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"



B.Sc. (Economics, Mathematics & Data Analytics)

Semester - I & II

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

Academic Year 2025 - 2026

Batch 2025

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 UGCin 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' gradeand 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, geopolitical 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 |
|---|--|-------------------|
| | CIA I (Test) | 10 Marks |
| Continuous Internal Assessment / Formative Assessment | CIA II (Skill-based Assessment) | 10 Marks |
| | Mid-Term Exam | 20 Marks |
| Total | 40 marks (scaled down to 20 mar | ks) |
| 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.

SGPA = Total of (Credits Earned X Grade Points) ÷ 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.

CGPA = Σ Total Credits in the Semester × SGPA ÷ Total Credits of the Courses

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

| Grade Points | % of Marks | Gr a d e | Result/Class Description |
|-----------------|------------|----------|-----------------------------|
| 9.00- 10.00 | 85 - 100 | Ο | Outstanding |
| 8.00- 8.99 | 75 - 85 | A + | First Class Exemplary |

| 7.00- 7.99 | 65 - 75 | А | First Class Distinction |
|----------------|----------|--------|-------------------------|
| 6.00- 6.99 | 55 - 65 | B + | First Class |
| 5.50- 5.99 | 50 -55 | В | High Second Class |
| 5.00- 5.49 | 45 - 50 | С | Second Class |
| 4.50 - 4.99 | 40 - 45 | Р | Pass Class |
| Belo w 4.5 | Below 40 | R A | To Re-Appear |

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

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

The question paper pattern will be as follows:

| 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 |

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 severally in case if they are found guilty of any malpractices during examination. The college has zero tolerance towards any kind of foul 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 Teamwork

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.

Programme Matrix for SEP Batch

(Deep Specialisation in Economics in the Vth and VIth Semester)

2025-26 Batch

| BSc (ECONOMICS, MATHEMATICS AND DATA ANALYTICS) | | | | | | | | |
|---|---|--|--|--|--|---|--|------------------|
| Category/ Semester | Ι | п | III | IV | | V | VI | Total Credits |
| | | | PART A: LANG | UAGES | 1 | | | |
| Languages | Lang I | Lang I | Lang I | Lang I | | - | - | |
| 4 HIS - 5 CIS | Lang II | Lang II | Lang II | Lang II | | - | - | |
| Credits 6 6 6 6 - | | | | | | | | |
| | | PART B: DISCIPL | INE-SPECIFIC CO | RE & ELECTIVE C | | SES | | |
| Major Core Economics (5 Crs) | Micro economics 5 Crs | Macro economics 5 Crs | Monetary Econometrics 5 Crs | Financial economics 5 Crs | E E P S P | Basic Econometric s 5 Crs | History of Economic Thought 5 Crs | |
| Major Core Mathematics (5 Crs) | Introduction to Calculus and Differential Equations 5 Crs | Linear Algebra 5 Crs | Advanced Calculus and Differential Equations 5 Crs | Numerical Methods 5 Crs | C I A L I S T A I O | Operation Research 5 Crs | Behavioural Economics 5 Crs | |
| Major Core 3 Data Analytics (3Crs) | Fundamentals of Statistics 3 Crs | Advanced Statistics 3 Crs | Fundamentals of Data Analytics 3 Crs | Advanced Data Analytics – Machine Learning 3 Crs | N I E C O N | International Economics 5 Crs | Public Economics 5 Crs | |
| Major Core 3 Data Analytics Practical (2Crs) | Fundamentals of Statistics using R Programming 2 Crs | Advanced R Programming 2 Crs | Introduction to Python Programming 2 Crs | Advanced Python Programming 2 Crs | M I C S | Economics of Growth and Developmen t 5 Crs | Environmental Economics 5 Crs | |
| Part B Credits | 15 | 15 | 15 | 15 | | 20 | 20 | 100 |
| | | PART C: SKILL | ENHANCEMENT | COURSES/ACTI | VITIES | 5 | | |
| Skill Based Courses | Data Analytics using Spreadsheets (2 Crs) | Applied Mathematical Economics (2Crs) | Stock Trading (2Crs) | Social Internship (2Crs) | Aca | demic Writing (2Crs) Research Aethodology (2 Crs) | Publication Ethics (2Crs) Professional 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 |
| | | PAR | T D: COMPULSO | RY COURSES | • | | | |
| Foundation Courses | Constitutional Values I (2 Crs) Psychological Wellbeing (1 Cr) | Constitutional Values II (2 Crs) | Environmental Studies (2 Crs) | - | | - | - | |
| Part D Credits | 3 | 2 | 2 | - | | - | - | 7 |
| Total Credits | 26 | 26 | 25 | 24 | | 24 | 27 | 152 |

Course Matrix for B.Sc. Economics Programme (SEP Batch) Semester I (Batch 2025-2026)

| Course Code | | | Lectur | | CIA | ESE | Marks |
|---------------|---|----------------------|--------|--------------|-----|-----|-------|
| | | | e | C 1'' | | | |
| | Title of the Course | Category | Hours | Credits | | | |
| | | | week | | | | |
| S1 24 MC 101 | Microeconomics | Major Core | 5+0+0 | 5 | 20 | 80 | 100 |
| S1 24 MC 102 | Introduction to Calculus and Differential Equations | Major Core | 5+0+0 | 5 | 20 | 80 | 100 |
| S1 25 MCT 103 | Fundamentals of Statistics | Major Core | 3+0+0 | 3 | 20 | 80 | 100 |
| S1 25 MCP 103 | Fundamentals of Statistics using R | Major Core | 0+0+2 | 2 | - | 50 | 50 |
| | Programming | (Practical) | | | • | • | |
| S1 25 SE 101 | Data Analysis using Spreadsheet | Skill Enhancement | 2+0+0 | 2 | 20 | 30 | 50 |
| S1 24 GE 101 | General English | Language 1 | 3 | 3 | 20 | 80 | 100 |
| | Language 2 | | | | 20 | 80 | |
| S1 24 KN 101 | Kannada | 1 | 2 | 2 | | | 100 |
| S1 24 HN 101 | Hindi | Language 2 | 3 | 3 | | | 100 |
| S1 24 AE 101 | Additional English | | | | | | |
| UG 24 FC 101 | Psychological wellbeing | Compulsory course | 1 | 1 | - | 25 | 25 |
| UG 24 CC 101 | Constitutional Values I | Compulsory course | 2 | 2 | - | 50 | 50 |
| | Total credits | | | 26 | 120 | 555 | 675 |

SEMESTER II

| Course Code | Title of the Course | Category | Lectur e 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 Programmin g | 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 | Lananaaa | | | | | 100 |
| S1 24 HN 201 | Hindi | Language | | | | | 100 |
| 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 | 3 | | 26 | 120 | 555 | 675 |

Semester I

S1 24 MC 101: MICROECONOMICS

COURSE OBJECTIVES

The course is designed to acquaint the students with the basic concepts of microeconomics which form the base of modern economics. The course help the student understand the functioning of the economy at the individual level.

Module 1 – Introduction to Economics 10 hrs

Introduction to Economics: Nature and scope of economics, Basic Concepts in economics, Importance of study of Economics, Understanding the economy, Mankiw's ten principles of economics.

Module 2 – Approaches to Consumer Behaviour 15 hrs

Cardinal Analysis: Utility: Law of diminishing marginal utility, equi marginal utility, consumer's equilibrium, Consumer surplus and its – application. Ordinal analysis: Meaning of Indifference curves - Indifference Schedule, Indifference Map, properties of Indifference curves Budget line - Equilibrium position, Income, Price, and substitution effects through **Hicks and Slutsky's Method**-inferior goods v/s Giffen goods, Samuelson's revealed preference theory, **Choice under risk and uncertainty**.

Module 3 - Demand Analysis 10 hrs

Meaning and Determinants of Demand, the Demand Schedule, The Law of Demand, Exceptions to the Law of Demand, Elasticity of Demand: Meaning- Types: Price, Income and 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

(These activities are only indicative, and the faculty member can innovate)

- 1. Understand how economic concepts are applicable to everyday life by taking live examples.
- 2. Conduct a small survey to understand how consumer behaviour has evolved during the pandemic.
- 3. Choose a particular firm or industry and study the demand forecasting techniques.

- 4. Analyse different companies and identify which market competition they fall into.
- 5. Study the price fluctuations in the market due to changes in demand and supply.

COURSE OUTCOMES:

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

- 1. Analyse the economic behaviour of the consumer and the firm
- 2. Explain the relationship between various variables such as Input and output, cost and output, price of the product and quantity demand and so on
- 3. Product and Factor pricing under different market structure

Books 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

| | Programme: B. | Department of Sc. (Economics, M | Mathematics athematics an | d Data Ana | lytics) | | | | |
|--|--|--|---|---|---|---|--|--|--|
| Semester | Course Code | Course Title | Course Duration | Course Type | Teac Hour We | ching rs Per eek | Credits | | |
| I | S1 24 MC 102 | Introduction to Calculus and Differential Equations | 75 Hours | МС | | 5 | 5 | | |
| Course Objectives | This course aim including set t equations. Stud mathematical re | nis course aims to build a strong foundation in fundamental mathematical concepts, cluding set theory, functions, differential and integral calculus, and differential quations. Students will develop analytical and problem-solving skills essential for athematical reasoning and real-world applications. | | | | | | | |
| Course Outcomes | Description | | | | | T Level | s K Levels | | |
| CO1 | Understand an problem-solvin | d apply set theory, ng. | relations, and | functions in | | T2 | K3 | | |
| CO2 | Analyse and di to optimize an | fferentiate function d model real-world | is, applying dei scenarios. | rivative con | cepts | Т3 | K4 | | |
| CO3 | Evaluate integ | rals using various to under curves. | echniques and | apply them | to | Т3 | K4 | | |
| CO4 | Apply mean va approximate fi | lue theorems and T unctions and solve i | Taylor series ex indeterminate | pansions to forms. | 1 | Т3 | К3 | | |
| C05 | Solve first-ord natural and en | er differential equa gineering phenome | tions and apply ena. | y them to m | odel | Т3 | К3 | | |
| Module 1 | Sets, Relation | s & Functions | | | | | 15 Hrs | | |
| Definition & notat complement), laws product of sets, de of a function, dor bijective), compos functions. | ion of sets, cardi s and properties finition of a rela nain, codomain sition of functio | nality, types of sets of set operations ar tion and types: refl and range of a fur ns, inverse of a f | , set operation nd Venn diagra exive, symmetr nction, and typ unction, trigor | s (union, in m. Relations ric, transitiv pes of funct nometric ar | tersect s: orde re, equi tions (nd inv | ion, diffe red pairs ivalence. one-one, erse trig | erence and c, cartesian Definition onto and conometric | | |
| Module 2 | Differential C | alculus I | | | | | 18 Hrs | | |
| Limits, Continuity functions, propert of Standard functi theorem and its ap Module 3 | , Differentiabilit es and rules of d ons e ^{ax+b} , (ax+b) plications. Integral | y and Properties ifferentiation, maxin ⁿ , log(ax+b), sin(ax Calculus I | of continuous ma-minima of +b), cos(ax+b) | functions, functions on , e ^{ax} sin(bx+ | deriv le varia c), e ^{ax} | atives of able, n th I cos(bx+c | f standard Derivatives c). Leibnitz 15 Hrs | | |
| Definition, Definito Substitution, by Pa integral, evaluate o | e and Indefinite arts, and by Part lefinite integrals | Integration, Integra ial Fractions. Fund and area bounded | lls of standard amental theor by the curves. | functions, p em of calcul | proper lus, Pro | ties, Inte operties | gration by of definite | | |
| Module 4 | Theorem | s of Calculus | | | | | 12 Hrs | | |
| Intermediate valu theorem and exam using L'Hospital's | e theorem, Rolle ples. Taylor's the rule. | e's Theorem, Lagra eorem, Maclaurin's | ange's Mean V series, Indeter | alue theore minate form | m, Caus and | uchy's M evaluatic | lean value on of limits | | |
| Module 5 | Different | tial equations I | | | | | 15 Hrs | | |
| Definition, Order homogeneous diff method of separat | and Degree, Lin erential equatior ion of variables. | ear and non-linea ns of first order and Solutions to first-or | r, solutions of d first degree; rder linear diff | a different solution of erential equ | ial equ differe ation | uation. S ential equ $\frac{dy}{dx} + p(x)$ | folution of uations by $y = q(x)$. | | |
| Applications: The | ogistic growth. I | nvestment Growth: | Continuous co | mpounding | , Newt | on's law | of cooling. | | |

Drug Absorption and Elimination.

Skill Development: (These activities are only indicative, the Faculty members can innovate) Visualisation of functions of one and two independent variables on Desmos and 1. Wolfram|Alpha Visualisation of area under the curves on GeoGebra & Desmos 2. 3. Evaluate derivatives and integrals on Wolfram Alpha **Books for Reference:** Textbooks: Ghosh, R. K., & Maity, K. C. (2022). An Introduction to Analysis: Differential Calculus 1. Part - I. New Central Book Agency Pvt. Ltd. 2. Ghosh, R. K., & Maity, K. C. (2022). An Introduction to Analysis: Integral Calculus. New Central Book Agency Pvt. Ltd. Sundarapandian, V. (2021). Ordinary and Partial Differential Equations with Laplace 3. Transforms, Fourier Series, and Applications. Tata McGraw-Hill Education Pvt. Ltd. **Additional References:** Narayan, S. (2020). Differential Calculus. S. Chand & Company. 1. 2. Narayan, S., & Mittal, P. K. (2020). Integral Calculus. S. Chand and Co. Pvt. Ltd. 3. Simmons, G. F. (2017). Differential Equations with Applications and Historical Notes (2nd ed.). McGraw-Hill Publishing Company. Raisinghania, M. D. (2018). Ordinary and Partial Differential Equations. S. Chand and 4. Co. Pvt. Ltd. Mapping of CO and PO **CO/PO PO2 PO3 PO4 PO5** P012 **P01 P06 P07 P08 PO9** P010 P011 C01 Η Η Μ L М L CO2 Η Η Μ L Μ L CO3 Η Η М L М L CO4 Η Η Μ L L М C05 Н Η М L L М C06 Η Η М L Μ L

| | Programm | Department of ne: B.Sc. (Economics, N | f Data Analyti Mathematics | ics and Data Ana | lytics) | | | |
|--|--|--|--|--|--|--|--|--|
| Semester | Course Code | Course Title | Course Duration | Course Type | Teaching Hours Per Week | Credits | | |
| I | S1 25 MCT 103 | Fundamentals of Statistics | 45 Hours | МСТ | 3 | 3 | | |
| Course Objective s | 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. The course aims to equip the students with essential statistical tools for data interpretation and decision-making. | | | | | | | |
| Course | | Description | L | | T Levels | K Levels | | |
| mes | | | | | | | | |
| C01 | Illustrate the problems | significance of statisti | ics in analyzi | ing business | T2 | K2 | | |
| CO2 | Use the concep for decision ma | t of measures of centra aking | al tendency an | d dispersion | T3 | КЗ | | |
| CO3 | Assess the sha kurtosis to uno | ape of data distributi lerstand data symmetr | ons using sk y and peaked | ewness and ness | Т3 | K3 | | |
| CO4 | Analyse the rel correlation | ationship between var | iables using th | ne concept of | T4 | К3 | | |
| CO5 | Derive the line linear regression | e of best fit for forecas on analysis | sting and pred | liction using | T4 | К3 | | |
| Module 1 | Introduction t | o Statistics | | | | 10 Hrs | | |
| in sustainab Attributes based on t Frequency diagrams ar | ble development. I - Discrete he nature of the Distribution (uni ad Pie chart, Ogive | Data- Meaning, Collecti and Continuc variable and the so variate and bivariate) es, Histogram, Frequen | on methods, a ous Varial urce of collec and Tabulat | nd sampling to bles, Class ction, Formati ion. Diagrams Polygon. | echniques, Var ification c on of Statisti s and Graphs: | riables and of data cal Series, Line, Bar | | |
| Module 2 | Measures of Ce | ntral Tendency and D | Dispersion | | | 12 Hrs | | |
| Meaning of Empirical re Definition o Deviation, a | Central Tenden elationship, Quar f Dispersion, Imp nd their coefficie | cy, Arithmetic Mean (tiles, Deciles, Percentil ortance of Dispersion, I nts, (applications, impo | Simple, Weig es (applicatio Range, Quartil ortance, merit | hted and Cor ns, importance le Deviation, M s, and demerit | nbined), Medi e, merits, and Iean Deviation ts). | an, Mode, demerits). I, Standard | | |
| Module 3 | Skewness and | Kurtosis: | | | | 7 Hrs | | |
| Definition of Moments (a Kurtosis, Mo | of Skewness, Mea about mean and a easure of Kurtosis | sures of Skewness: Ka arbitrary point), Coeffi s, and Coefficient of Ku | rl Pearson's a cient of Skew rtosis based o | and Bowley's ness based on n Moments. | Coefficient of 1 Moments. De | Skewness, efinition of | | |
| Module 4 | Correlation A | nalysis | | | | 8 Hrs | | |
| Correlation (Direct met (unique and | : definition, scatt hod only), proba l repeated ranks) | er diagram, levels of co ble error and confiden and applications. | orrelation, Ka ce interval, a | rl Pearson's C nd Spearman's | oefficient of C s Correlation (| orrelation Coefficient | | |
| Module 5 Meaning of squares (di applications Books for F | Linear Regress Linear regression irect method on s. Coefficient of de Reference: | ion Analysis n, simple and multiple ly), relationship betw etermination R ² and ad | linear regressi veen regressi justed R ² . | ssion equation on and corre | elation coeffic | 8 Hrs od of least ients, and | | |

| | 1 | Gupta, S. P. (2021). Statistical methods (46th ed.). Sultan Chand & Sons. | | | | | | | | | | | | | | | | |
|---|--|--|--|---------------------------------------|-------------------------------------|--------------|--|---------------|--|------------|-------------|--|--|--|--|--|--|--|
| | 2 | Sharma, J. K. (2020). Business statistics (5th ed.). Vikas Publishing House. | | | | | | | | | | | | | | | | |
| | 3 | Akhilesh, K. B., & Balasubrahmanyam, S. (latest edition). Mathematics and statistics for | | | | | | | | | | | | | | | | |
| | | manageme | management (1st ed.). Vikas Publishing House. | | | | | | | | | | | | | | | |
| | 4 | Goon, A. M | Goon, A. M., Gupta, M. K., & Dasgupta, B. (2013). Fundamentals of statistics: Vol. 1 (10th | | | | | | | | | | | | | | | |
| | | ed.). World | l Press. | | | | | - | - | | | | | | | | | |
| | 5 | Gupta, S. (| С., & Каро | or, V. K. (2 | 020). Fund | damentals o | of mathema | ntical statis | tics (12th | ed.). | | | | | | | | |
| | | Sultan Cha | nd & Sons. | - | - | | - | | - | _ | | | | | | | | |
| | 6 | Kapur, J. N | l., & Saxena | a, H. C. (201 | 10). Mather | natical stat | <i>istics</i> (20th | ed.). S. Cha | nd & Com | pany | | | | | | | | |
| | | Ltd. | | - | - | | - | - | - | | | | | | | | | |
| | 7 | Kohler, P. | (2013). A | dvanced st | atistics for | the social s | sciences: A | practical g | <i>uide</i> (3rd | ed.). | | | | | | | | |
| | | SAGE India | l. | | | | | | | | SAGE India. | | | | | | | |
| | 8 | Mukherjee, S. P., & Sinha, B. K. (2017). Statistical methods in social science research (2nd | | | | | | | | | | | | | | | | |
| | | ed.). Springer. | | | | | | | | (2nd | | | | | | | | |
| | | ed.). Spring | ger. | IIIIId, D. N. | (2017). 30 | atisticai me | etnoas in so | cial science | research | (2nd | | | | | | | | |
| | Mapping o | ed.). Spring | ger. 0 | IIIIIa, D. K. | (2017). 30 | | ethoas in so | cial science | e research | (2nd | | | | | | | | |
|] | Mapping of CO/PO | ed.). Spring of CO and Po PO1 | ger. 0 PO2 | P03 | P04 | PO5 | PO6 | PO7 | PO8 | (2nd | 9 | | | | | | | |
|] | Mapping of CO/PO | ed.). Spring of CO and P(PO1 | ger. 0 PO2 H | ниа, в. к. РОЗ L | РО4 Н | P05 | PO6 L | PO7 | PO8 M | (2nd | 9 | | | | | | | |
|] | Mapping of CO/PO | ed.). Spring of CO and Po PO1 | ger. 0 PO2 H H | ниа, в. к. РОЗ L | РО4 Н Н | PO5 | PO6 L L | PO7 | PO8 M M | (2nd | 9 | | | | | | | |
| | Mapping of CO/PO C01 C02 C03 | ed.). Spring of CO and P(PO1 | ger. 0 PO2 H H H | ниа, в. к. РОЗ L L | РО4 Н Н Н | PO5 | PO6 L L L | PO7 | PO8 M M M M | (2nd | 9 | | | | | | | |
| | Mapping of CO/PO C01 C02 C03 C04 | ed.). Spring of CO and P(PO1 | е, 3. Г., & 3 ger. D PO2 H H H H | ниа, в. к. РОЗ L L L L | РО4 Н Н Н Н | PO5 | PO6 L L L L | | PO8 M M M M M M | (2nd PO | 9 | | | | | | | |
| | Mapping of CO/PO C01 C02 C03 C04 C05 | ed.). Spring of CO and P(PO1 | е, 3. Г., & 3 ger. РО2 Н Н Н Н Н | РОЗ L L L L L L | РО4 Н Н Н Н Н | PO5 | PO6 L L L L L L L | | PO8 M M M M M M M | (2nd PO | 9 | | | | | | | |

| | Program | Departmer 1me: B.Sc. (Economi | nt of Data Analy cs. Mathematic | vtics cs and Data A | (nalytics) | | |
|---|--|--|--|--|---|-------------------------------------|---|
| Semester | Course Code | Course Title | Course Duration | Course Type | Teachir Hours Po Week | ng er | Credits |
| I | S1 25 MCP 103 | Fundamentals of Statistics using R | 30 Hours | МСР | 2 | | 2 |
| Course Objectives This course builds a strong foundation in R programming, covering data type operations, functions, and control structures. It enables learners to explore descriptive statistics, data structures, and data manipulation using R packages. Additionally, focuses on data visualization, correlation, and regression analysis to derive insigh through case studies and hands-on applications. | | | | | | | a types, scriptive onally, it insights |
| Course | Descripti | ion | | | | Т | К |
| Outcomes | | | | | | Levels | Levels |
| C01 | Develop f types, op problem- | foundational proficien erations, functions, an solving. | ncy in R program nd control struc | nming, incluc tures for anal | ling data lytical | Т3 | K2 |
| CO2 | Use inbui and inter | lt statistical functions pretation. | s in R for Descri | ptive Statistic | cal analysis | Т3 | K3 |
| CO3 | Use data the best l predictio | visualisation and reg ine with minimal erro ns. | ression tools ava or to make relial | ailable on R fo ble estimation | or fitting ns and | T4 | K3 |
| Module 1 | Introduc | tion to R | | | 10 Hour | 'S | • |
| Logical, Basic Structures (cond Module 2 | Operations ditional and Descript | : Arithmetic, Logica l looping), User define ive Statistics using I | I, Relational, In ed function, Han | ntroduction ids-on Exerci | to Functio ses and Ass | ns and ignmen ⁻ rs | Control ts. |
| Data Structures Import and Exp measures of ce variance, range) | : Vectors, I ort: CSV, Ex entral tende and case st | Matrices, Lists, Data cel, Text files, Introdu ency (mean, median tudies. | Frames: Creation action to R Packa , mode), measu | on, Manipula ages and Libr ares of dispe | tion, and S aries, Descu ersion (star | ub setti riptive S ndard d | ng, Data tatistics: eviation, |
| Module 3 | Data Visua | lisation and Regres | sion Analysis u | ising R | 10 Hour | S | |
| Data Visualizati Skewness), boxy Pearson's and Sy regression, Resi | ion: Scatter plot, Line gr pearman's c dual Plot ar | r plot, Bar plot, pie aphs, multiple bar dia correlation coefficient nd case studies. | chart, histogra agram, and ggplo s, Linear Regres | am and frequent of the second se | uency curv relation: Sc Simple and | e (Kurt attered d Multip | osis and diagram, le Linear |
| Moulle 4 Correlation: def | inition sca | tter diagram levels | of correlation I | Karl Pearson | о пошъ s Coefficier | t of Co | rrolation |
| (Direct method (unique and rep | only), prob eated ranks | bable error and confi s) and applications. | idence interval, | and Spearm | an's Correl | ation Co | efficient |
| Module 5 | Linear Reg | ression Analysis | | | 8 Hours | | |
| Meaning of Line squares (direct applications. Co | ear regressi method o efficient of | on, simple and mult only), relationship k determination R ² and | tiple linear regroetween regres l adjusted R ² . | ression equat sion and co | tions using prrelation o | methoc coefficie | l of least nts, and |
| Books for Ref | erence: | | | | | | |
| 1 Prove 1 minin | ost, F., & Fav Ig and data- | wcett, T. (2013). Data analytic thinking. O'F | <i>science for busi</i> Reilly Media. | ness: What yo | ou need to ki | now abo | ut data |

Г

| 2 | Wickh model | Vickham, H., & Grolemund, G. (2017). <i>R for data science: Import, tidy, transform, visualize, and nodel data.</i> O'Reilly Media. | | | | | | | | | | |
|--------|----------------|---|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| 3 | Zuur, A | ur, A. F., Ieno, E. N., & Meesters, E. H. W. G. (2009). A beginner's guide to R. Springer. | | | | | | | | | | |
| 4 | Specto | ector, P. (2008). Data manipulation with R. Springer. | | | | | | | | | | |
| Mappin | g of CO | of CO and PO | | | | | | | | | | |
| CO/P | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 | P011 | P012 |
| 0 | | | | | | | | | | | | |
| C01 | | Н | L | М | М | Н | | | | | L | М |
| CO2 | | Н | L | М | М | Н | | | | | L | М |
| CO3 | | Н | L | М | М | Н | | | | | L | М |
| CO4 | | Н | L | М | М | Н | | | | | L | М |
| C05 | | Н | L | М | М | Н | | | | | L | М |
| C06 | | Н | L | М | М | Н | | | | | L | М |

| Semeste | r Course Code | Course Title | Course Duration | Course Type | Teaching Hours Per Week | Credits | | |
|-------------------|--|---|-----------------------------------|---------------------------------|-------------------------------|-----------------------|--|--|
| I | S1 25 SE 101 | Data Analysis using Spreadsheet | 30 | SEC-SB | 2 | 2 | | |
| Course | This course intr | oduces learners to | Excel as a p | owerful tool | for data anal | ysis and | | |
| Objectives | visualization. It | covers essential spre | adsheet oper | ations, functi | ons, and data- | handling | | |
| | techniques. Stud | lents will learn to cr | eate charts, o | dashboards, a | and perform s | tatistical | | |
| | analysis for mea | ningful insights. By | the end, they | y will be able | to efficiently | analyse, | | |
| | interpret, and pr | esent data for decision | on-making. | | | | | |
| Course Outcome | Description | | | | T Levels | K Levels | | |
| C01 | Demonstrate pro and organizing techniques. | oficiency in using Exce data using workbool | el for data ent ks, sheets, ar | ry, formatting nd referencin | g, T2 g | К2 | | |
| CO2 | Apply various Ex string, and fin computations an | cel functions, includi ancial functions, to d analyses. | ng mathemat o perform o | ical, statistica complex dat | l, T3 a | К3 | | |
| CO3 | Create visually | appealing data rep | resentations | using charts | s, T2 | K3 | | |
| | graphs, pivot tab | oles, and interactive d | lashboards to | enhance dat | a | | | |
| | interpretation. | | | | | | | |
| CO4 | Analyse datasets | using statistical tech | iniques such a | as measures o | of T3 | K4 | | |
| | central tendenc | y, dispersion, corre | elation, and | regression t | 0 | | | |
| | derive meaningf | ul insights. | | | | | | |
| Module I | I Introduction to | Spreausneet | a warlshaals | ab a ata, a alla | | 5 HOULS | | |
| origin and | noportance of Spread | sneet in Data Analysi | s, workbook, r. toyt colour | sneets: cens, | ula har and st | s, ribbon | | |
| referencing | · Relative Absolute an | d Mixed Mathematic | al operators a | , Tallge, 101 III | conditional for | atus Dai, rmatting | | |
| sorting and | filtering data | u Mixeu, Matilematie | aroperatorsa | | contrictionario | matting, | | |
| Module 2 | Snreadsheet Fu | nctions | | | | 10 | | |
| Module 2 | | netions | | | | Hours | | |
| Spreadshee | t Functions - Mathem | atical Functions: SUI | M. AVERAGE. | COUNT COU | NTA. MIN/MA | X. SORT. | | |
| POWER. LC | M. COMBIN and PERM | IUT. String functions | : LEN. LEFT. N | MID. RIGHT. (| CONCAT. TRIM | LUPPER. | | |
| LOWER, PR | OPER, Date Functions | , | , , | , _, , , | · · · · | , - , | | |
| Random nu | mber generators: RAN | ND and RANDBETWE | EN, Condition | nal functions: | IF, | | | |
| NESTED IF | , SUMIFS, COUNTIFS, | and AVERAGEIFS, I | Data Handlin | g Functions: | VLOOKUP, H | LOOKUP. | | |
| Financial fu | nctions: PMT, PV, RAT | ons: PMT, PV, RATE, NPER. What if Analysis: Goal Seek, Scenario manager, and Data table | | | | | | |
| (one way ar | nd two way). | vo way). | | | | | | |
| Module 3 | B Data Visualisat | ion using Spreadshe | eet | | | 5 Hours | | |
| Bar charts, | Column charts, Histog | ram, pie-chart, Line | graphs, Spark | lines, Scatter | ed plot: linear | ity check | | |
| and curve f | itting, Chart elements | and Chart designs. I | nteractive Da | ishboard Dev | elopment: Piv | ot Table, | | |
| Pivot Chart | and Slicers. | | | | | 4.0 | | |
| Module 4 | Statistical Analy | ysis using Spreadsh | eet | | | 10 | | |
| Maggurag | f Control tondon are a | maan madian mada | Diananaian | atandard da | viation alread | Hours | | |
| wiedsures 0 | efficient of correlation | nean, meulan, mode | sion and act | stanuaru de | viation, skew | liess allu | | |
| Skill Dovol | onmont. | i, simple intear regre | ssion, and est | | | | | |
| (These activ | opinena vities are only indicativ | e the Faculty membe | rs can innova | te) | | | | |
| | Create and format an | Excel workhook with | h multinle sh | eets, annlving | cell styles co | nditional | | |
| 1 | formatting. and refer | encing techniques to | organize data | a effectively. | , 50, 100, 00 | | | |
| _ | Solve real-world busi | iness scenarios using | Excel functio | ons such as SU | MIFS, COUNT | IFS, | | |
| 2 | VLOOKUP, financial f | unctions, and What-I | f Analysis to 1 | make data-dr | iven decisions | • | | |

| 2 | | Develop | a dashl | ooard u | sing ba | r charts | , histog | rams, a | nd pivo | t charts | to prese | nt sales o | or | |
|------------|-------|-------------|---|-----------|----------|----------|----------|-----------|----------|----------|-----------|------------|------|--|
| 5 | | survey d | yey data visually, incorporating slicers for interactivity. | | | | | | | | | | | |
| 1 | | Perform | rform statistical analysis on a dataset, calculating measures of central tendency, | | | | | | | | | | | |
| 4 | | standar | d deviat | ion, cor | relation | n, and r | egressio | on to int | terpret | trends a | and insig | hts. | | |
| Books | for R | eferenc | erence: | | | | | | | | | | | |
| 1. | Win | ston, W. | con, W. L. (2016). Microsoft Excel: Data analysis & business modeling (5th ed.). Pearson. | | | | | | | | | | | |
| 2. | Lalv | vani, L. (. | ani, L. (2022). Excel all-in-one (1st ed.). BPB Publications. | | | | | | | | | | | |
| 3. | McF | 'edries, P | edries, P. (2022). Excel formulas and functions (5th ed.). Que Publishing. | | | | | | | | | | | |
| 4. | Alex | ander, M | nder, M., & Walkenbach, J. (2016). Excel dashboards and reports (2nd ed.). Wiley. | | | | | | | | | | | |
| 5. | Hub | bard, R. | G., & O'I | Brien, A. | P. (201 | 2). Mac | roecond | omics (4 | th ed.). | Pearson | 1 | - | | |
| Mappi | ng of | CO and | CO and PO | | | | | | | | | | | |
| CO/P | 0 | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 | P011 | P012 | |
| CO1 | | L | М | М | Н | | | | | | | М | Н | |
| CO2 | | L | М | М | | Н | | | | | | М | Н | |
| CO3 | | L | М | М | | Н | | | | | | Н | М | |
| CO4 | | L | М | М | | Н | М | | | | | Н | М | |

| I | UG 24 FC 101 | Psychological Well being | 60 | Practical | 4 | | 4 |
|---|---|--|--|--|---|--------------------------------|---------------------------|
| Course Objectives: | This course at skills and to help in skills. | ims to nurture se the development | lf-awarene of emotion | ss and mea al quotient | aningful and int | l relatio er-pers | nship onal |
| Course Outcomes: | After completi | on of the course, t | he students | s will be abl | e to: | T Level s: | K levels |
| CO1 | Develop a bett | er emotional quoti | ent. | | | T5 | K2 |
| CO2 | Devise a health | nier sense of self th | rough self- | awareness | | T5 | K2 |
| CO3 | Build more me | eaningful relations | ships. | | | T4 | K2 |
| CO4 | Display an imp | provement in inter | r-personal | skills. | | T4 | K2 |
| CO5 | Modify though | nt and belief patte | rns. | | | T4 | K2 |
| CO6 | Understand the | e grieving process | | | | Т3 | K2 |
| Module 1 | Introduction | 0 01 | | | | 3 Hours | |
| Meaning of c to seeking c circles | ounselling – My ounselling – No | ths and Facts relat ormalizing seeking | ed to couns g help – Se | elling – Bre lf-reflection | aking st 1 throug | igmas re gh conce | elated entric |
| Module 2 | Intra-personal | and Inter-persona | l Awarenes | s | | 10 Hour | 'S |
| Meaning of Confronting Meaning of Personal Rig in a relations | peer pressure - peer pressure - relationships - hts in a relation ship - Intimacy a | Different kinds of Group sharing act Types of relation ship – Components and understanding | of peer pres tivity nships – H s of a health our needs - | ssure – Res ealthy rela y relationsh - Boundaries | sisting p tionship nip – Tyj s | oeer pre dynam pes of ab | ssure - nics – ouse |
| Module 3 | Understanding | gEmotions | | | | 4 Hours | , |
| Meaning of Harmful effe emotions in a | emotions – Rol ects of suppress a healthy manne | e of emotions in o sing emotions – S er – Self-assessment | our lives – igns of emo t activity | Beliefs reg otional sup | arding pressio | emotior 1 – Han | ıs – dling |
| Module 4 | Anger manage | ment | | | | 5 Hours | |
| Meaning of a express ango means wher activity | inger – Physical er – Expression 1 we're angry - | and Emotional syn and experience o - Dealing with ang | nptoms of a f anger – W ger – Guide | anger – Diff Vhat makes ed visualiza | erent w us ang tion an | ays that ry and v d art | people what it |
| Module 5 | Managing Anx | iety/Fear | | | | 4 Hours | ; |
| Meaning of reactions to | fear – Types of fear – Overcomi | fear – Physical ar ing fear – Art work | nd Emotion followed by | al symptom y group sha | ns of fea ring acti | ar – Diff ivity | erent |
| Module 6 | Dealing with I | Loss and Grief | | | | Hours | |
| Understandi Dealing with | ng loss and grid grief – Ways to | ef – Form of loss - help others in grie | - Stages of , f | grief – Dan | gers of | not grie | ving- |
| Skill Develo | pment: | | | | | | |
| 1 | Maintaining Da | aily or weekly jourr | nal to record | d the emotic | ons felt, | triggers | etc. |

| 2 | Guided mindfulness session and reflection on focus and acceptance. | | | | | | | | | |
|------------|--|--|--|--|--|--|--|--|--|--|
| 3 | Act out a scenario involving a cognitive distortion (e.g., catastrophizing, black-and-white thinking). | | | | | | | | | |
| 4 | Discuss different types of boundaries (emotional, physical, time, etc.) and Role-play scenarios: Saying no, requesting space, asking for support. | | | | | | | | | |
| 5 | Reflect on values using a list (e.g., honesty, creativity, family). | | | | | | | | | |
| 6 | Normalize challenges and highlight growth through story -telling and group submissions. | | | | | | | | | |
| Book for F | Reference: | | | | | | | | | |
| 1 | Jones, R. N. (2023). <i>Theory and Practice of Counselling and Therapy</i> (5th ed.). SAGE South Asia | | | | | | | | | |
| 2 | Ryff, C. D., & Singer, B. (2008). Know thyself and become what you are: A Eudaimonic approach to psychological well-being. In J. D. Wright (Ed.), International Encyclopaedia of the social sciences (2nd ed., Vol. 8, pp. 143-148). Macmillan. | | | | | | | | | |
| 3 | Seligman, M. E. P. (2011). Flourish: A New Understanding of Happiness and Well- being—and how to achieve them. Free Press | | | | | | | | | |
| 4 | Lyubomirsky, S. (2007). <i>The How of Happiness: A Scientific Approach to getting the life you want</i> . Penguin Press. | | | | | | | | | |
| 5 | Neff, K. D. (2011). Self-Compassion: The proven power of being kind to yourself. William Morrow. | | | | | | | | | |
| 6 | Gilbert, P. (2010). <i>The Compassionate Mind: A new approach to life's challenges</i> . Constable. | | | | | | | | | |
| Mapping | of CO and PO | | | | | | | | | |
| CO/PO | PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 | | | | | | | | | |

| со/ро | P01 | PO2 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 | P011 | P012 |
|------------|-----|-----|-----|-----|------------|------------|-----|-----|-----|------|------|------|
| | | | | | | | | | | | | |
| C01 | L | | | | Μ | М | | | H | Н | L | L |
| CO2 | L | | | | M | M | | | Н | Н | L | L |
| | | | | | | | | | | | | _ |
| CO3 | L | | | | Μ | М | | | Н | Н | L | L |
| <u>CO4</u> | | | | | D A | N A | | | | 11 | T | T |
| LU4 | L | | | | IVI | IVI | | | П | н | | L |
| C05 | L | | | | Μ | M | | | Н | Н | L | L |
| | | | | | | | | | | | | |
| CO6 | L | | | | Μ | Μ | | | Н | Н | L | L |
| | | | | | | | | | | | | |

| Semester | Course Code | Course Title | Course | Cours | Teach | ing | Credits |
|--------------------------|---|--|-----------------------------|----------------------------|-----------------------|-----------------------|-------------------|
| | | | Duration | e T | Hou | rs | |
| | | | | Туре | Per w | еек | |
| I | UG 24 CC 101 | Constitution al Values I | 60 | Practical | 4 | | 4 |
| Course | This course | aims to provi | de a con | nprehensiv | re und | erstand | ing of |
| Objectives: | constitutional evolution, and | values in India, practical applicat | focusing o tion of the C | n the four Constitutio | ndation n. It see | al prine eks to ar | ciples, nalyze |
| | the interplay h democratic go democratic id | between constitut vernance and the | ional rigidi role of con | ty and flex stitutional | ibility i ism in ι | n shapi upholdi | ng ng |
| Course | After completi | on of the course, t | he students | will be ab | le to: | Т | K |
| Outcomes: | | · | | | | Level s: | levels |
| CO1 | Analyze and | explain the sign | ificance o | f constitut | tional | T4 | K2 |
| | rigidity and fle | exibility in the con | text of dem | locratic val | ues. | | |
| CO2 | Evaluate the | contributions of | key figure | es like Dr. | B.R. | T5 | K2 |
| | Ambedkar, Ne Constitution. | hru, and Patel in | the making | g of the Ind | ian | | |
| CO3 | Demonstrate t | he impact of Fund | damental R | ights, Dire | ctive | Т3 | K2 |
| | Principles, an | d Fundamental D | outies in p | romoting s | social | | |
| Madula 1 | justice, unity, a | and integrity in In | dia. | | | 40.11 | |
| Module 1 | Introduction – | Constitution of In | dia, Constit | tuent | | 10 Hou | ſS |
| i The Maki | ng of the Cons | titution of India. F | Evolution N | Jationalist | Movem | l Ient | |
| Compositi | on of the Const | tituent Assembly, | Committee | es of the Co | nstitue | nt Asse | mbly, |
| Enactmen | t of the Constit | ution. | | | | | |
| ii. Constitu | ent Assembly: | Role of Dr B.R. An | nbedkar, Ja | avaharlal N | lehru, S | ardar | |
| Vallababha | ai Patel | | | | | | |
| iii. Preambl | le of the Indian | Constitution – Va | lues enshri | ined in the | Pream | ble; Sov | ereign, |
| Secular, Soc Module 2 | Fundamental | cratic, Republic, Ju | istice, Libe | rty, Equalit | ty and I | Tatern | ity. |
| | r unuamentar i | Aights and Duties | | | | 10 1100 | 3 |
| i. Salient Fe | eatures of India | in Constitution an | a Basic Stri | lcture wording in | dividuz | al libort | ioc |
| iii Directiv | e Princinles o | of the State Poli | cv. Socialis | st Gandhi | an and | l Liber | al- |
| Intellectua | l. | f the state for | ey, boeland | , Gunann | an, and | | |
| iv. Fundame | ntal Duties | | | | | | |
| Module 3 | Union Legislat | ure, Executive and | l Judiciary | | | 10 Hou | rs |
| i.Union Le | gislature – Par | liament; Lok Sabh | a, Rajya Sa | bha – Com | positio | n, powe | rs, |
| ii Union Fr | vocutivo - Pros | ident Vice – Pres | idont Prim | o Ministor | Union | Council | of |
| Ministry r | owers and fur | ictions Leadershi | n and colle | ctive resno | nsihilit | v | 01 |
| iii. Iudiciary | y – Supreme | Court. High Cou | rts. powei | rs and fu | nctions | and I | udicial |
| Activism in | India | , 3 200 | · F · · · · | | | ~ , | |
| Skill Develo | pment: | | | | | | |
| 1 | Make a chart | of evolution of Co | onstitution | of India an | d the P | reamble | 2. |
| 2 | Identify a case, parties involved | /scenario and anal | yse the func | lamental ri | ghts and | d duties | of the |

| 3 | Make a chart of the powers and functions of Union legislature, executive and the judiciary. |
|--------------|---|
| | |
| Rook for Ref | erence |

Book for Reference:

| 1 | B. K. Sharma, Introduction to the Constitution of India, Prentice Hall of India, New Delhi, 2002. |
|---|---|
| 2 | Austin, G. (1999). The Indian Constitution: Cornerstone of a Nation. Oxford University Press. |
| 3 | P. M Bakshi, Constitution of India, Universal Law Publishing House, New Delhi, 1999 |
| 4 | D. D. Basu, Introduction to the Constitution of India, Prentice Hall of India, New Delhi, 1982. |
| 5 | D. C. Gupta, Indian Government and Politics, Vikas publishing House, New Delhi, 1975 |
| 6 | S. N. Jha, Indian Political System, Historical Developments, Ganga Kaveri Publishing House, Varanasi, 2005 |

Mapping of CO and PO

| CO/PO | P01 | P02 | PO3 | P04 | PO5 | P06 | P07 | P08 | P09 | P010 | P011 | P012 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| C01 | Н | L | Н | L | М | | М | | | L | Н | L |
| CO2 | Н | | Н | L | M | | М | L | | L | Н | |
| C03 | Н | L | Н | L | M | | М | | | L | Н | L |
| | | | | | | | | | | | | |

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

15 Hrs

15 Hrs

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

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

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

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

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

10

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

SEMESTER II S1 24 MC 202- LINEAR ALGEBRA

COURSE OBJECTIVES:

This aims to provide students a firm grasp of key linear algebra concepts, including matrices, vectors, systems of equations, and eigenvalues and eigenvectors. Through theoretical learning and practical applications, students will develop essential problem-solving skills relevant to mathematical analysis and real-world data interpretation, focusing on applications in machine learning (Linear model fit) and data analysis.

COURSE OBJECTIVES

CO1-Understand the fundamental concepts of vectors in R2 and R3, including vector operations, geometricproperties, and applications in physics (force analysis) and Image Processing

CO2- Apply the concepts of matrix rank, solutions to systems of linear equations, and their applications to real-world problems such as network flow, traffic flow, and chemical equation balancing, using Gauss-Jordan elimination.

CO3- Understand vector spaces, subspaces, bases, and dimensions to explore their properties and solve related problems.

CO4-Solve problems involving linear transformations by understanding their definitions, properties, and applications in computer graphics.

CO5-Solve problems involving eigenvalues and eigenvectors, including characteristic equations and applications to Markov Chains and the Cayley-Hamilton theorem.

CO6- Apply techniques for solving inconsistent systems of linear equations, focusing on solution approximation using least squares, normal matrix equations, and linear regression models.

Module 1 Vectors

Vectors in Rn, position vectors, Length of a vector, unit vector, parallelogram law of vector addition, algebra of vectors (addition, subtraction and scalar multiplication), Dot product, Cross product of vectors, Scalar triple product, Colinear, Coplanar and orthogonal vectors, properties, area of a parallelogram and volume of a parallelopiped, graphical representation in R2 and R3, and Applications - Force, Resultant force and displacement problems, Mean shift theory in Image processing(overview)

Module 2 System of Linear Equations

12 Hrs

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 (Rn)

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

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

hrs Eigenvalues and Eigenvectors: Definition and examples, characteristic equation of a matrix, Cayley Hamilton Theorem (statement only) verification and finding A-1, A2, A3... 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

hrs Projection of a vector on a vector, a line and a plane in R3, 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 ($\mathbb{Z} = \mathbb{Z}0 + \mathbb{Z}0\mathbb{Z} + \mathbb{Z}$) 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.

15

10

8 hrs

15

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.

SEMESTER II S1 24 MC 203- ADVANCED STATISTICS

COURSE OBJECTIVES

The course on Advanced Statistics aims to deepen students' understanding of probability theory, statistical distributions, and inferential statistics. It focuses on theoretical and applied aspects of probability functions, distribution models, sampling techniques, and hypothesis testing. By exploring real-world data, students will gain proficiency in using statistical tools to make informed decisions, solve complex problems, and analyse large datasets. The course emphasises the practical implementation of statistical methods, fostering critical thinking, analytical skills, and decision-making capabilities for data-driven environments.

COURSE OUTCOMES

CO1- Illustrate the scope of Probability and its application for determination of certainty of possible outcome of event in real world uncertain problems.

CO2- Apply Binomial and Poisson distributions to model real-life situations involving discrete data.

CO3-Understand Uniform and Normal distribution models to analyse and interpret large datasets, with a focus on fitting the Normal curve.

CO4-Differentiate between various sampling methods and distributions, and standard error for population mean estimation.

CO5-Apply hypothesis tests using t, z, χ^2 , ANOVA to evaluate hypotheses in various research scenarios.

Module 1 Introduction to Probability

Definition of Probability- Sample Space - Favourable Events - Mutually Exclusive Events - Dependent and Independent Events - Permutations and Combinations (application-based problems) - Addition, and Multiplication Theorem of Probability (statement only) - Conditional Probability and Bayes theorem (statement only), Importance and application-based problems.

Module 2 Discrete Probability Distributions

Random Variable- Expectation-Variance, Theoretical probability distributions -Bernoulli Distribution-definition-properties-importance, Binomial distributiondefinition- properties - importance-applications - fitting a Binomial distribution, Poisson Distribution- definition- properties -importance- fitting a Poisson distributionapplications.

Module 3 Continuous Probability Distributions

8 hrs

8 hrs

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

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

Module 5 Hypothesis Testing

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.

6 hrs

17 hrs

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

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

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)

12 hrs

12

Module 4 Hypothesis Testing using R

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

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., & Grolemund, 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.

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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 1Introduction to Mathematical Economics10

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

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

Module 3Application of Differential Calculus in Economic Analysis10

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.
- 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.

| Semester | Course Code | Course Title | Course Duration | Course Type | Teaching Hours Per week | Cr | redits |
|--|---|--|---|--|--|------------------------|----------------------|
| II | UG 24 CC 201 | Constitutiona l Values II | 30 Hours | Theory | 2 | | 2 |
| Course Objectives: | This course High Court contemporar on governan | aims to provide ar . Students will y issues to critical ce and social equit | n proper und explore key lly analyze th y. | erstanding of constitution ine impact of | state legisla nal provisi constitution | ture, exec ons, deb | cutive and ates, and |
| Course Outcome | s After comple | etion of the course | , the student | s will be able | to: | T levels | K Levels |
| | CO1 | Analyze the role federalism in s system. | of decentrali trengthening | zation and co the Indian | poperative political | T4 | K2 |
| | CO2 | Discuss the effec and affirmative a | tiveness of concentrations in pro- | onstitutional jomoting socia | provisions al welfare, | Τ2 | K2 |
| | | equality, and prot | tection of vul | nerable grou | ıps. | | |
| | CO3 | Demonstrate the p Commission in In | powers and f idia. | unctions of H | Election | Τ2 | К2 |
| Module 1 | State Legisla | ture and State Ex | ecutive | | 10 I | Hours | |
| Module 2 | Democratic | Decentralisation | | <u> </u> | 101 | Hours | •• 1 |
| amendments, con and Special with Constitution with | h Concurrence special refere | allenges - Constitu e of States - Ba | tional Amen asic Structur | dment Proceed e of Indian | lure in India | ; Simple, | Special |
| Module 3 | Election Co | nmission of India | | Case | 101 | Hours | |
| Election Commis and State Public | ssion of India; | Composition, Pov mission - Affirm | vers and Fun native Actio | ctions - Publ n; Reservation | ic Service Con for SC/S | ommissio Γ(23%), | ns; UPSC |
| Skill Developme | nt: | omen(33% Reserva | ition within) | r's Relevance | • | | |
| 1 | Make a cha | rt of State Legis | lature struct | ure and iden | ntify the pe | ople hold | ing |
| 2 | different prot Analyse any | files. of the election pr | ocess conduc | cted in the pr | evious years | and pres | ent |
| 3 | your observa Study the Ke | itions. eshava Nanda case servations | e and make a | report and a | lso present i | t in the c | ass |
| Book for Referei | ice: | servations. | | | | | |
| 1 | Ambedkar, B | . R. (1948), The Co | nstitution of | India, Govern | iment of Indi | а. | |
| 2 | Basu, D. D. (| 2018). Introduction | n to the Cons | titution of Ind | lia, LexisNex | is. | |
| 3 | Austin, G. (1 Press. | 999). The Indian (| Constitution: | Cornerstone | of a Nation, | Oxford U | niversity |
| 4 | Sharma, B. K | . (2021). Introduct | ion to the Cor | nstitution of I | ndia. Prentic | e Hall. | |
| 5 | Singh, M. F | P., & Saxena, R. (| 2008). India | n Politics: C | onstitutional | Foundat | ions and |

| 6 |
|---|
|---|

Khosla, M. (2012). The Indian Constitution, Oxford University Press

Mapping of CO and PO

| CO/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | H | L | Н | L | | | М | | | L | М | |
| CO2 | Н | | Н | L | | | М | L | | L | M | |
| CO3 | Н | L | н | L | | | М | | | L | М | |
| | | | | | | | | | | | | |