JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME64b – SIMULATION AND MODELLING OF MANUFACTURING SYSTEMS
(Professional Elective-II)

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Course Objectives: The objectives of the course are to make the students learn about
- Explain the concept of modeling and simulation of manufacturing systems.
- Familiarize manufacturing simulation languages.
- Describe the various approaches to analyze the output data.
- Impart knowledge applications of simulation.
- Expose the students G P S S, SIMAN and SIMSCRIPT.

UNIT – 1: System and Simulation   **10 Hrs**

System – ways to analyze the system – Model – types of models – Simulation – Definition – Types of simulation models – steps involved in simulation – Advantages & Disadvantages. Parameter estimation – estimator – properties – estimate – point estimate – confidence interval estimates – independent – dependent – hypothesis – types of hypothesis- steps – types 1& 2 errors – Framing – strong law of large numbers.

Learning Outcomes:
At the end of this unit, the student will be able to

• Implement various steps involved in simulation process.	L5
• Illustrate the advantages and disadvantages of simulation process.	L2
• List the various types of hypothesis.	L1
• Apply simulation models to manufacturing systems.	L2

UNIT – II: Building of simulation model   **10 Hrs**

Building of Simulation model – validation – verification – credibility – their timing – principles of valid simulation Modeling – Techniques for verification – statistical procedures for developing credible model. Modeling of stochastic input elements – importance – various procedures – theoretical distribution – continuous – discrete – their suitability in modeling.
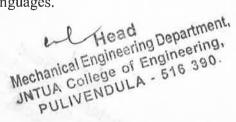
Learning Outcomes:
At the end of this unit, the student will be able to

• Build the simulation model for manufacturing systems.	L6
• Apply statistical procedures for developing credible model.	L2
• Describe modeling of stochastic input elements.	L2
• Appraise the importance of stochastic input elements.	L5
• Illustrate the principles of valid simulation modeling.	L2

UNIT – III: Generation of random variates   **10Hrs**

Generation of random variates – factors for selection – methods – inverse transform – composition – convolution – acceptance – rejection – generation of random variables – exponential – uniform – weibull – normal Bernoullie – Binomial – uniform – poisson. Simulation languages – comparison of simulation languages with general purpose languages – Simulation languages vs Simulators – software features – statistical capabilities – G P S S – SIMAN- SIMSCRIPT –Simulation of M/M/1 queue – comparison of simulation languages.

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Learning Outcomes:
At the end of this unit, the student will be able to
- List the various factors for selection of random variates. L1
- Explain how random variables can be generated. L2
- Compare various simulation languages used for generation of random varients. L2
- Select appropriate simulation software's like., GPSS, SIMAN-SIMSCRIPT etc L3

UNIT – IV: Output data analysis 8 Hrs

Output data analysis – Types of Simulation w.r.t output data analysis – warmup period- Welch algorithm – Approaches for Steady – State Analysis – replication – Batch means methods – comparisons

Learning Outcomes:
At the end of this unit, the student will be able to
- Analyze the output data in manufacturing system. L4
- Illustrate the types of simulation with respect to output data analysis. L2
- List the approaches for steady of output data. L1
- Explain Welch algorithm for analyze the output data. L2

UNIT – V: Applications of Simulation 8 Hrs

Applications of Simulation – flow shop system – job shop system – M/M/1 queues with infinite and finite capacities – Simple fixed period inventory system – Newboy paper problem.

Learning Outcomes:
At the end of this unit, the student will be able to
- Illustrate the applications of simulation in manufacturing systems. L2
- Explain simple fixed period inventory system. L2
- Describe flow shop and job shop systems. L2
- Solve the manufacturing problems using Newboy paper method. L3

Text Books:
1. Law, A.M. & Kelton, Simulation Modelling and Analysis, McGraw Hill, 2/e, New York, 1991.
2. N. Viswanadham & Y. Narahari, Performance Modeling of Automated Manufacturing Systems, Prentice-Hall (12 March 1992).

Reference Books:
1. Banks J. & Carson J.S., PH, Discrete Event System Simulation, Englewood Cliffs, NJ, 1984.
2. Carrie A. Simulation of Manufacturing Systems, Wiley, NY, 1990.
3. Ross, S.M., McMillan, NY, A Course in Simulation / 1990. Simulation Modelling and SIMNET / Taha H.A / PH, Englewood Cliffs, NJ, 1987.

Course Outcomes:
At the end of this Course the student will be able to
- Summarizes the various approaches to modelling and simulation of manufacturing systems. L2
- Outline the concepts of output data analysis. L2
- Identify various software languages for simulation of manufacturing systems. L3