1.	Title of the course	Computational Complexity Theory
2.	Course number	CS505L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To CS5023/6
6.	To be offered by	Department of Computer Science and Engineering
7.	To take effect from	July 2022
8.	Prerequisite	CoT
9.	**Course Objective(s):** This course is to introduce computational complexity theory through an investigation of the time, memory, or other resources required for solving computational problems, and develop fundamental understanding of "computation under resource constraints".	
10.	**Course Content:** Formal definitions of computation, Turing Machines(TMs), Simulations, Time complexity and universal TMs, Time Hierarchy Theorem, Problems in P, SAT, NP, Nondeterminism, Reductions, NP-completeness and the Cook-Levin Theorem, NP-completeness reductions, Search-to-decision, padding, dichotomy theorems, Ladner's Theorem and Mahaney's Theorem, coNP; Space complexity, Savitch's Theorem and NL, NL-completeness and log-space reductions,Pcompleteness, PSPACE-completeness, The Immerman--Szelepcsényi Theorem, Randomized complexity: RP, coRP, ZPP, BPP. The Polynomial Hierarchy. Oracle Turing Machines and P^NP. Interactive proofs: IP = PSPACE. Counting Problems. Theory of #P-completeness. Beyond worst-case analysis.	
11.	**Textbook(s):** 1. Sanjeev Arora and Boaz Barak,Computational Complexity: A Modern Approach, Cambridge University Press (2009). 2. Michael Sipser, Introduction to the Theory of Computation(2nd or 3rd edition), Cengage Learning (2012).	
12.	**Reference(s):** 1. Garey M R, and Johnson D S, *Computers and Intractability: A guide to the theory of NP-completeness*, Freeman and Company (1979).	