

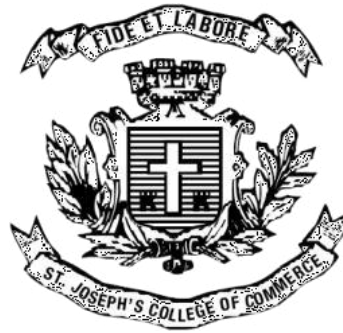
St. Joseph's College of Commerce (Autonomous)

163, Brigade Road, Bengaluru - 560 025

Accredited with 'A++' Grade (4th Cycle) by the National Assessment
and Accreditation Council (NAAC)

Recognized by the UGC as

"COLLEGE WITH POTENTIAL FOR EXCELLENCE"



BSc Economics, Mathematics & Data Science Semester - I & II

*Syllabus as per Karnataka State Education Policy 2024
Curriculum Framework w.e.f., 2024-2025*

Academic Year 2024 - 2025

Batch 2024

St. Joseph's College of Commerce (Autonomous) **Affiliated to Bengaluru City University**

St. Joseph's College of Commerce (SJCC) was formerly a part of St. Joseph's College, established in the year 1882. The Commerce Department was established in the year 1949 and it became an independent college with its own building in Brigade Road in the year 1972.

The college has in its Vision a model for higher education which encourages individuals to dream of a socially just world and in its Mission a strategy to empower individuals in realizing that dream.

With an objective of imparting quality education in the field of Commerce and Management, the college has been innovating in all aspects of higher education over a long period of time. These innovations were further bolstered with the granting of autonomous status to the college by UGC in September 2005. From then on, the college has taken a lead in reforming curriculum and syllabus, examination and evaluation pattern and teaching and learning methods through the Board of Studies, the Academic Council and the Governing Council comprising of eminent academicians, industry representatives and notable alumni.

The college has undergone four cycles of NAAC accreditation starting from the year 2000 in which it secured 'five stars', next in the year 2007 an 'A' grade, in the year 2012 again an 'A' grade and recently in February 2021 an 'A++'. It is one of the very few institutions in the country to have secured A++ grade in the fourth cycle under the Revised Accreditation Framework (RAF) and the first college in Karnataka to do so. The college was declared as a 'College with Potential for Excellence' in the year 2010. In 2011, SJCC was recognized as a Research Centre by Bangalore University. The college has been ranked 55th in the National Institutional Ranking Framework (NIRF) ratings of Ministry of Education, Government of India, in 2024 and it has been the only institution from Karnataka to make it consistently to the top 100 in the country.

The college offers diverse programmes in Commerce, Business Administration Arts and Science. Under Commerce Studies it offers B.Com, B.Com (Professional-International Accounting and Finance), B.Com (BPM- Industry Integrated), B.Com (Travel and Tourism), B.Com (Analytics), B.Com (Professional - Strategic Finance), M.Com (Finance & Taxation/ Marketing & Analytics), M.Com (International Business) & M.Com (Financial Analysis). Under Business Administration it offers BBA, BBA (Entrepreneurship) and BBA (Professional- Finance and Accountancy). Under Arts it offers BA (English, Communicative English and Psychology) and Under Science it offers B.Sc (Economics, Mathematics and Data Analytics). The college also offers five one-year Post Graduate Diploma programmes.

THE DEPARTMENT OF ECONOMICS

The Department of Economics offers B.Sc (Economics) Honours. This Department has been started to incorporate the multidisciplinary spirit of the new NEP 2020. The B.Sc (Economics) Honours programme has been designed to provide a cutting edge expertise in mainstream economics with minor (psychology). The programme aims to develop analytical, creative and critical thinking skills for problem solving and decision making. It aims at better understanding of social, economic, psychological and political issues and also explores the full spectrum of finance. The transferable skills attained through the B.Sc (Economics) Honours are highly sought after by employers and increase the employability quotient of students in various dynamic fields. A student could be an economist, a government advisor, financial consultant,

econometrician, banker and also look forward to different government positions after successful completion of the programme. Keeping in view the new NEP, the programme is multidisciplinary in nature and integrates different fields like Psychology, Finance, Mathematics, Statistics, Operations Research, History, Politics, Environmental Studies, Model Building with an inbuilt local as well as global perspective.

New elements such as internship, case studies, seminars and research projects enhance deeper understanding of the practical applications of the programme. So, join in to embark on a whole new adventure with us. The Bachelor's degree honours programme in Economics is a full-time undergraduate programme of 4 years that aims at providing a programme structure which would retain the 'traditional' in the programme and equip the students with business acumen necessary to succeed in the professional world. On completion of B.Sc. (Economics) Honours at SJCC, students will acquire comprehensive knowledge of how the economic principles are applied in the society, family, government and private sector, business, and science.

Economics Major

Develops expertise in mainstream economics, enhancing analytical, creative, and critical thinking for effective problem-solving and decision-making.

- Offers an interdisciplinary approach by integrating fields like Finance, Mathematics, Programming (Python & R), History, and Environmental Studies with local and global perspectives

- . • Equips students with transferable skills, boosting employability for roles such as economist, government advisor, financial consultant, and banker

Mathematics Major

- Provides a strong foundation in core mathematical topics such as calculus, linear algebra, and optimization methods, emphasizing problem-solving and analysis.

- Focuses on practical applications, enabling students to tackle real-world problems in areas like science, engineering, and economics.

- Enhances proficiency in computational tools and techniques through projects and case studies, with applications in data analysis, operations research, and finance.

Data Analytics Major

Develops essential skills in data cleaning, statistical techniques, exploratory analysis, and machine learning applications for informed decision-making.

- Offers hands-on experience with tools like Python, R, Power BI and SQL for data manipulation, visualization, and problem-solving.

- Applies knowledge to real-world challenges in industries such as finance, healthcare, and marketing through case studies and projects.

OBJECTIVES OF THE BSC PROGRAMME

- To impart knowledge to students in functional areas of economics so that they may pursue careers in economics, Maths & Data Analytics.
- To incorporate extensively – along with theoretical knowledge sharing – various skills (viz., Presentations, rapid reading, geo political awareness, time management) needed for managerial effectiveness.
- To gain diverse employment prospects, master microeconomics and macroeconomics, and cultivate problem-solving and decision-making skills.
- To develop a thorough grasp of data analysis, comprehend statistical and mathematical techniques, and master the utilization of technology for proficient data analysis.
- To acquire practical insights, apply knowledge to real-life scenarios, and make sound financial decisions.

I. ELIGIBILITY FOR ADMISSION

Candidates who have completed the two-year Pre-University course of Karnataka State or its equivalent are eligible for admission into this Programme.

II. DURATION OF THE PROGRAMME

The duration of the programme is three (03) years of Six Semesters. A candidate shall complete his/her degree within five (5) academic years from the date of his/her admission to the first semester. Students successfully completing three (03) years of the course will be awarded Bachelor's Degree in Economics, Mathematics & Data Analytics.

III. MEDIUM OF INSTRUCTION

The medium of instruction shall be in English.

IV. ATTENDANCE

- a. A student shall be considered to have satisfied the requirement of attendance for the semester, if he/she has attended not less than 75% in aggregate of the number of working periods in each of the courses, compulsorily.
- b. A student who fails to complete the course in the manner stated above shall not be permitted to take the End Semester Examination.

V. TEACHING AND EVALUATION

MSc/MA/M.Com/MBA/MFA/MBS/MTA graduates with B.Sc/BA/B.Com as basic degree from a recognized university are only eligible to teach and to evaluate the courses including part – B courses of I and II semesters except languages, compulsory additional courses and core Information Technology related courses, Skill based, Value Based and Foundation courses, mentioned in this regulation. These courses shall be taught by the Post graduates as recognized by the respective Board of Studies.

VI. Scheme Of Examination

ACADEMIC EVALUATION UNDER STATE EDUCATION POLICY (SEP)
(EFFECTIVE FROM ACADEMIC YEAR 2024-2025)

The academic evaluation of both undergraduate (UG) and postgraduate (PG) programmes consists of two components: Continuous Internal Assessment (Formative Assessment) and End-Semester Examination (Summative Assessment).

Assessment for UG Students under SEP will be as follows:

Type of Assessment	Assessment Component	Allotted Marks
Continuous Internal Assessment / Formative Assessment	CIA I (Test)	10 Marks
	CIA II (Skill-based Assessment)	10 Marks
	Mid-Term Exam	20 Marks
Total	40 marks (scaled down to 20 marks)	
End-Semester Examination / Summative Assessment	End-Semester Examination (For three hours duration)	80 Marks
TOTAL		100 Marks

A. Additional Details

- **Mid-Term Exam:** The mid-term exam covers at least 40-50% of the syllabus and has duration of one hour.
- **Continuous Internal Assessment (CIA) Activities:** CIA activities are designed with clear objectives, modalities, assessment rubrics, and outcomes.

B. CIA improvement

There is **no provision for enhancing CIA marks** for UG students once the semester ends.

Attendance requirement for taking ESE

- The University Grants Commission (UGC) mandates a minimum of 75% attendance in each course to be eligible to write the End Semester Examinations (ESE).
- There is no provision for condonation of attendance under the UGC Act.

VII. Minimum for a pass

- **Minimum Pass Marks in Final Examination:** A minimum of 40 percent is required in each course in the End Semester Exams. The student must score at least 32 marks out of 80 in the End Semester Examination (ESE).
- **Overall Pass Requirement:** The aggregate of Continuous Internal Assessment (CIA) and End Semester Examination (ESE) should also be a minimum of 40 percent. Out of 100 marks, a student must secure at least 40 marks in each course to qualify as passed inclusive of minimum 32 marks out of 80 in End Semester Exam.

VIII. Grading System For Choice Based Credit System (CBCS)

The modalities and operational details are given below:

- **Grade Points:** The College adopts a ten-point grading system. The papers are marked in a conventional way for 100 marks. The marks obtained are converted to grade point according to the following table. If a student is absent for the paper the grade point assigned is 0.

Credits: Credits are assigned to courses based on the following broad classification

Courses Category	Instruction Hours/week	Credits
Languages	3 Hours	3
Major Core	4 Hours	4
Skill Enhancement Courses	1-4 Hours	1-4
Compulsory Courses	1-2 Hours	1-2

Grade point calculation

- **Semester Grade Point Average (SGPA):** The SGPA is calculated as the sum of the product of the credits and the grade points scored in all courses, divided by the total credits.
- Minimum SGPA required for a pass is 4.5.

$$\text{SGPA} = \frac{\text{Total of (Credits Earned X Grade Points)}}{\text{Total of Corresponding Credits}}$$

- If a student has not passed in all courses or is absent, the SGPA is not assigned.
- **Cumulative Grade Point Average (CGPA):** The CGPA is the weighted average of all the courses taken by a student across all semesters of a programme.

$$\text{CGPA} = \frac{\sum \text{Total Credits in the Semester} \times \text{SGPA}}{\text{Total Credits of the Courses}}$$

Note: SGPA and CGPA will be rounded off to two decimal places.

Grade Points	% of Marks	Grade	Result/Class Description
9.00-10.00	85 - 100	O	Outstanding
8.00-8.99	75 - 85	A+	First Class Exemplary

7.00-7.99	65 - 75	A	First Class Distinction
6.00-6.99	55 – 65	B+	First Class
5.50-5.99	50 -55	B	High Second Class
5.00-5.49	45 - 50	C	Second Class
4.50 - 4.99	40 - 45	P	Pass Class
Below 4.5	Below 40	R A	To Re-Appear

Sections	Marks per Question	Number of Questions	Total Marks
Section A	2 marks	5 questions (out of 7)	10 Marks
Section B	5 marks	4 questions (out of 6)	20 Marks
Section C	12 marks	3 questions (out of 5)	36 Marks
Section D	14 marks	1 question (Case Study)	14 Marks
Total			80 Marks

Interpretation of SGPA/CGPA and Classification of Final Result

IX. PATTERN OF ESE QUESTION PAPER UNDER SEP

The End Semester Examination (ESE) question paper under SEP will include questions that assess both Lower Order Thinking Skills (LOTS) and Higher Order Thinking Skills (HOTS). The difficulty level of the question paper will be distributed as follows: 40% easy, 30% difficult, and 30% very challenging.

Order Thinking Skills (LOTS) and Higher Order Thinking Skills (HOTS). The

Sections	Marks per Question	Number of Questions	Total Marks
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Section C	12 marks	3 questions (out of 5)	36 Marks
Section D	14 marks	1 question (Case Study)	14 Marks
Total			80 Marks

difficulty level of the question paper will be distributed as follows: 40% easy, 30% difficult, and 30% very challenging.

- **Duration:** 3 Hours
- **Maximum Marks:** 80

The question paper pattern will be as follows:

X. REVALUATION AND RETOTALING

Requests for **revaluation, retotaling, and photocopies of the answer book** for the End-Semester Examination (ESE) must be submitted to the Controller of Examination along with the prescribed fee within two weeks from the declaration of results.

XI. Absence during End Semester Examination

If a student misses the End Semester Examination, they will be marked as "Absent" and will be required to take the supplementary examination for that course during the next available opportunity only.

XII. Malpractice

Students will be dealt severely in case if they are found guilty of any malpractices during examination. The college has zero tolerance towards any kind of ~~four~~ means adopted to secure marks in the exams.

OUTCOME BASED EDUCATION (OBE)

Our BSC programmes will produce graduates who will be capable of the following:

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PE O1 Develop professional competence to become successful managers and entrepreneurs in academia, industry or government.

PE O2 Adapt to a rapidly changing environment with newly learnt and applied skills and competencies, become socially responsible and value-driven citizens, committed to sustainable development

PE O3 Act with conscience of global, ethical, societal, ecological and commercial awareness with sustainable values as is expected of practicing management professionals contributing to the country

PE O4 Able to continue their professional development by obtaining advanced degrees in Management or other professional fields

PROGRAMME OUTCOMES (POs)

PO 1 Disciplinary and Inter-disciplinary Knowledge

Demonstrates a comprehensive understanding of economic theories, principles, and concepts relevant to both microeconomics and macroeconomics.

PO 2 Decision Making Skill:

Applies critical thinking and analytical skills to make informed decisions in economic contexts, considering various solutions and their implications.

PO 3 Integrated Problem-Solving and Research:

Analyzes complex economic issues and managerial challenges within specific industries or sectors, proposing suitable solutions based on research and analysis.

PO 4 Critical Thinking Skill:

Evaluate evidence, arguments, claims and beliefs by using right type of reasoning as appropriate to the situation and Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems.

PO 5 Creative Thinking Skill:

Evaluates evidence, arguments, and economic claims using appropriate reasoning techniques, fostering a critical mindset.

PO 6 Usage of Modern Technology and Tools:

Utilizes digital tools, data analysis techniques, and economic software to access, manage, evaluate, and create economic information effectively.

PO 7 Leadership and Team Work

Develops leadership skills and collaborates effectively within diverse teams, translating visions into shared goals and achievements.

PO 8 Ethical Conduct

Acts ethically and sustainably in economic decision-making at local, national, and global levels.

PO 9 Collaboration:

Collaborates respectfully within multidisciplinary teams, demonstrating effective communication and teamwork in diverse economic contexts.

PO 10 Self-Directed and Life-Long Learning:

Create goals and monitor progress toward them by developing an awareness of the personal, environmental and task-specific factors that affect the attainment of the goals.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PO 11 Entrepreneurial Perspectives:

Develop, organize and manage a business venture along with any of its risks. (Sustainable Business Models)

PO 12 Global Perspectives and Multicultural:

Create effective and appropriate interaction and Teamwork with people of different nationalities and cultures, demonstrating respect for social, cultural and linguistic diversity at the local, national and international levels.

BSc (ECONOMICS, MATHEMATICS AND DATA ANALYTICS)							
Category/Semester	I	II	III	IV	V	VI	Total Credits
PART A: LANGUAGES							
Languages 4 Hrs - 3 Crs	Lang I	Lang I	Lang I	Lang I	-	-	
	Lang II	Lang II	Lang II	Lang II	-	-	
Part A Credits	6	6	6	6			24
PART B: DISCIPLINE-SPECIFIC CORE & ELECTIVE COURSES							
Major Core ECONOMICS (5 Crs)	Micro economics 5 Crs	Macro economics 5 Crs	Basic Economics 5 Crs	Financial economics 5 Crs	1. International Economics 2. Economics of Growth and Development	1. Environmental Economics 2. Behavioural Economics	
Major Core MATHEMATICS (5 Crs)	Fundamentals of Applied Maths 5 Crs	Linear Algebra 5 Crs	Advances applied mathematics 5 Crs	Numerical Methods 5 Crs			
Major Core 3 DATA ANALYTICS (3Crs)	Descriptive Statistics and MS Excel 3 Crs	Advanced Statistics 3 Crs	Advanced-Data Analytics 3 Crs	Introduction to Machine Learning 3 Crs			
Major Core Practical 3 DATA ANALYTICS PRACTICAL (2Crs)	MS Excel 2 cr	Advanced Statistics using R Programming 2 cr	Advanced-Data Analytics using R programming 2 Crs	Machine Learning Using Python 2 cr			

Major Electives					Electives	Electives	
Part B Credits	15	15	15	15	20	20	80
PART C: SKILL ENHANCEMENT COURSES/ACTIVITIES							
Skill Based Courses	Indian Economy (2 Crs)	Applied Mathematics I Economics (2Crs)	Field Project (2Crs)	SEC (2Crs)	SEC (2Crs)	SEC (2Crs)	
					Research Methodology (3Crs)	Internship (2 Crs)	
						Research Project (2Crs)	
Value-Based Activities		Extra-Curricular Activities 1 Cr	-	Extra-Curricular Activities 1 Cr	-	Extension Activities 1 Cr	
Part C Credits	2	3	2	3	4	7	21
PART D: COMPULSORY COURSES							
Foundation Courses	Constitutional Values I 2 Crs	Constitutional Values II 2 Crs	-	-	-	-	
	Psychological Wellbeing 1 Cr						
Part D Credits	3	2					5
Total Credits	26	26	23	24	24	27	150

B. Sc. - Economics, Mathematics and Data Analytics Programme

**PROGRAMM STRUCTURE
CORE SUBJECTS
SEMESTER – I**

Course Code	Title of the Course	Category	Lecture Hours per week	Credits	CIA	ESE	Marks
S1 24 MC 101	Microeconomics	Major Core	5	5	20	80	100
S1 24 MC 102	Fundamentals of Applied Maths	Major Core	5	5	20	80	100
S1 24 MCT 103 S1 24 MCP 103	Descriptive Statistics	Major Core	3	3	20	80	100
	Descriptive Statistics using Excel	Major Core (Practical)	4	2		50	50
S1 24 SE 101	Indian Economy	Skill Enhancement	2	2	20	30	50
S1 24 GE 101	General English	Language	3	3	20	80	100
	Language 2	Language	3	3	20	80	100
S1 24 KN 101	Kannada						
S1 24 HN 101	Hindi						
S1 24 AE 101	Additional English						
UG 24 CC 101	Psychological wellbeing	Compulsory course	1	1		25	25
UG 24 CC 102	Constitutional Values I	Compulsory course	2	2		50	50
Total credits				26	120	555	675

SEMESTER II

Course Code	Title of the Course	Category	Lecture Hours per week	Credits	CIA	ESE	Marks
S1 24 MC 201	Macro Economics	Major Core	5	5	20	80	100
S1 24 MC 202	Linear Algebra	Major Core	5	5	20	80	100
S1 24 MCT 203	Advanced Statistics	Major Core	3	3	20	80	100
S1 24 MCP 203	Advanced Statistics using R Programming	Major Core Practical	4	2	-	50	50
S1 24 SE 201	Applied Mathematical Economics	Skill Enhancement	2	2	20	30	50
	Language 1						
S1 24 GE 201	General English	Language	3	3	20	80	100
	Language 2		3	3	20	80	
S1 24 KN 201	Kannada	Language					100
S1 24 HN 201	Hindi						
S1 24 AE 201	Additional English						
UG 24 CC 201	Constitutional Values II	Compulsory course	2	2		25	50
UG 24 VB 202	Extra-Curricular activities	Value Added Activity	1	1		50	25
Total credits				26	120	555	675

Semester I

Cross Elasticity, Measurement of Elasticity of Demand. Supply: Concept of Supply, the Law of Supply, and Determinants of Supply.

Module 4 Production Analysis 15 hrs

Production Function Production Function - The Law of Variable Proportion - the Law of Returns to Scale -Isocost- Isoquant Approach- Least cost combination of Inputs

Module 5 Cost Analysis 5 hrs

Cost Concepts, Cost output relationship in the short - run and long - run – Relationship between Short run and long run curves, Relationship between Average Cost and Marginal Cost

Module 6 Market Competition 20 hrs

Concepts of Revenue: Total, Average and Marginal Revenue Curve- Price and Output determination under different markets: Meaning and features of perfect competitive market, Monopoly, Monopolistic competition and oligopoly, Price, and Output determination under these markets. (in depth)

SKILL DEVELOPMENT:

- Understand how economic concepts are applicable to everyday life by taking live examples.
- Conduct a small survey to understand how consumer behaviour has evolved during the pandemic.
- Choose a particular firm or industry and study the demand forecasting techniques.
- Analyse different companies and identify which market competition they fall into.
- Study the price fluctuations in the market due to changes in demand and supply.

Book for Reference:

- 1 Ahuja H.L, Advanced Economic Theory, S. Chand and Company, New Delhi
- 2 Koutsoyiannis A, Modern Microeconomics, Macmillan, London.
- 3 Dominick Salvatore, Theory and Problems of Microeconomic Theory, Schaum's Outline Series, McGraw-Hill Book Company, Singapore.
- 4 Ferguson C.E and Maurice S. Charles, Economic Analysis-Theory and Applications, Richard D. Irwin Inc. USA
- 5 Hubbard R. Glenn and Anthony Patrick O'Brien, Microeconomics, Pearson Prentice Hall, New Jersey
- 6 Pindyck Robert S., and Daniel L. Rubinfeld, Microeconomics, Pearson Prentice Hall, New Jersey
- 7 Varian, H. R., "Intermediate Microeconomics: A Modern Approach", W. W. Norton and Company

Functions, Limits and Continuity, Derivative of a function (concepts only), derivatives of the standard functions (excluding trigonometric functions), Rules of Differentiation: addition/subtraction, scalar multiplication, product, quotient, chain, Partial Derivatives, Maxima and Minima, and Lagrangian Multiplier-Constrained Optimization.

Applications: Cost minimization and Revenue and Profit maximization, Break Even Point, Marginal Cost, Marginal Revenue, and price elasticity of demand.

Module 4 Integral Calculus

15 hrs

Introduction, Indefinite Integration, Standard Integrals (excluding trigonometric functions), Rules of Integration: addition/subtraction and scalar multiplication, Integration by Substitution, Integration by Parts, Integration by resolving into Partial Fractions.

Applications of Integration in business (finding cost, revenue functions from marginal cost and marginal revenue functions)

Module 5 Differential Equations

8 hrs

Definition of differential equation, first and second order linear homogenous ordinary differential equation with constant coefficients and its solution.

Module 6 Mathematical Modelling using differential equations

10 hrs

Definition of Mathematical modelling, Applications: Radioactive Decay, Logistic growth (fishery, rabbits' population, piggery etc.), and Exponential Growth (continuous compounding of an invested amount)

SKILL DEVELOPMENT

- Visualization of solution or roots of algebraic functions and discussion of nature of the roots
- To solve and visual system of linear equations with 3 variables on GeoGebra website (Math visualizer platform)
- Visualization of maxima and minima of single and multivariable functions(optimization) through function plotting software.
- Visualization of the solution of the differential equations.

Book for Reference:

1. P. N. Arora & S. Arora: Mathematics
2. Lay, D. C., Lay, S. R., & McDonald, J. J, Linear algebra, and its applications
3. Pugh, C. C, Real mathematical analysis

4. Fitzpatrick, P. M., Advanced calculus
5. D.R. Agarwal: Comprehensive Mathematics
6. Anand Sharma: Business Mathematics & Analytics
7. Ajay Goel & Alka Goel: Mathematics & Statistics
8. Robert R. Stall: Linear Algebra & Matrix Theory

SEMESTER 1

S1 24 MC 103- DESCRIPTIVE STATISTICS AND EXCEL

COURSE OBJECTIVES:

The course aims to provide students with a firm grasp of basic statistical concepts. Through theoretical learning and practical applications, students will develop an essential problem-solving skill relevant to statistics and real-world data analysis and interpretation, with a focus on applications in various fields and master excel functions for precise data manipulation. Develop proficiency in data visualization through charts and graphs for clear communication of insights. Gain expertise in dashboard development for representation of dynamic systems.

COURSE OUTCOMES

CO1-Illustrate the significance of statistics in analysing business problems..

CO2-Use the concept of measures of central tendency and dispersion for decision making.

CO3-Apply the concept of Correlation and Regression to analyse the data.

CO4-Proficiently utilize Excel functions for precise data manipulation, enhancing analytical capabilities.

CO5-Demonstrate proficiency in data visualization through charts and graphs, and in statistical analysis, enabling clear communication of findings.

Module 1 Introduction to Statistics

15 hrs

Definition of Statistics, Scope and Limitations, Ethics to be followed by a statistician and role of statistics in sustainable development. Data- Meaning, Collection methods, and sampling techniques, Variables and Attributes - Discrete and Continuous Variables, Classification of data based on the nature of the variable and the source of collection, Formation of Statistical Series, Frequency Distribution (univariate and bivariate) and Tabulation. Diagrams and Graphs: Line, Bar diagrams and Pie chart, Ogives, Histogram, Frequency Curve and Polygon.

Module 2 Measures of Central Tendency and Dispersion

15 hrs

Meaning of Central Tendency, Arithmetic Mean (Simple, Weighted and Combined), Median, Mode, Empirical relationship, Quartiles, Deciles, Percentiles (applications, importance, merits, and demerits). Definition of Dispersion, Importance of Dispersion, Range, Quartile Deviation, Mean Deviation, Standard Deviation, and their coefficients, (applications, importance, merits, and demerits).

Module 3 Skewness and Kurtosis**10 hrs**

Definition of Skewness, Measures of Skewness: Karl Pearson's and Bowley's Coefficient of Skewness, Moments (about mean and arbitrary point), Coefficient of Skewness based on Moments. Definition of Kurtosis, Measure of Kurtosis, and Coefficient of Kurtosis based on Moments.

Module 4 Correlation & Simple Linear Regression Analysis**15 hrs**

Correlation: definition, scatter diagram, levels of correlation, Karl Pearson's Coefficient of Correlation (Direct method only), probable error and confidence interval, and Spearman's Correlation Coefficient (unique and repeated ranks) and applications. Meaning of Linear regression, general expression ($y = \beta_0 + \beta_1x + \epsilon$), types of simple linear regression equations, regression equation using method of least squares (direct method only), relationship between regression and correlation coefficients, and applications.

Module 5 Introduction to Excel**10 hrs**

Origin and Importance of Excel in Data Analysis, workbook, sheets: cells, columns, rows, ribbon and its components, table border and style, cell colour, text colour, range, formula bar and status bar, referencing: Relative, Absolute and Mixed, Mathematical operators and relations. Excel Functions - Mathematical Functions: SUM, AVERAGE, COUNT, COUNTA, MIN/MAX, SQRT, POWER, LCM, COMBIN and PERMUT. String functions: LEN, LEFT, MID, RIGHT, CONCAT, TRIM, UPPER, LOWER, PROPER, Date Functions, Random number generators: RAND and RANDBETWEEN, Conditional functions: IF, NESTED IF, SUMIFS, COUNTIFS, and AVERAGEIFS, Data Handling Functions: VLOOKUP, HLOOKUP. Financial functions: PMT, PV, RATE, NPER.

Module 6 Statistical Analysis using EXCEL**10 hrs**

Data Visualization: Bar charts, Column charts, Histogram, pie-chart, Line graphs, Sparklines, Scattered plot: linearity check and curve fitting, Chart elements and Chart designs. Interactive Dashboard Development: Pivot Table, Pivot Chart and Slicers. Measures of Central tendency: mean, median, mode, Dispersion: standard deviation, skewness and kurtosis, coefficient of correlation, simple linear regression, and estimation. What if Analysis: Goal Seek, Scenario manager, and Data table (one way and two way).

SKILL DEVELOPMENT

Group Project: Utilizing Excel Tools for Analysis and Presentation of Insights.

The objective of this project is to employ the necessary Excel tools to analyse a given case study and extract valuable insights and presentation the same.

Books for Reference

1. Gupta S.P., Statistical Methods, New Delhi, Sultan Chand & Sons.
2. J.K Sharma – Business Statistics.
3. Akhilesh K. B. and Balasubrahmanyam S, Mathematics and statistics for Management, 1st Edition, Delhi, Vikas Publishing.
4. Winston, W. L., Microsoft Excel: Data Analysis & Business Model.
5. Lalwani, L., Excel All-In-One.
6. McFedries, P. Excel Formulas and Functions.
7. Alexander, M., & Walkenbach, J. Excel Dashboards and Reports.
8. Hubbard R. Glenn and Anthony Patrick O'Brien, (2012) Macroeconomics, Pearson Prentice, New Jersey, USA

MS EXCEL PRACTICAL

1. Basics of Excel and Workbook Handling

- Create a new Excel workbook.
- Insert multiple sheets and rename them appropriately.
- Enter data in different cells, organizing them into rows and columns.
- Change font size, style, and apply bold/italic effects.
- Modify the ribbon by customizing it to include commonly used functions.

2. Table Borders, Styles, and Cell Formatting

- Apply table borders and different styles to organize data.
- Change cell color and text color based on category.
- Merge and center headings for better presentation.

3. Formula Bar and Status Bar

- Use the formula bar to enter and modify formulas.
- Observe the status bar to check for cell mode, sum, count, and average of selected data.

4. Referencing in Excel

- Apply a formula in one cell and drag it to apply to adjacent cells.
- Use \$ symbol to fix row or column references.

- Demonstrate with an example where either row or column remains fixed.

5. Mathematical Operators and Relations

- Perform basic arithmetic operations (+, -, *, /, ^).
- Use logical comparisons (>, <, =, >=, <=, <>).

6. Excel Functions

Mathematical Functions

- SUM, AVERAGE, COUNT, COUNTA, MIN, MAX: Apply to a dataset.
- SQRT, POWER, LCM: Calculate square root, power, and LCM of numbers.
- COMBIN and PERMUT: Compute combinations and permutations.

String Functions

- LEN, LEFT, MID, RIGHT: Extract text information.
- CONCAT, TRIM, UPPER, LOWER, PROPER: Format text properly.

Date Functions and Random Number Generators

- Use TODAY, NOW, and DATE functions.
- Generate random numbers using RAND and RANDBETWEEN.

Conditional Functions

- IF and Nested IF: Apply conditions for grade calculation.
- SUMIFS, COUNTIFS, AVERAGEIFS: Use multiple criteria for calculations.

Data Handling Functions

- VLOOKUP and HLOOKUP

Financial Functions

- PMT, PV, RATE, NPER Create bar charts, column charts, histograms, pie charts, and line graphs.

- Insert sparklines within a dataset.
- Use scattered plots to check linearity and curve fitting.
- Modify chart elements and styles.

8. Interactive Dashboard Development

- Create Pivot Tables and Pivot Charts.

- Use Slicers to filter Pivot Table data dynamically.

9. Statistical Analysis in Excel

- Calculate mean, median, and mode for datasets.
- Compute standard deviation, skewness, and kurtosis.
- Determine the coefficient of correlation.
- Perform simple linear regression and make estimations.

10. What-If Analysis

- Use Goal Seek to find input values for a desired result.
- Apply Scenario Manager for different financial planning models.
- Create one-way and two-way Data Tables to analyze variations.

EXERCISE

Create a comprehensive project that includes multiple elements from the above sections, such as:

- o A dataset with applied formulas and functions.
- o Conditional formatting for enhanced visualization.
- o Pivot Tables and Charts.
- o A What-If analysis section.

SEMESTER 1

UG 24 FC 101- PSYCHOLOGICAL WELL BEING

COURSE OBJECTIVES:

This course aims to nurture self-awareness and meaningful relationship skills and to help in the development of emotional quotient and inter-personal skills.

COURSE OUTCOMES

CO1-Develop a better emotional quotient.

CO2-Formulate a healthier sense of self through self-awareness.

CO3-Build more meaningful relationships.

CO4-Display an improvement in inter-personal skills.

CO5-Modify thought and belief patterns.

Module 1 Introduction 3 hrs

Meaning of counselling – Myths and Facts related to counselling – Breaking stigmas related seeking counselling – Normalizing seeking help – Self-reflection through concentric circles.

Module 2 Intra-personal and Inter-personal Awareness 10 hrs

Meaning of self-esteem – Factors that influence self-esteem – Importance of self-esteem – Effects of low self-esteem – Qualities seen in people with high vs. low self-esteem – How to improve self-esteem – Self-awareness activity. Meaning of peer pressure – Different kinds of peer pressure – Resisting peer pressure – Confronting peer pressure – Group sharing activity. Meaning of relationships – Types of relationships – Healthy relationship dynamics – Personal Rights in a relationship – Components of a healthy relationship – Types of abuse in a relationship – Intimacy and understanding our needs – Boundaries

Module 3 Understanding Emotions 4 hrs

Meaning of emotions – Role of emotions in our lives – Beliefs regarding emotions – Harmful effects of suppressing emotions – Signs of emotional suppression – Handling emotions in a healthy manner – Self-assessment activity

Module 4 Anger Management 5 hrs

Meaning of anger – Physical and Emotional symptoms of anger – Different ways that people express anger – Expression and experience of anger – What makes us angry and what it means when we're angry – Dealing with anger – Guided visualization and art activity.

Module 5 Managing Anxiety and Fear

4 hrs

Meaning of fear – Types of fear – Physical and Emotional symptoms of fear – Different reactions to fear – Overcoming fear – Artwork followed by group sharing activity.

Module 6 Dealing with Loss and Grief

4 hrs

Understanding loss and grief – Form of loss – Stages of grief – Dangers of not grieving – Dealing with grief – Ways to help others in grief.

SEMESTER 1

S1 24 AR 101- CONTEMPORARY INDIAN ECONOMY

COURSE OBJECTIVES:

The course aims to familiarise students on the current problems of Indian Economy
Identify solutions through specific policies.

COURSE OUTCOMES

CO1-Understand the current problems of Indian Economy

CO2-Analyse the sector specific policies adopted for achieving the aspirational goals.

CO3-Review various economic policies adopted.

CO4- Understand the history of Economic planning in India.

CO5- Understand the sectoral reforms through LPG policy.

Module 1 LPG Policies and Economic Reforms 5 hrs

LPG-Economic reforms under the New economic policy – globalisation, privatisation, and liberalisation -Niti Aayog – functions and its role in India's economic development

Module 2 NITI AYOG and Economic Development 10 hrs

NITI Aayog and goals of SDG, programs of the govt- priorities of economic growth and employment, education, health and gender, environmental concerns, clean water, energy security, poverty alleviation and income inequality (overview of different programs). Population and demographic dividend. Human development Index, Hunger Index, Gross Happiness Index

Module 3 Economic Reforms in Agriculture and Food management 10 hrs

Green revolution- Agricultural Finance-Agriculture price policy, minimum support price- procurement prices and issue price- zero hunger, public distribution system. MGNREGA- Agriculture and WTO (overview)

Module 4 Industry, innovation, infrastructure 10 hrs

New Industrial Policy 1991- public sector reforms, privatisation and disinvestment, entrepreneurship– competition policy. Role of MNCs in industrial development- economic and social infrastructure-roads, railways, airports tele density (overview).

Module 5 Monetary, Fiscal Policy and External Trade 10 hrs

Monetary Policy – RBI- Monetary policy -banking privatisation, role of SEBI. Fiscal Policy - Finance Commission and its role– Fiscal federalism. India’s foreign trade- volume, direction, and composition (latest trends)- FDI –Meaning, trends and patterns- India’s balance of payment since 1991.

SKILL DEVELOPMENT

- Using case study analyse the U N sustainable development goals.
- Draft a diagrammatic representation of inflation rates for specific products using secondary data from websites
- Using a chart to show impact of MNREGA works.
- Using secondary data analyse India’s direction of trade in the last 5 years.

Book for Reference:

1. Ramesh Singh. 2022 The Indian Economy, Tata McGraw Hill
2. Byres Terence J. (ed.), (1998), The State, Development Planning and Liberalisation 'in India, Delhi,
3. Dutt Ruddar and K.P.M Sundaram (2011): Indian Economy, S Chand& Co. Ltd. New Delhi
4. Frankel Francine R., (2004), India's Political Economy, Delhi.
5. Jalan, B. (1996), India’s Economic Policy- Preparing for the Twenty First Century, Viking, New Delhi.
6. Joshi Vijaya and L.M.D. Little, (1998), India's Economic Reform 1991-2001, Delhi,
7. Kapila Uma: Indian Economy: Policies and Performances, Academic Foundation
8. Mishra S.K & V.K Puri (2001) “Indian Economy and –Its development experience”, Himalaya Publishing House.

SEMESTER II

SEMESTER II

S1 24 MC 201- MACROECONOMICS

COURSE OBJECTIVES:

The objective of this course is to explore and understand basic concepts related to National Income. The course will also help familiarize the students with the Keynesian Theory of Income and Employment. Further, the course entails understanding different policies and debates under macroeconomics.

COURSE OUTCOMES

CO1-Explain the concept of National Income and methods of its estimation.

CO2-Analyse the relationship between Macroeconomic variables

CO3-Describe the determination of income and employment under CO4-Classical and Keynesian framework

CO5-Discuss the monetary and fiscal policies with the students and their effectiveness in regulating the economy.

Module 1 Introduction to Macroeconomics Identities 15 Hrs

Nature of Macroeconomics and its significance, Indicators of Macro Economic Activity - Key Concepts: Stock and flow variables- Two Sector Model, Three Sector Model and Four Sector Models.

Measurement of Macro Variables and Economic Performance: National Income Accounting - Important Concepts: GNP, GDP, NNP, NDP, NI, PI, DPI- Real GDP versus Nominal GDP - GDP deflator - Method of estimating National Income - Expenditure Method- Income method - Value added or Net Product method - Difficulties in National Income Accounting - Trends in GDP in India- GNP and Quality of Life - Net Economic Welfare - Green Income

Module 2 Building Blocks of Macroeconomic Analysis 15 Hrs

Simple Keynesian Theory-Aggregate Demand (AD) curve, Aggregate Supply (AS) curve, Sources of shift in AD and AS, Equilibrium in National Income and Price level, Unemployment and National Income, Inflation and Unemployment, Circular flow of Income, Goods market and Money Market- Phillips Curve-Opel's Law

Module 3 Classical Theory 15 Hrs

Introduction to Classical theory of employment - Basic Assumptions of the Classical School - Say's Law of Market - Determinants of Output, Employment, Savings, Investment, Wages, Prices, Interest Rate - Equilibrium Output and Employment-Implications of Classical Full Employment Model - Critical Evaluation

Module 4 Keynesian Macroeconomics 15 hrs

Principle of effective demand - Keynesian theory of output, income and employment –
Concept of Multiplier and accelerator-IS-LM curve-General Equilibrium of Product and Money
Market-Extensions of IS-LM Model

Module 5 Keynes Psychological law of consumption 10 hrs

An Overview of Post Keynesian theories of consumption: absolute income, relative income, permanent income & life cycle hypothesis - Multiplier and Accelerator Analysis - Marginal Efficiency of Capital - Relevance and Critique of Keynesian Macroeconomics

Module 6 Monetary and Fiscal Policy 5Hrs

Monetary Policy: Objectives and Instruments

Fiscal Policy: Objectives and instruments

Effectiveness of Monetary and Fiscal Policy

SKILL DEVELOPMENT

- Segregate different economic indicators into stock and flow components.
- Conduct a study on the inflationary trends during the last ten years.
- Calculate the different national income estimates from actual data through the online databases.
- Analyze the relevance of Keynesian theory in modern Indian Economy.

Books for Reference

1. Ahuja H L (2013) Macroeconomics: Theory and Policy, S Chand & Company Pvt Ltd. New Delhi
2. Mankiw N. Gregory, (2012) Macroeconomics, Worth Publishers, New York
3. Shapiro Edward, (2004) Macroeconomic Analysis, Galgotia Publications Pvt. Ltd, New Delhi
4. Ackley Gardner, (1978) Macroeconomics: Theory and Policy, Macmillan, New York
5. Dornbusch, R., Fischer, S. and Startz, R., "Macroeconomics", McGraw-Hill, 11th Ed 2010
6. D'Souza E., "Macroeconomics", Pearson Education, 2009
7. Froyen Richard T. (2013) Macroeconomics-Theories and Policies, Macmillan Pub., Company, NY

Recapitulation (Matrices, Algebra of matrices, Elementary Row operations and Echelon form), Rank of a matrix by reducing to row reduced echelon form, System of Linear Equations with real coefficients, Matrix form of System of Linear Equations, Augmented Matrix, Solution through Gauss Jordan method, Criteria for Existence and Uniqueness of the solution, linear combinations of vectors, linear span of vectors, vector equation of system of linear equations, parametric vector form of the solution set, linear independence and dependence of vectors, Applications of linear systems: Network flow- >Traffic Flow

Module 3 Vector Space (R^n)

8 hrs

Vector Space -Definition, examples and properties, Bases, dimension of the space, Subspaces - definition, examples, Bases of a subspace, dimension of a subspace, criterion for a subset to be a subspace and properties and problems.

Module 4 Linear Transformation 1

15 hrs

Linear Transformation: definition, domain space, codomain space, examples of Linear Transformation, properties, range space, null space, matrix of linear transformation with respect to the standard basis, rank, nullity, Rank nullity theorem (statement only) and problems, types of linear transformations (one-to-one, onto, and many to one) and properties, Applications of linear transformations: translation, scaling, shear, projection and reflection in 2D and 3D computer graphics (animations and gaming)- Overview.

Module 5 Eigenvalues and Eigenvectors

15 hrs

Eigenvalues and Eigenvectors: Definition and examples, characteristic equation of a matrix, Cayley Hamilton Theorem (statement only) verification and finding A^{-1} , A^2 , A^3 ... using Cayley Hamilton Theorem, Eigenspace, Basis of Eigenspace, algebraic and geometric multiplicity, and properties. Applications to Markov Chains: Introduction, One-step transition probability matrix, probability vector, stochastic matrix, and steady state vector, and first order difference equation (matrix form): Predator -Prey system and related problems.

Module 6 Linear Models in Machine Learning

10 hrs

Projection of a vector on a vector, a line and a plane in R^3 , Gram-Schmidt Orthogonalization process, Inconsistent system of linear equations with real coefficients, solution approximation in the range space, residue, total squared residue and best approximation using least squares, Normal matrix equations for $Ax=b$ system, Linear simple regression model ($y = \beta_0 + \beta_1x + \epsilon$) using least squares and Matrix form, and problems.

SKILL DEVELOPMENT

- Visualization of vectors and vector operations on online platforms like Desmos and Academo.
- Visualization of solution of system of linear equations on GeoGebra.
- Understanding residual and linear regression fit for a given set of data values on Desmos.

Books for Reference

1. Lay, D. C., Lay, S. R., & McDonald, J. (2023). Linear algebra and its applications.
2. Anton, H., & Kaul, A. (2019). Elementary linear algebra. John Wiley & Sons.
3. Andrilli, S., & Hecker, D. (2022). Elementary Linear Algebra. Academic Press.
4. Hogben, L. (2007). Handbook of Linear Algebra. Chapman and Hall/CRC.

Uniform distribution-definition-properties-importance-application, Normal distribution – introduction- definition –properties -Probability Density function- expected value- variance, importance - applications, Standard Normal Distribution, Fitting a Normal distribution.

Module 4 Sampling Distributions

6 hrs

Population and Sample- parameter and statistic, Sampling Techniques (Probability and Non-Probability), Mean and Variance, Standard Error and properties, Sampling Distributions - Chi-square, t-distribution, and F distributions. Central Limit Theorem (statement only)

Module 5 Hypothesis Testing

17 hrs

Meaning and Importance of Hypothesis - Formulation of Null and Alternative Hypothesis - Level of Significance -Type I and Type II Errors - Hypothesis Testing- t-test for mean (one sample, two- sample and paired), Confidence interval, z-test for mean (one sample and two-sample), Chi-square test - Importance and applications problems (Goodness of fit -Uniform, Binomial, and Poisson distribution and test for independence of attributes) , ANOVA and F statistic- Meaning- Need- Procedure- Assumptions- One-Way - Post-hoc test -Applications.

Books for reference

1. Hoel, P. G. (2022). Statistics for behavioural sciences. Macmillan.
2. Gupta S.P. (2019), Statistical Methods, Sultan Chand and Sons, New Delhi.
3. J.K.Sharma, (2017), Quantitative Techniques for Management, Macmillan, New Delhi.
4. Croxton, F. E., Cowden, D. J., & Klein, S. (1973). Applied general statistics (3rd ed.). Prentice Hall Inc.
5. Goon, A.M., Gupta, M.K., and Das Gupta, B. (1991). Fundamentals of Statistics, Vol. I, World Press, Calcutta.

SEMESTER II

S1 24 MCP 203- ADVANCED STATISTICS USING R

COURSE OBJECTIVES

Develop proficiency in conducting exploratory data analysis (EDA) and utilizing data visualization techniques in R to extract insights and patterns from diverse datasets, ultimately aiding in informed decision-making processes in data analytics.

COURSE OUTCOMES

CO1-Use mathematical operators and logical and conditional statements on R for solving basic mathematical problems.

CO2-Use inbuilt statistical function in R for Descriptive Statistical analysis and interpretation.

CO3-Use data visualisations tools on R to draw insights from the raw data taken from various sectors.

CO4-Use the relevant inbuilt hypothesis testing functions to test the hypothesis and its significance for better decision making in various fields like medicine, commerce, engineering etc.

CO5-Use regression tools and functions available on R for fitting the best curve for the original data with minimal error to make reliable estimations and predictions

Module 1 Introduction to R 12 hrs

Introduction to R Programming Language, R Studio Environment, Basic Data Types: Numeric, Character, Logical, Basic Operations: Arithmetic, Logical, Relational, Introduction to Functions and Control Structures (conditional and looping), User defined function, Hands-on Exercises and Assignments

Module 2 Descriptive Statistics using R 12 hrs

Data Structures: Vectors, Matrices, Lists, Data Frames: Creation, Manipulation, and Sub setting, Data Import and Export: CSV, Excel, Text files, Introduction to R Packages and Libraries, Descriptive Statistics: measures of central tendency (mean, median, mode), and measures of dispersion (standard deviation, variance, range)-Analysis and Interpretation: Application of descriptive statistics in data analysis.

Module 3 Data Visualisation and Exploratory Data Analysis 11 hrs

Data Visualization: Scatter plot, Bar plot, pie chart, histogram, boxplot, Line graphs, multiple bar diagram, and ggplot library, missing values and outliers' analysis, Hands-on Exercises and Assignments and Exploratory Data Analysis (EDA)

Module 4 Hypothesis Testing using R**15 hrs**

Hypothesis Testing- t-test for mean (one sample, two- sample and paired), z-test for mean (one sample and two- sample), Chi-square test -applications problems (Goodness of fit - Uniform, Binomial, and Poisson distribution and test for independence of attributes), ANOVA and F statistic- One-Way -Applications.

Module 5 Analytical Statistics using R**10 hrs**

Correlation: Scattered diagram, Pearson's and Spearman's correlation coefficients, Data Linearisation, and Regression Analysis: Simple Linear regression, Residual Plot, applications and interpretations.

SKILL DEVELOPMENT

- Exploratory Data Analysis (EDA) and utilizing data visualization techniques to extract insights and patterns from data sets using R.
- Diagrammatic and Graphical representation of data using R.
- Conduct hypothesis tests using R, interpret results, and make informed decisions based on statistical inference.
- Classification and Regression Analysis on R.

Books for Reference

1. Provost, F., & Fawcett, T. (2013). Data science for business: What you need to know about data mining and data-analytic thinking. O'Reilly Media.
2. Wickham, H., & Golemund, G. (2017). R for data science: Import, tidy, transform, visualize, and model data. O'Reilly Media.
3. Zuur, A. F., Ieno, E. N., & Meesters, E. H. W. G. (2009). A beginner's guide to R. Springer.
4. Spector, P. (2008). Data manipulation with R. Springer.

SEMESTER II

S1 24 SE 201- APPLIED MATHEMATICAL ECONOMICS

COURSE OBJECTIVES:

The Mathematical Economics course provides essential mathematical tools for economic analysis, covering functions (linear, non-linear, logarithmic, and exponential) and their applications to demand, supply, and market equilibrium. Students will learn matrix algebra, differential calculus, optimization techniques, and integration for calculating consumer and producer surplus. By the end, students will be adept at applying these mathematical methods in economic contexts.

COURSE OUTCOME

CO1-Describe the Role of Mathematics: Students will explain the role of mathematics in economic analysis, identifying its uses and limitations

CO2- Apply Matrix in Economic Analysis: Students will solve economic problems using elementary matrix algebra, including determinants and simultaneous equations through Cramer's rule and matrix inversion

CO3- Apply differential calculus to analyze elasticity, consumer behavior, production functions, and cost analysis, including problems related to market equilibrium and monopolies

CO4-Demonstrate proficiency in integral calculus, applying it to calculate consumer and producer surplus and solving linear programming problems

Module 1 Introduction to Mathematical Economics 10 hrs

Introduction –Role of Mathematics in Economic Analysis-Uses and limitations. Applications of mathematical functions- Demand and supply-market equilibrium-taxation and subsidy, P.T. Curve, national income analysis.

Module 2 Application of Matrix in Economic Analysis 5 hrs

Application of Cramer's rule and matrix inversion- input-output analysis- input- output table-matrix of technical coefficients.

Module 3 Application of Differential Calculus in Economic Analysis 10 hrs

Limits and Derivatives -ordinary and partial differentiation- elasticity, consumer behaviour, production functions, revenue and cost analysis market structure problems- monopoly, discriminating monopoly, duopoly, and Oligopoly.

Module 4 Optimization and Integration 5 hrs

Constrained Optimisation(maxima-minima). Application of integral calculus- definite and indefinite integration - consumer's surplus-producer's surplus.

Lists of tools can be used for solving the problems in the modules

- 1) Excel
- 2) <https://www.derivative-calculator.net/> 3)<https://www.integral-calculator.com/>
- 4) <https://www.wolframalpha.com/calculators/integral-calculator/>
- 5) <https://www.wolframalpha.com/calculators/derivative-calculator/>

SKILL DEVELOPMENT

- Create graphs for various economic functions (demand, supply) using Excel
- Solve real-world input-output problems using matrix algebra.
- Work on case studies that require linear programming to allocate resources efficiently.
- Conduct research on the application of mathematics in a specific area of economics, such as econometrics
- Use software (R/Python) to simulate economic models and analyze outcomes.

Books for Reference

1. Mas-Colell, A., Whinston, M. D., & Green, J. R. (2021).
2. Microeconomic theory (3rd ed.). Oxford University Press.
3. Varian, H. R. (2014). Intermediate microeconomics: A modern approach (9th ed.). W. W. Norton & Company.
4. Simon, C. P., & Blume, L. E. (2015). Mathematics for economists (2nd ed.). W. W. Norton & Company.
5. Kreps, D. M. (2013). Microeconomics for managers. W. W. Norton & Company.
6. Chiang, A. C., & Wainwright, K. (2005). Fundamental methods of mathematical economics (4th ed.). McGraw-Hill.
7. Taha, H. A. (2007). Operations research: An introduction (8th ed.). Pearson.