1. **Course Number and Course Title**
   COE 375 – Modeling and Simulation of Stochastic Systems

2. **Credit Hours**
   3-0-3

3. **Prerequisites and/or Co-Requisites:**
   Prerequisite: NGN 111 (Introduction to Statistical Analysis) or STA 201 (Introduction to Statistics for Engineering and Natural Sciences)
   Prerequisite/Concurrent: COE 370 (Communications Networks) or COE 371 (Computer Networks-I)

4. **Name and Contact Information of Instructor:**
   Dr. Taha Landolsi

5. **Course Description (Catalog Description):**
   Examines concepts of probability and stochastic processes and their applications to computer engineering problems. Includes the following topics: random variables, random processes, queuing models, discrete-event and discrete-time simulation and its application to computer systems and networks performance. Emphasizes the use of computer programs and industry-standard simulation packages to model stochastic computer systems.

6. **Textbook and other Supplemental Material:**
   Textbook:
   - S. Ross, Introduction to Probability Models, 11th ed., Academic Press, 2014.

   Supplemental material:
   - S. Miller, Probability and Random Processes, 2nd ed., Academic Press, 2012.
   - J. Banks, Discrete-Event System Simulation, 5th ed., Pearson, 2009.
   - A. L. Garcia, Communication Networks, 2nd ed., McGraw-Hill, 2004.

7. **Learning Outcomes:**
   Upon completion of the course, students will be able to:
   1. Identify the probability distribution functions of important discrete and continuous random variables.
   2. Develop MATLAB programs to generate random variables and perform transformations and operations on them.
   3. Use joint distribution functions of random variable pairs to compute probabilities, expectations, covariances, and correlations.
   4. Calculate the autocorrelation and power spectral density of stationary stochastic processes.
   5. Apply Markov chains and birth-death processes' results to queuing systems.
   6. Develop queuing models for simple computer systems and networks.
   7. Simulate computer networks and analyze their performance using OPNET.

8. **Teaching and Learning Methodologies:**
   Include lectures, class discussions, homework, programming assignments, and projects.

9. Course Topics and Schedule:

Topic	Weeks
Probability theory	1
Discrete and continuous random variables	1
Transformation of random variables	1
Introduction to modeling and simulation	1
Evaluation of probabilities using computer programs	1
Programming transformations and operations on random variables	1
Distribution functions of random variable pairs	1
Operations and transformations of random variable pairs	1
Random processes	1
Introduction to Markov chains	1
Numerical evaluation of MC's state probabilities	1
Single-server queuing systems	1
Multi-server queuing systems	1
Simulation of networking scenarios	1
Review and evaluations	2
Total:	**16**