

	<b>Program me :</b>	<b>B.Sc- Economics, Mathematics, Statistics(EMS)</b>		
	<b>Economics</b>			
	<b>PO Code</b>	<b>Programme Outcomes</b>		
	<b>PO 1</b>	Provide specific knowledge of relevant mathematical, statistical and econometric methods and the ability to employ specific econometric model.		
	<b>PO 2</b>	Deliver knowledge and understanding of topics in microeconomic and macroeconomic theory at a more advanced level, and extend knowledge of a specific topic in micro and macroeconomic theory.		
<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>CO Code</b>	<b>Course Outcomes</b>
I	ECO1MIE	Micro Economics-I	CO 1	To comprehend the role of scarcity, basic economic problems, production possibility curve, types of economic systems and analytical tools in economic models
			CO 2	To identify the determinants of supply and demand; market equilibrium, demonstrate the impact of shifts in both market supply and demand curves on equilibrium price and output and impact of Government intervention on market equilibrium.
			CO 3	Calculate supply and demand elasticities, identify the determinants of price elasticity of demand and supply, economic application of the concept of elasticity and demonstrate the relationship between elasticity and total revenue.
			CO 4	To understand consumer behaviour and consumer equilibrium using the cardinal and ordinal approaches

			CO 5	Describe the production function, Laws of Production, production equilibrium and production functions.
			CO 6	To comprehend mathematical approach in understanding microeconomic analysis.
II	ECO2ME	Microeconomics II	CO 1	Understanding the concept of firm, economic goals of the firms and theories of firms
			CO 2	To identify the characteristics of perfect competition, firm equilibrium under perfect competition and impact of time element on market equilibrium
			CO 3	To identify the characteristics of monopoly market, firm equilibrium under monopoly; concept of monopoly power and price discrimination
			CO 4	To identify the characteristics and firm equilibrium of monopolistically competitive oligopoly markets; introduction to Game Theory
			CO 5	To be able to comprehend the functioning of factor market and determination of factor prices
			CO 6	To understand the concept of economic efficiency including Pareto Efficiency
III	ECO3MRE	Macroeconomic s-I	CO 1	Identify and explain important macroeconomic concepts with National Income and measurement of inflationary index.
			CO 2	Discuss the Classical macroeconomic model and use this model to interpret the behavior of employment theory.
			CO 3	Analyze simple Keynesian macroeconomic model to describe component elements in employment theory and connect the employment sector to investment and government spending decisions with multiplier effect. Also this module help to elucidate the full aggregate demand/aggregate supply model and explain its origins, uses and limitations.
			CO 4	Understanding and application of the theory of consumption and investment function with Keynesian theory of Consumption Function, Relative Income Hypothesis, Permanent Income Hypothesis & Life Cycle Hypothesis,

				Capital Accumulation, Marginal Efficiency of Capital and Accelerator.
			CO 5	Explain and understanding the theory of money market from its demand-side, how money is created by lending, the money multiplier, the Keynesian concept of the Liquidity Trap and explain why it occurs and how it reduces the effectiveness of monetary policy.
IV	ECO4M AE	Macroeconomic s II	CO 3	Describing the role of financial market with banking and non banking institutions, its function and monetary policy.
			CO 4	Basic understanding of the functions and role of Government and inevitable intervention in the various economic activities, its Market Failure, Public Goods and Externalities and market inefficiency with Pigovian tax and subsidies, tradable permits, Coase Theorem.
			CO 1	Broad understanding of the demand dimensions of money with respect to the theoretical background with its Fisher and Cambridge Approach, Classical Theory of Interest and Keynesian theory of money demand.
			CO 2	Analyzing the inflationary and deflationary macroeconomic concepts with explaining the Business cycle, Philips' curve, impact of Okun's law and its policy implication.
			CO 5	Describing a theoretical base on the relevance of public expenditure – its structure and growth, the rationale behind taxation, knowledge of various views on public debt in terms of debt burden and inter-generation transfer of debt, examining the centre-state financial relations and discussion on current issues such as Union Budget and Finance Commission.
			CO 6	Describing the macroeconomic policies with fiscal and monetary phenomenon.
V	ECO5DE	Development Economics	CO 1	To comprehend the meaning of development and its indicators; obstacles to development in UDCs and critical development issues like Planning, Market Failure and Role of State

			CO 2	To understand the concept of Poverty & Economics inequality and the various measures of Poverty & Inequality
			CO 3	To understand the various theories, which examine the relationship of population and economic development
			CO 4	To analyse the trends, causes and impact of Urbanization and Migration
			CO 5	To understand the concept, role of human capital and its components; the capital formation process in the economy and causes for low capital formation in the developing economies
			CO 6	To comprehend the meaning of sustainable development, types of goods, and free rider problem
	ECO5IEP P	Indian Economy- Performance & Policies	CO 1	To critically comprehend the Drain of Wealth Theory, Nehruvian Growth Strategy & Planning, India's growth trends, 1991 crisis and its evolution as an Emerging Economy
			CO 2	To analyze the changes in India's Population trends, principle of demographic dividend, characteristics of India's Labour Market and HDI status of India
			CO 3	To develop a complete understanding of the Indian agriculture in terms of its importance, Green Revolution, the challenges of Indian agriculture, Pricing Policy and marketing challenges
			CO 4	To gain an insight into the Industrial Policies with focus on 1991 Policy, the challenges in the operation of Public Sector Undertakings and Privatization process
			CO 5	To understand the fundamentals of India's external sector i.e. trade trends, BOP situation, foreign capital flows, rupee convertibility and SEZ.
			CO 6	To identify the key features of India's financial markets, budget and finances
VI	ECO6IE	International Economics	CO 1	To comprehend the theoretical background of International Trade by analyzing the analytical tools, theories of trade and terms of trade
			CO 2	To analyse the trade policy of protection and free trade, understand the types and impact of tools of protection; comprehend the nature and impact of economic integration

			CO 3	To analyse the features and trends in international factor movements i.e.capital flows and labour movement
			CO 4	To understand the structure and causes for BOP disequilibrium; evaluate the various approaches to addressing the BOP disequilibrium
			CO 5	Understanding the nature and functioning of foreign exchange market, theories of foreign exchange rate, process of devaluation and its impact and foreign trade multiplier
			CO 6	To understand the main features of the international monetary system
	ECO6EE	Econometrics	CO 1	To understand the subject and the basic concepts of Statistics, estimation and testing hypothesis concept which will be used in following modules.
			CO 2	To analyse OLS with one independent variable, its properties and goodness of fit and understanding the problem, diagnostics and remedies when CLRM assumptions are relaxed.
			CO 3	Introduce multiple regression models, properties, goodness of fit, short coming and remedies.
			CO 4	To analyse the detailed concept of dummy variable, structural stability of regression model & interaction effect.
			CO 5	To understand the concept, problem and rules of identification in simultaneous equation model.
			CO 6	Use of maximum likelihood method in Logit, Probit& Tobit model
	<b>MATHEMATICS</b>			
	PO Code	<b>Programme Outcomes</b>		

	<b>PO1</b>	Enables the students to take up advanced studies in the core subjects and enable them to find opportunities in careers in Science and Technology and Management where a high level of competence and dependence on many of the science subjects is demanded.		
	<b>PO 2</b>	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.		
	<b>PO 3</b>	Formulate and develop mathematical arguments in a logical manner.		
	<b>PO 4</b>	Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses.		
	<b>PO 5</b>	Understand, formulate and use quantitative models arising		

		in physical sciences, business and other contexts.		
Semester	Course Code	Course Name	CO Code	Course Outcomes
I	MAT1M AIB	Mathematical Analysis-I	CO1	Define and recognize the basic properties of the field of real numbers. Define and recognize the basic properties of the field of real numbers
			CO2	Have the knowledge of the series of real numbers and convergence..
			CO3	Shown the ability of working independently and with groups.
			CO4	. Studying Leibnitz theorem – Roll’s theorem, Langrange’s Mean Value theorem, Taylor’s theorem Maclarurin’s expansion Theorem and Cauchy criteria.
			CO5	Skill of solving integral calculus like reduction formulae.
			CO6	Application of Integral Calculus by solving the problem of standard curves
II	MAT2M AIA	Mathematical Analysis-II	CO1	. Define and recognize the differentiability of real functions and its related theorems
			CO2	Have the knowledge of real functions- limits of functions and their properties. Interpret how to Know the differentiability and related theorems.
			CO3	Define and recognize the basic topological properties of R Define and recognize the continuity of real functions
			CO4	Interpret how to Know the continuity using the internet.
			CO5	Studying the differentiability of real functions and related theorems .
			CO6	Skill of solving problems on Fourier series.
III	MAT3DE	Differential Equations	CO1	Apply the concepts of Ordinary Differential Equations and Partial Differential Equations for their resolution and developed the knowledge to solve problems in higher order ordinary linear differential equations, Methods of finding Complementary function and Particular integral.

			CO2	Understand the difficulty of solving problems analytically and capable to formulate and solve problems in concepts like simultaneous differential equations, Legendre's linear differential equation and Cauchy's linear differential equation
			CO3	Recognize and work with problems in Second Order Ordinary Differential Equations with variable coefficient with various methods and developed skills to understand concepts like Special functions.
			CO4	Able to work and apply concepts in Second order linear partial differential equations, canonical form for parabolic, elliptic and hyperbolic equations.
			CO5	Use computational tools to formulate and solve problems of one-dimensional heat and wave equation and two-dimensional Laplace equation using Fourier series
			CO6	Analyze real world problems and recognize when partial differential equations are appropriate, formulate problems about them, creatively model these (using technology, if appropriate) to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
IV	MAT4A GR	Algebra - Groups and Rings	CO1	Assess properties implied by the definitions of groups and rings.
			CO2	Use various canonical types of groups (including cyclic groups) and canonical types of rings (including Quotient rings).
			CO3	Analyze and demonstrate examples and theorems of subgroups, normal subgroups and quotient groups.
			CO4	Analyze and demonstrate examples of Subring, Integral domains, Ideals, Maximal Ideals and quotient rings.
			CO5	Use the concepts of isomorphism and homomorphism for groups and rings.
			CO6	Produce rigorous proofs of propositions arising in Fundamental theorem of homomorphism in groups and rings.
			CO7	Apply problem-solving using advanced algebraic techniques applied to diverse situations in physics, engineering and other mathematical contexts.

V	MAT5CA D	Complex Analysis	CO1	The student realizes the importance of fundamental concepts of complex analysis and their role in modern mathematics and applied contexts
			CO2	The student will be able to analyze the ideas of complex differentiation and complex integration in a coherent and meaningful manner and use appropriate techniques for solving related problems and for establishing theoretical results.
			CO3	The student gains knowledge about Complex Number System and understands the relation to other existing number systems
			CO4	The student will develop the critical thinking ability by proving mathematical conjectures and establishing theorems
			CO5	The student gains competence to understand the operations with complex numbers, use the complex derivatives function, use and operate analytic functions, demonstrate knowledge of integration in the complex plane, use the Cauchy integral theorem and Cauchy integral formula, manipulate and use power series, understand residues and their use in integration, demonstrate the understanding of conformal mappings
			CO6	The student will be able to appreciate the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations
			CO7	The student will be able to apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.
	MAT5LA A	Linear Algebra	CO1	Use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, Eigenvalues and eigenvectors, orthogonality and diagonalization. (Computational and Algebraic Skills).
			CO2	Use visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems, and view solutions, especially in $R^2$ and $R^3$ , as well as conceptually extend these results to higher dimensions. (Geometric Skills).

			CO3	Critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra. (Proof and Reasoning).
			CO4	Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as an aid in solving problems and presenting solutions (Technological Skills).
			CO5	Communicate and understand mathematical statements, ideas and results, both verbally and in writing, with the correct use of mathematical definitions, terminology and symbolism (Communication Skills).
			CO6	Work collaboratively with peers and instructors to acquire mathematical understanding and to formulate and solve problems and present solutions (Collaborative Skills).
VI	MAT6E OTC	Optimization Techniques	CO1	Understand the importance of optimization of industrial process management
			CO2	Apply basic concepts of mathematics to formulate an optimization problem
			CO3	Analyze and appreciate variety of performance measures for various optimization problems
			CO4	Develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
			CO5	Solve a multi-objective problem through weighted and constrained methods
	MAT6N AA	Numerical Analysis	CO1	Understand the importance of computers and the role of approximations and errors in the implementation and development of numerical methods.
			CO2	Gain sufficient information to successfully approach a wide variety of problems dealing with roots of equations
			CO3	Solve problems involving linear algebraic equations and appreciate the application of these equations in many fields.
			CO4	Approach a wide variety of engineering problems dealing with optimization.
			CO5	Enhance their capability to fit curves to data.
			CO6	Solve ordinary differential equations and eigenvalue problems.

STATISTICS				
	<b>PO Code</b>	<b>Programme Outcomes</b>		
	PO1	Acquire the ability to bring together and flexibly apply knowledge to characterise, analyse and solve a wide range of problems		
	PO2	Recognize and appreciate the connections between theory and applications		
	PO3	Independently read statistical literature of various types, including survey articles, scholarly books and online sources		
	PO4	Have the versatility to work effectively in a broad range of analytic, scientific, government, financial, health, technical and other positions		
	PO5	Choose appropriate statistical methods and demonstrate their ability to apply various concepts in exploratory data analysis		
	PO6	Use different statistical software to carry out data analysis		
	PO7	Have the intellectual curiosity and flexibility to grow with developing technology and new methods		
Semester	Course Code	Course Name	CO Code	Course Outcomes
I	STA1DPA	Descriptive Statistics and Probability	CO1	Explain, recognise and identify different data types.
			CO2	Calculate and interpret the various descriptive measures for centrality and dispersion; assess which methods are appropriate for a given data set.
			CO3	Describe how outliers affect various numerical summaries.
			CO4	Find and interpret the sample correlation and regression coefficients.

			CO5	Identify and understand from a probability scenario different kinds of events.
II	STA2DA B	Discrete Distributions and Applied Statistics	CO1	To understand different probability functions with respect to univariate and bivariate discrete random variables.
			CO2	To learn and derive the properties of theoretical discrete distributions like Bernoulli, binomial, Poisson, hypergeometric, geometric and negative binomial.
			CO3	To understand and appreciate the role of official statistics, NSSO and CSO in governance.
			CO4	Demonstrate knowledge and understanding of index numbers theory and methods and be able to provide practical solutions to general aggregation problems.
			CO5	To understand and apply the elementary concepts and methods to measure trend and seasonal variations underlying a time series data.
			CO6	To analyse and interpret basic demographic measures.
III	STA3CD A	Continuous Distributions	CO1	To understand different probability functions with respect to univariate and bivariate continuous random variables.
			CO2	To be able to determine the appropriate areas under a normal probability curve and to prove important properties of normal distribution.
			CO3	To learn and derive the properties of other theoretical continuous distributions like uniform, exponential, beta and gamma.
			CO4	To describe the abstract idea of a sampling distribution and how it reflects the sample to sample variability of a statistic.
			CO5	To derive chi-square, t and F distributions from normal distribution, their important properties and inter-relationships.
			CO6	Apply the Central Limit Theorem to problems involving sums and averages of variables from arbitrary distributions.
IV	STA4SIA	Statistical Inference	CO1	To understand the need for statistical inference and point estimation of the parameters, properties of the point estimates.

			CO2	Discussion of method of maximum likelihood function and method of moments of obtaining point estimators.
			CO3	To identify the appropriate null and alternative hypotheses in different scenarios.
			CO4	Discussion of the Neyman-Pearson lemma and its utility in the construction of most powerful tests; construction of uniformly most powerful and likelihood ratio tests.
			CO5	To understand the informal and formal explanations of any confidence interval and the different factors that influence it.
			CO6	Construction of the pivotal quantity and use it to derive intervals for common population parameters involving means and proportions.
V	STA5ST NTA	Sampling Theory and Nonparametric Tests	CO1	To understand the need for sampling, difference between non probability and probability sampling; to understand different non-probability sampling methods.
			CO2	To distinguish between sampling and non-sampling errors.
			CO3	To learn about a variety of sampling methods like simple random, stratified and systematic sampling; estimates of the parameters and their standard error.
			CO4	To appreciate that estimation procedures depend on the sample design.
			CO5	To compare and contrast parametric and nonparametric tests; identify multiple applications where nonparametric approaches are appropriate.
			CO6	To perform and interpret important non parametric test procedures.
	STA5TS DEB	Tests of Significance and Design of Experiments	CO1	To derive test statistics for common tests of significance.
			CO2	To understand the concept of p-value and its role in a test of significance.
			CO3	To recognize the situation in which the analysis of variance (ANOVA) is appropriate and be able to perform one-way and two-way ANOVA.
			CO4	To understand the importance of statistical design of experiments.
			CO5	To learn the statistical analyses of CRD, RBD and LSD.

			CO6	To understand the difference between simple and factorial experiments. The need for a factorial experiment, analyses of a 22 and 23 factorial experiments and confounded 23 factorial experiments.
VI	STA6ORB	Operations Research	CO1	To formulate and solve a linear programming problem (LLP) by graphical and simplex methods and to understand the different types of solutions that can be obtained while solving a LLP.
			CO2	To discuss the basic structure of a transportation problems and assignment problems and methods of solving them
			CO3	Solve simple decision problems and game problems using different techniques.
			CO4	To construct a simple network diagram; Critical path calculation and PERT.
			CO5	To describe an inventory system, simple inventory models-mathematical solutions.
			CO6	To understand a queueing system and its different components; characteristics of a single server queue.
	STA6ISA	Industrial Statistics	CO1	To understand the aims and objectives of Statistical Quality Control, the different quality tools and quality standards.
			CO2	To construct control charts for variables and attributes.
			CO3	To understand the meaning of product control; role of sampling plans.
			CO4	To be able to interpret the results of process capability studies.
			CO5	To learn the reliability concepts and calculate failure rate assuming different probability distributions.
			CO6	To generate observations from different probability distributions.