School of Computing and Information Sciences

Course Title: Randomized Algorithms **Date:** 2/27/2015

Course Number: COT-6446

Number of Credits: 3

Subject Area: Algorithms	**Subject Area Coordinator:** Deng Pan **email:** pand@cs.fiu.edu
Catalog Description: Topics include the basic concept of randomized algorithms, commonly used tools and techniques for the design and analysis of randomized algorithms, and their applications in many core computer science areas.	
Textbook: "Randomized Algorithms" by *Rajeev Motwani* and *Prabhakar Raghavan*, Cambridge University Press, 1995 (ISBN-13: 978-0521474658).	
References: • "Probability and Computing: Randomized Algorithms and Probabilistic Analysis", by *Michael Mitzenmacher* and *Eli Upfal*, Cambridge University Press, 2005 (ISBN-13: 978-0521835404). • "The Probabilistic Method", by Noga Alon and Joel Spencer, John Wiley & Sons, 2008 (ISBN-13: 978-0470170205). • Lecture notes from similar courses taught at MIT, Princeton, Berkeley, CMU, etc.	
Prerequisites Courses: COT-5407	
Corequisites Courses: None	

Type: Elective for MSCS, MSIT, MSTN, and Ph.D. students

Prerequisites Topics:

- Discrete mathematics, probability theory
- Algorithms
- Programming

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Course Outcomes:

1. Understand the basic concept of randomized algorithms
2. Master the moment method, deviations and tail inequalities
3. Master random walks and their applications
4. Understand the probabilistic method
5. Understand how to apply tools developed to data structures and algorithms
6. Present a research paper that uses randomized algorithms

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Outline

Topic	Lecture Hours	Outcome
• Introduction • Background and history of randomized algorithms	3	1

• Deviation bounds
  • Moments and deviations
  • Tail bounds
	6	2

• Random walks
  • Markov chains
  • Random walks on graphs
  • Expanders
	6	3

• The probabilistic method
  • Overview
  • The Lovasz local lemma
  • Conditional probability method
	6	4

• Applications
  • Data structure (skip lists, hash table, etc)
  • Graph algorithms
  • Property testing
	9	5

• Students presentations	6	6

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Oral and Written Communication:

- Number of written reports: **1** for the term project.
- Approximate number of pages for term project: **10 pages**.
- Number of assignments: **3** (3 problem sets).
- Number of required oral presentations: **One** for the term project.
- Approximate time for each presentation: about **30 minutes** for each student