SEMESTER S6

MODELLING AND SIMULATION LAB

Course Code	PCIEL607	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	ESE Marks	50
Credits	2	Exam Hours	2 Hrs 30 Min.
Prerequisites (if any)	None	Course Type	Lab

Course Objectives:

1. To make the students gain practical skills in applying system simulation techniques in various industrial and interdisciplinary areas.
2. To provide hands-on training on system modelling and behaviour.

Expt. No.	Experiments
1	Exercise on random number generation and test of fitness using Excel and Statistical softwares
2	Exercise on statistical distribution fitting using SPSS/ Minitab / Systat etc.
3	Exercise on Monte-Carlo simulation using Excel.
4	Simulation of queuing systems using Simio / Arena / Promodel / Witness etc.
5	Simulation of manufacturing systems using Simio / Arena / Promodel / Witness etc.
6	Simulation of healthcare systems using Simio / Arena / Promodel / Witness etc.
7	Simulation of biological systems using Vensim / Powersim / Stella etc.
8	Simulation of social systems using Vensim / Powersim / Stella etc.
9	Simulation of industrial systems using ensim / Powersim / Stella etc.
10	Apply system dynamics models for forecasting, financial analysis and decision making.

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Course Assessment Method
(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Internal Examination	Total
5	25	20	50

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

- ***Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.***
- ***Endorsement by External Examiner:*** *The external examiner shall endorse the record*

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Apply the system concepts to understand a real world system.	**K3**
CO2	Distinguish a discrete and continuous system with respect to modelling.	**K4**
CO3	Build various scenarios for a discrete system and simulate the same.	**K3**
CO4	Develop cause and effect relationships for continuous systems and simulate the same.	**K3**

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Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	3	-	-	1	1	-	2
CO2	2	1	2	1	2	1	-	-	1	1	-	2
CO3	2	2	3	2	3	2	-	-	1	1	-	2
CO4	2	2	3	2	3	2	-	-	1	1	-	2

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Excel Data Analysis : Modeling and Simulation	Hector Guerrero	Springer	2nd Edition, 2019
2	Simio and Simulation - Modeling, Analysis, Applications	Jeffrey S. Smith, David T. Sturrock	Simio LLC	7th Edition, 2024
3	System Dynamics Modelling with Vensim	Juan Martin Garcia	Independently published	1st Edition, 2018

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Simulation Modeling and Analysis	A. M. Law	McGraw Hill	6th Edition, 2024
2	System Simulation	Geoffrey Gordon	Prentice Hall India	2nd Edition, 1979
3	Discrete Event Simulation: Modeling, Programming and Analysis	George Fishman	Springer series in Operations Research and Financial Engg.	1st Edition, 2001
4	System Simulation with Digital Computer	Deo Narsingh	Prentice Hall India	24th Edition, 2011
5	Simulation	Sheldon M Ross	Elsevier	6th Edition, 2023
6	Business Dynamics – Systems Thinking and Modeling for a Complex World	John D Sterman	McGraw Hill	1st Edition, 2000

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Video Links (NPTEL, SWAYAM…)	
Link ID	https://archive.nptel.ac.in/courses/112/107/112107220/
	https://archive.nptel.ac.in/courses/112/107/112107214/
	https://archive.nptel.ac.in/courses/110/101/110101142/
	https://archive.nptel.ac.in/courses/110/107/110107157/

Continuous Assessment (25 Marks)

1. Preparation and Pre-Lab Work (7 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. **Conduct of Experiments (7 Marks)**

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. **Lab Reports and Record Keeping (6 Marks)**

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. **Viva Voce (5 Marks)**

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

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Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

2. **Conduct of Experiment/Execution of Work/Programming (15 Marks)**

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

3. **Result with Valid Inference/Quality of Output (10 Marks)**

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. **Viva Voce (10 Marks)**

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. **Record (5 Marks)**

- Completeness, clarity, and accuracy of the lab record submitted

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