Title (Units): **COMP 7050 Advanced Topics in Networking and Systems (3,2,1)**

Course Aims: To learn the mathematical modeling and simulation techniques and apply them to solve problems in networking and systems.

Prerequisite: Research Postgraduate Student Standing

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Explain the basic concepts and methodologies of mathematical modeling for networking and systems
2	Describe the procedures of computer simulations and explain simulation results
3	Describe the problems in the selected topics and explain the solutions to these problems
	Skill
4	Develop mathematical models for problems in networking and systems
5	Carry out performance evaluation of networking and systems

Calendar Description: The course offers a study of the mathematical modeling and simulation techniques for networking and systems. It also provides case studies on one or more of the advanced topics in computer networks, wireless networks, mobile networks, distributed systems, and cloud computing.

Teaching and Learning Activities (TLAs):

CILOs	TLAs will include the following:
1, 2, 3	Students will learn the concepts and techniques via lectures, in-class discussions, assignments, and tests.
4, 5	Students will work on a project which involves problem formulation, proposal of solution, and performance evaluation.

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Remarks
1	Continuous assessment	50%	1-5	Continuous assessments will be used to evaluate how well students have learned the concepts in mathematical modeling and simulation. A project will be used to assess the students' skills in applying the modeling and simulation techniques to solve problems in networking and systems.
2	Examination	50%	1-5	Examination will be used to evaluate the students' overall understanding on the modeling and simulation techniques, and the problems and solutions of selected topics in networking and systems.

Assessment Rubrics:

Excellent (A)	• Achieve all five CILOs, demonstrating a thorough understanding and solid knowledge of the selected topics • Able to apply a variety of techniques for solving problems in networking and systems
Good (B)	• Achieve most of the five CILOs, demonstrating a good understanding and competent knowledge of the selected topics • Able to apply an appropriate technique for solving problems in networking and systems
Satisfactory (C)	• Achieve some of the five CILOs, demonstrating a basic level of understanding and knowledge of the selected topics • Able to provide solutions for familiar problems in networking and systems
Fail (F)	• Achieve few of the five CILOs, with little understanding of the selected topics • Unable to provide solutions for simple problems in networking and systems

Course Intended Learning Outcomes and Weighting:

Content	CILO No.
I. Mathematical modeling and simulation	1, 2, 4, 5
II. One or more advanced topics in networking and systems	3-5

References:

James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, Pearson, 7th Edition, 2016. (ISBN 978-0133594140)
Sunilkumar S. Manvi and Mahabaleshwar S. Kakkasageri, Wireless and Mobile Networks, Concepts and Protocols, Wiley India, 2nd Edition, 2016. (ISBN 978-8126558551)
G.F. Coulourism, J. Dollimore, T. Kindberg, and G. Blair, Distributed Systems: Concepts and Design, 5th Edition, Pearson, 2011. (ISBN 978-0132143011)
Anurag Kumar, D. Manjunath, and Joy Kuri, Communication Networking: An Analytical Approach, Morgan Kaufmann, 2004. (ISBN 978-0124287518)
Raj Jain, The Art of Computer Systems Performance Analysis, Wiley, 1991. (ISBN 978-0471503361)
Additional reading materials such as research papers and book chapters will be provided.

Course Content in Outline:

Topic

I. Mathematical modeling and simulation for networking and systems
   A. Overview of mathematical modeling
   B. Mathematical optimization techniques
   C. Queueing theory
   D. Game theory
   E. Simulation for networking and systems

II. One or more advanced topics in
   A. Computer networks
   B. Wireless networks
   C. Mobile networks
   D. Distributed systems
   E. Cloud computing