Birla Institute of Technology & Science, Pilani
K. K. Birla Goa Campus
First Semester 2018-2019
Course Handout (Part-II)

In addition to part I this portion gives further specific details regarding the course Logic in Computer Science.

Course Details

Course Title	:	Advanced Algorithms & Complexity
Course Number	:	CSF364
Instructor-In-charge	:	A Baskar

Objective

- Introduce various algorithms design techniques to solve optimization problems.
- Introduce the notion of hard problems and techniques to prove hardness of the problem.
- Study approximation algorithms and randomized algorithms to solve hard problems

Text book

(T_1) Introduction to Algorithms, TH Cormen, CE Leiserson, RL Rivest, C Stein, Third Edition, MIT Press.

Please note that whatever definitions, notations and techniques which we use in the class are final.

References

(R_1) Randomized Algorithms, Rajeev Motwani, Prabhakar Raghavan, Cambridge University Press 2000

(R_2) Algorithm Design, Jon Kleinberg, Eva Tardos, First Edition, Pearson.

Course Plan

Modules

Module No	Topic	Objectives
	Introduction	Introducing goals and motivation for the course
I	Randomized Data Structures	Introducing probabilistic techniques using advanced data structures
II	Algorithm Design Techniques	Review of algorithm design techniques and using them to solve optimization problems
III	NP-Completeness	Introduce the concept of complexity classes and understand NP-complete problems. Learn the reduction techniques
IV	Randomized Algorithms	Investigate the power of randomization to design efficient algorithms for NP-hard problems
V	Approximation Algorithms	Using approximation techniques to design efficient algorithms for NP-hard problems

Lecture Schedule

Lecture	Topics	Reading	Module No
1	Overview of Algorithms		I
2–6	Treaps	R_1 8.2	II
7–8	Skip Lists	R_1 8.3	II
9	Introduction to Algorithm Design Techniques		III
10-12	Dynamic Programming	T_1 15	III
13-15	Greedy Algorithms	T_1 16	III
16	Introduction to the complexity classes NP and NP-complete	T_1 34	IV
17–24	NP-hard problems: 3 CNF SAT, Hamiltonian Cycle, Subset Sum, Travelling Salesman problem,	T_1 34	IV
25	Introduction to Approximation Algorithms	T_1 35	V
26–33	Designing approximation algorithms for various NP-hard problems	T_1 35	V
34	Introduction to randomized algorithms: hiring problem	T_1 5	VI
35–37	Balls and Bins Problem, Coupon Collectors Problem, Birthday Paradox	T_1 5	VI
38–39	Application of Randomized algorithms for NP hard problems	R_1	VI
40	Summary and Review		

Evaluation Scheme

No	Component	Weightage	Date	Time	Remarks
1	MidSem	30%	13/03/2019	2 PM – 3.30 PM	Closed Book
2	Comprehensive	45%	07/05/2019	9 AM – 12 Noon	Partly Open Book
3	Surprise quiz	15%	-	-	Open Book
4	Lab	10%	TBA	TBA	Open Book

Chamber Consultation

Wednesday (4:30 PM – 5:30 PM)

Notices

The course site on photon will be used and some announcements will be made in the class during lectures.

Make-up Policy

- Make-up (for MidSem and Compre) shall be granted only in genuine cases based on individual's need and circumstances.
- No marks will be awarded without make-up for that component
- There are no make-ups for quizzes or labs. If we conduct n of them, we will consider the best n-1.

Instructor-In-Charge
CSF364