

COURSE CODE	COURSE TITLE	L	T	P	C
1152CS167	COMPUTATIONAL THINKING	3	0	0	3

Course Category: Program Elective

A. Preamble:

Working with data requires extensive computing skills. A Data Science student must be prepared to work with data as they are commonly found in the workplace and re- search labs. For example, accessing and organizing data in databases, scraping data from websites, processing text into data that can be analyze and ensuring secure and confidential data storage all require extensive computing skills.

B. Pre-requisites:

SI No	Course Code	Course Name
1	1151CS102	Data Structures
2	1151CS106	Design and Analysis of Algorithms
3	1151CS119	Introduction to Design and Analysis of Algorithms

C. Related Courses:

SI No	Course Code	Course Name
1	1152CS110	Knowledge based decision support systems
2	1152CS206	Statistical Methods for Data Science

D. Course Outcomes:

Students undergoing this course are able to:

CO Nos	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Understand problems drawn from real-world scenarios by interpreting and evaluating data	K2
CO2	Explain computational thinking to solve problems, and determine what insight can be gained	K2
CO3	Identify concepts that make computing using statistical concepts	K2
CO4	Demonstrate how computations can be viewed as an alternative to theory and experiments in scientific research using knapsack	K2
CO5	Explain some of the logic behind existing computational approaches for various problems of interest to science and society	K2

E. Correlation of Cos with Pos :

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	L								L	H	L	M	L	
CO2	M		M	M	L							H	H		L
CO3	M	M								M			M	L	
CO4	M		M	M	M						L	M	L		
CO5	M	L	M	M	M					L	M		L		L

H- High; M-Medium; L-Low

F. Course content:

- Unit-I Stochastic Programs, Probability and Statistics** **9**
Stochastic Programs-Inferential statistics and simulation-Distributions- Normal distribution and confidence levels-Uniform distributions-Exponential and Geometric distributions-Bedford's distribution
- Unit- II Random Walk and data visualization** **9**
Drunkards Walk, Biased Random walks, Treacherous fields-Pascal's Problem- pass or Don't pass
- Unit-III Lies and Statistics** **9**
Garbage In Garbage Out (GIGO)-sampling bias-context Matters-Beware of extrapolation-the Texas sharpshooter Fallacy- just beware
- Unit-IV Knapsack and Graph optimization problems** **9**
Knapsack problems-Greedy algorithms-an optimal solution to knapsack problem- graph optimization problems-shortest path-DFS-BFS-Dynamic Programming-Fibonacci sequence – divide and conquers
- Unit-V Quick look on Machine Learning** **9**
Feature vectors-Distance Metrics- Clustering- K-means Clustering- A contrived Example- Wrapping up

G. Learning Resources

i. Text Book

1. Guttag, John. Introduction to Computation and Programming Using Python: With Application to Understanding Data. 2nd ed. MIT Press, 2016.
2. Ethem Alpaydin. Introduction to Machine Learning, second edition, The MIT Press, 2010.

i. Reference books

1. Introduction to computational thinking Kindle Edition by The Open University The Open University; 1.0 edition, 2016.

ii. Online Resources

1. <https://mitpress.mit.edu/books/introduction-computation-and-programming-using-python-revised-and-expanded-edition>
2. <https://www.edx.org/course/introduction-computational-thinking-data-mitx-6-00-2x-7>
3. <https://www.pearson.com/us/higher-education/program/Guzdial-Introduction-to-Computing-and-Programming-in-Python-plus-My-Lab-Programming-with-Pearson-e-Text-Access-Card-Package-4th-Edition/PGM239876.html>