, Keith. Investment Analysis and Portfolio Management. 12<sup>th</sup> 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. 6<sup>th</sup> 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. 7<sup>th</sup> 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. 2<sup>nd</sup> 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.

## Course Outcomes (CO):

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

CO1: Describe performance measurement measures

CO2: Evaluate portfolio performance.

CO3: Describe and contrast different investment strategies.

CO4: Propose investment strategy solutions

CO5: Evaluate alternative avenue of investments

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (30 %)</li> <li>• CAT 2 (10 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3678 - Agricultural Finance

Course Category	L	T	P	C
TS2	3	1	0	4

### Detailed Syllabus

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

**10 Hours**

**Unit II:** 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 III:** 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 IV:** 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 V:** International Experience – Case Study of China

**5 Hours**

**Total 60 hours including Tutorials**

### 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](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.

## Course Outcomes

CO1: Explain the historical evolution and key policy milestones in agricultural finance in India, along with emerging trends in agricultural credit.

CO2: Differentiate between institutional and non-institutional sources of agricultural credit and evaluate the role of various financial agencies in addressing regional and activity-wise disparities

CO3: Assess the effectiveness of inclusive credit models and innovations such as Priority Sector Lending, Interest Subvention Scheme

CO4: Analyze the causes and consequences of farm loan waivers on credit culture and fiscal health, and draw lessons from international experiences such as China's agricultural finance system

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks: Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz, /Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3674 - 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

**Total 60 hours including Tutorials**

## 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.

## Course Outcomes (CO):

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

CO1: Review and apply regression analysis and statistical inference with real data from financial markets.

CO2: Develop skills in modeling and forecasting financial time series data.

CO3: Understand and model seasonality in financial data and estimate regime switching model using Markov and Kalman Filter methods.

CO4: Gain foundational knowledge in modelling volatility and estimating long run relationships with high frequency financial data.

CO5: Articulate and critically apply the statistical and econometric concepts learned in the course to analyse real-life case studies on financial markets.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 %) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3692 - 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.

**Total 60 hours including Tutorials**

### 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, 11<sup>th</sup> 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.

## Course Outcomes (CO):

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

CO1: Apply the basic knowledge in finance in the analysis of different derivative instruments like forwards, futures, options, and swaps.

CO2: Understand how forwards and futures are valued and the roles played by them in managing financial risk.

CO3: Acquire basic knowledge of how different derivative instruments can be used to manage foreign exchange risk exposure of the firms.

CO4: Interpret the theoretical frameworks of option pricing techniques and appreciate their importance in risk management.

CO5: Articulate and critically apply the theoretical concepts learned in the course to analyse real-life case studies on financial risk management process.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to • CAT 1 (10 %) • Mid-Sem (30 %) • CAT 2 (10 % ) <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## EC3790 - APPLIED FINANCIAL MODELLING

<b>Course Category</b>	<b>Track Specialization 2: Finance (TS2 Elective)</b>		<b>Credits</b>	4
<b>Marks</b>	<b>Internal</b>	<b>ESE (Theory+ Practical)</b>	<b>Hours/Semester</b>	60
	30	70	<b>L : T : P</b>	2-0-4
<b>Course Objective</b>	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.			
<b>Course Outcome</b>	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			

<b>Unit 1</b>	<b>Introduction to Models</b>	<b>10 hours</b>
	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	
<b>Unit 2</b>	<b>Review of Advanced Spreadsheet Techniques</b>	<b>10 hours</b>
	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	
<b>Unit 3</b>	<b>Construction of a 3 Statement Model</b>	<b>10 hours</b>
	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.	
<b>Unit 4</b>	<b>Forecasting and Scenario Modelling</b>	<b>10 hours</b>
	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	
<b>Unit 5</b>	<b>Fundamental Analysis vs Charting</b>	<b>10 hours</b>
	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	
<b>Unit 6</b>	<b>Creating Dashboards</b>	<b>10 hours</b>
	Dashboard design principles, advanced charting, Form control, data validation, conditional formatting, adding interactivity, Pivot Tables, Slicers, Pivot charts	

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 30 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (10 marks) Mid-sem (50 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>160</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"> <li>• CAT 1 (10 %)</li> <li>• Mid-Sem (20 %)</li> </ul> <b>Total Internal Continuous Assessment (ICA) 30 %</b>	Total 70 % (40% ESPE + 30% ESTE)	100 %

\*ESPE – End Sem Practical Examination

\*ESTE – End Sem Theory Examination

## Course Outcomes (CO):

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

CO1: Gain foundational knowledge in modelling principles, spreadsheet errors, and best practices.

CO2: Review and apply advanced spreadsheet techniques for what-if analysis and identifying key variables.

CO3: Construct a 3-statement financial model and perform valuation using DCF methods.

CO4: Develop skills in forecasting and scenario modelling, including regression analysis and risk handling.

CO5: Learn dashboard design principles and advanced charting techniques for creating interactive dashboards.

## Semester IV

### EC2598 - INTERNATIONAL TRADE (For Honors Students Only)

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

### Detailed Syllabus

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

#### Hours

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

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

**Total 60 hours including Tutorials**

### 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. 13<sup>th</sup> Edition, Paperback. Wiley India Pvt Ltd, 1 September 2021.

## Course Outcomes

CO1: Build a knowledge base on the fundamental concepts of international trade like balance of payment, exchange rate, purchasing power parity, process of globalization, different stages of globalization

CO2: To discuss the theories on international trade: the Mercantilist, Classical and Neo-classical theories

CO3: To discuss new theories on intra-industry trade with empirical evidence

CO4: To the role of interventions in trade and limitations of free trade identify the changes in global value chain, working of MNCs and latest changes in the process of globalization

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> <b>100 marks</b>	<b>Total</b> <b>190</b> <b>marks</b>
Marks Scaled to <ul style="list-style-type: none"><li>CAT 1 (10 %)</li><li>Mid-Sem (30 %)</li><li>CAT 2 (10 %)</li></ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %

## Semester V

### EC3599 - HISTORY OF ECONOMIC THOUGHT

(For Honours 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.

**Total Hours: 60 including tutorials**

## 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

## Course Outcomes

A student who has successfully completed the course should be able to:

- CO1: Explain the theories introduced by different economic thinkers.
- CO2: Understand the evolution and relevance of the schools of economic thought in the historical context.
- CO3: Understand the contemporary relevance of the various schools of economic thought.
- CO4: Examine critically the validity of assumptions underlying various schools of economic thought.
- CO5: Compare and contrast the various schools of economic thought.

## Assessment Scheme:

**Total Marks of Internal Continuous Assessment (ICA) : 90 Marks**

**Distribution of ICA Marks : Term Work**

**Term Work = Components can be any of the following, Assignment/Class Participation/ Classroom Activity/Project Work/Case Study/Viva/ Presentation, /Quiz,/Group discussion, MCQs/any other.**

Evaluation Scheme		
<b>Internal Continuous Assessment (ICA)</b> CAT 1 (20 marks) Mid-sem (50 Marks) CAT 2 (20 Marks)	<b>End Examination</b> 100 marks	<b>Total</b> 190 marks
Marks Scaled to <ul style="list-style-type: none"><li>• CAT 1 (10 %)</li><li>• Mid-Sem (30 %)</li><li>• CAT 2 (10 %)</li></ul> <b>Total Internal Continuous Assessment (ICA) 50 %</b>	Total 50 %	100 %