Semester	**2**
Course *1	**Minor**
Paper code	B1MT230221T
Paper Title	**Linear Programming and Calculus-1 [Economics+ Computer Science]**
No. of Credits *2	**4**
Theory / Practical / Composite	**Theory**
Minimum No. of preparatory hours per week a student has to devote	**4**
Number of Modules	**2**
Syllabus	**Module-1[Linear Programming]** 1. Linear Programming [37] : Formulation of Linear Programming Problems: standard and canonical forms. **(3)**. Graphical Solution of L.P.P and moving hyperplane method: Examples of Finite Optimal Solution; Alternative Optimal Solution; Unbounded Solution. **(3).** Basic Solution of a system of linear equations: examples. Feasible solution. Degenerate solution. Reduction of a feasible solution to a basic feasible solution. **(4)**. Convex sets and their properties (statement only) Examples; [2]. Extreme points and Boundary points of a convex set and examples [1] Simplex Method: Its Algebraic and Geometric Aspect **(2)**. Criteria for improvement and optimality of objective function; Criterion for unbounded solution. Computational Aspect of Simplex method: Simplex table. Examples **(5)** Obtaining initial b.f.s. Artificial variable. Charne's Big M Method **(4)** Duality Theory: Canonical and Standard form of primal and dual l.p.p. , Dual of the dual LPP is the primal LPP[2]. Weak duality Theorem, Fundamental Theorem on Duality (no proof) and their applications. [2] Game theory: Two Person zero sum game. The Saddle point and the maximin-minimax principle. Relation between maximin and minimax values **(2)**. Games without saddle

	point: Mixed strategy **(2)**. Graphical Method of solving nx2 and 2xn games **(2)**. Dominance property: generalised dominance (**1**). Reduction of a game problem to a LPP: Fundamental Theorem of Rectangular Games (statement only) **(2)**.

Module -2 [Calculus-1]

Mean Value Theorems [15]: Statement of Rolle's Theorem - its geometrical interpretation and direct applications. Mean Value Theorems of Lagrange and Cauchy (no proof) and applications (5). Indeterminate Forms: L' Hospital's Rule: statement and problems only (2). Statement of Taylor's and Maclaurin's Theorem with Lagrange's & Cauchy's form of remainders. Taylor's and Maclaurin's infinite series for functions like $\exp(x)$, $\sin(x)$, $\cos(x)$, $\ln(1+ x)$ (with restrictions wherever necessary)(5). Application of the principle of maximum and minimum for a function of a single variable in geometrical, physical and other problems (3). |
| Learning Outcomes *[3] | On successful completion of the course a student will be able to do the following:

• Gain insights in managerial decision to choose the best possible course of action to optimize resource allocation of a real-life problem keeping in mind the linear constraints involved: this has useful application in logistics and economical systems.
• Understand dual nature of real-life problems and how to utilise the duality to solve a given problem more easily.
• Learn Game theory as the study of mathematical models of strategic interaction in between rational decision-makers and discusses its applications in different fields of social sciences.
• Learn to find whether the dependent variable is increasing/decreasing with increase in independent variable value and the rate of Increment/decrement.
• Get familiarity with conditions under which approximate value of a dependent variable may be found when value of the variable and rate of change of that variable at a nearby point are known. |

	- Learn techniques in establishing bounds between which an unknown quantity lies. - Will be able to search for minimum/maximum value of a given dependent variable: this has useful role in optimization in physical and economical systems.
Reading/Reference Lists *[4]	- Introduction to Real Analysis—Bartle, Sherbert - Real Analysis—S.K.Mapa - Linear Programming and Network Flows: Bajara & Jarvis - Linear Programming: P.M.Karak Online lectures: - https://youtu.be/9EazAcwS3S0 - https://youtu.be/tffrrtzUhmw

Evaluation	Theory CIA: 20+5+5=30 Semester Exam: 70	Practical (if applicable) CA: Semester Exam:
Paper Structure for Theory Semester Exam	Module-1 [50 marks]: 5 questions each carrying 10 marks out of 9 questions. Module-2 [20 marks]: 2 questions each carrying 10 marks out of 4 questions.	