Mathematics Practical
Python Programming Language-II
[CORE COURSE]

Semester: IV	Credits: 2	Subject Code: BSP42109	Lectures: 48

Course Outcomes:

At the end of this course, the learner will be able to:
- Illustrate 2D and 3D objects using numpy, matplotlib libraries.
- Illustrate and interpret graphical aspects of two-dimensional and three-dimensional transformation
- Demonstrate the Bezier curve though given points in python.
- Apply Python Programming to solve Linear Programming Problems using graphical method, Simplex method and interpret the solution type.

Practical 1: 2D, 3D Graphs	

- Installation of numpy, matplotlib packages
- Graphs plotting of functions such as ... etc.
- Different formats of graphs.
- Three-dimensional Points and Lines
- Three-dimensional Contour Plots
- Wireframes and Surface Plots
- Graphs plotting of functions such as... etc.

Practical 2: Computational Geometry	

- **Points:**
  - The distance between two points, Lists of Points - the Point List class, Integer point lists, Ordered Point sets, Extreme Points of a Point List, Random sets of Points not in general position
- **Points:**
  - Displaying Points and other geometrical objects, Lines, rays, and line segments,
  - The geometry of line segments, Displaying lines, rays and line segments

Practical 3: Computational Geometry	

- **Polygon**
  - Representing polygons in Python, Triangles, Signed area of a triangle,
  - Triangles and the relationships of points to lines, is Collinear, is Left, is Left On, is Right, is Right On, Between Comparison operators (>, <, ==)

Practical 4: Two-dimensional transformation	

- Study of Graphical aspects of Two-dimensional transformation matrix using Matplotlib

Practical 5: Three-dimensional transformation	

- Study of Graphical aspects of Three-dimensional transformation matrix using Matplotlib

Board Of Studies	Name	Signature
Chairman (HoD)	Gitanjali Phadnis	G.M.Phadnis

Practical 6: Concatenation of 2D and 3D	
• Study of effect of concatenation of Two dimensional and Three dimensional Transformations	

Practical 7: Bezier Curve	
• Generation of Bezier curve using given control points	

Practical 8: Study of Operation Research	
• Linear Programming in Python	

Practical 9: Study of Operation Research	
• Introduction to Simplex Method in Python (Canonical Form of LPP)	

Recommended Text Books:

• Jaan Kiusalaas, *Numerical Methods in Engineering with Python*, Cambridge
    ○ Section 3
• Jason Brownlee, *Basics of Linear Algebra for Machine Learning*, Discover the Mathematical Language of Data in Python
    ○ Section 2
• Robert Johansson, *Introduction to Scientific Computing in Python*
    ○ Section: 1

Reference Books:
• Guzdial, M. J., *Introduction to Computing and Programming in Python*, Pearson India. • Jim Arlow, Interactive Computational Geometry in Python • Lambert K. A., Fundamentals of Python - First Programs, Cengage Learning India, • 2015. • Perkovic, L., Introduction to Computing Using Python, 2/e, John Wiley, 2015. • Zelle, J., Python Programming: An Introduction to Computer Science, Franklin, Beedle and Associates Inc.

Board Of Studies	Name	Signature
Chairman (HoD)	Gitanjali Phadnis	*f. M.Phadnis*