

Tribhuvan University
Institute of Science and Technology
BSc. CSIT 5th Semester Syllabus
Course Title: Simulation and Modeling

Course No.: CSC-302

Full Marks: 60+20+20

Credit Hours: 3

Pass Marks: 24+8+8

Nature of Course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: This course provides the discrete and continuous system, generation of random variables, analysis of simulation output and simulation languages.

Unit	Break down	Hours	Remarks
1. Introduction to simulation	1. System concept, Boundary, environment	0.5	
	2. Continuous and Discrete System, Real time simulation	0.5	
	3. Types of simulation model(Static Physical, Dynamic Physical, Static Mathematical)	2	
	4. Principles used in modeling, Distributed lag model	1	
	5. Phases and steps in simulation study	0.5	
	6. Advantages and Disadvantages of Simulation	0.5	
	7. Areas of Application.		
2. Simulation of Continuous system	1. Queuing System	0.5	
	a. Introduction, Characteristics, Notation, Discipline		
	b. Single Server queues		
	c. Server Utilization, Concept of Multi Server Queues	0.5	
	2. Markov Chains	2	
a. Introduction			
b. Application and examples			
3. Differential and Partial Differential Equations	1		
3. Random Numbers	1. Introduction, Table, Pseudo Random Numbers	1	
	2. Generation of Random Numbers	2	
	a. Uniform: Linear Congruential Method	2	
	b. Non Uniform: Inverse Transformation , Rejection	2	
	3. Testing for Randomness	1	
	a. Uniformity (frequency) test	1	
	i. Kolmogorov-Smirnov Test		
	ii. Chi-Square Test		
	b. Testing for auto correlation	1	
	c. Poker test		
d. Gap test			
4. Verification and Validation of Simulation Model	1. Modeling Building	1	
	2. Verification of Simulation Model	2	
	3. Calibration and Validation of Models	3	
5. Analysis of	1. Nature of problem	1	

Simulation Output	2. Estimation methods 3. Simulation run statistics 4. Replication of runs 5. Elimination of internal bias	1 2 2 2	
6. Simulation Language	1. Basic concept of simulation tools 2. Discrete systems modeling and simulation- Introduction to GPSS 3. Continuous system modeling and simulation- Introduction to CSMP 4. Data and control statement in CSMP 5. Hybrid simulation 6. Feedback systems: typical applications (Auto pilot)	1 3 3 1 1 1	

Committee:

- | | | |
|---|-------------------------|----------------------|
| 1. Dr. Subarna Shakya | -Expert and Coordinator | -subarna40@gmail.com |
| 2. Hari Khadka | -Patan Campus | -erkhadka@yahoo.com |
| 3. Bhoj Raj Ghimire
bhojghimire614@gmail.com | -Amrit Campus | - |

Tribhuvan University
Institute of Science and Technology

Bachelor of Science in Computer Science and Information Technology

Course Title: Simulation and Modeling

Full Marks: 60

Course No.: CSC 302

Pass Marks: 24

Time: 3 Hrs.

Model Question:

Group A

Long answer questions. (Attempt any two)

(10x2=20)

1. Define system modeling and simulation. Describe the dynamic physical model with suitable example.
2. What do you mean by uniformity test? The following is the set of single digit numbers from a random number generator

6	7	0	6	9	9	0	6	4	6
4	0	8	2	6	6	1	2	6	8
5	6	0	4	7	1	3	5	0	7
1	4	9	8	6	0	9	6	6	7
1	0	4	7	9	2	0	1	4	8
6	9	7	7	5	4	2	3	3	3
6	0	5	8	2	5	8	8	3	1
4	0	8	1	7	0	0	6	2	8
5	6	0	8	0	6	9	7	0	0
3	1	5	4	3	8	3	3	2	4

Using appropriate test, check whether the numbers are uniformly distributed or not.

3. What do you understand by simulation output analysis? Describe the estimation method with suitable example.

Group B

Short answer questions (Attempt any eight)

(8x5=40)

4. Explain different phases of simulation study in brief.
5. Why do we use differential and partial differential equations in simulation?
6. Define random number. Explain the rejection method of random number generation.
7. Explain the process of model validation through the iterative method of calibration.
8. Describe any 5 block diagram symbols of GPSS with suitable diagram.
9. What is Markov chain? Describe different areas of application in short.
10. List out the entities, attributes, activities and state variables for the following systems:
 - a. Traffic system
 - b. Banking system
 - c. Super markets
 - d. Communication systems
 - e. Production system.
11. What do you mean by M/M/1/N/K? Suppose an office working 8 hr per day for 5 days a week gets about 800 telephone calls a week. Find out the number of calls per minute.
12. Explain in brief time simulation.
13. Write short notes on:
 - a. CSMP
 - b. Simulation Run Statistics