

**DEPARTMENT OF PRODUCTION ENGINEERING**

**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

<b>COURSE PLAN – PART I</b>			
<b>Name of the programme and specialization</b>	<b>B.Tech. (Production Engineering)</b>		
<b>Course Title</b>	<b>MANUFACTURING SYSTEM SIMULATION (Theory &amp; Lab)</b>		
<b>Course Code</b>	<b>PRPC29</b>	<b>No. of Credits</b>	<b>4</b>
<b>Course Code of Pre-requisite subject(s)</b>	<b>MA208, PR302</b>		
<b>Session</b>	<b>July 2018</b>	<b>Section (if, applicable)</b>	<b>A and B</b>
<b>Name of Faculty</b>	<b>Dr. S. PrasannaVenkatesan</b>	<b>Department</b>	<b>Production Engg.</b>
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<b>Name of Course Coordinator(s) (if, applicable)</b>	---		
<b>E-mail</b>	--	<b>Telephone No.</b>	---
<b>Course Type</b>	<input checked="" type="checkbox"/> <b>Core course</b> <input type="checkbox"/> <b>Elective course</b>		
<b>Syllabus (approved in BoS)</b>			
<p>Introduction to Simulation - Components of a system, Types of models, Monte Carlo Simulation, Steps in simulation, applications -Discrete Event Simulation – components of DES -Time advance mechanism.</p> <p>Introduction – probability mass function, probability density function, Statistical models – Discrete distributions – Bernoulli, Binomial, Poisson, Geometric- Continuous distributions – Normal, Uniform, Exponential Gamma, Triangular Empirical Distributions</p> <p>Properties of random numbers- Random number generation techniques – midsquare, mid product Constant multiplier, linear, additive congruential. Test for random numbers- uniformity, independence- Kolmogorov simronov test, chi squareRuns test, Gap test, poker test, autocorrelation test Random variate generation-Inverse transform Acceptance rejection, convolution method</p> <p>Input Analysis Methods-Examples-Verification of simulation models- Validation of simulation models-Measure of performance and their estimation- Output Analysis Methods-Transient and steady state behavior – Evaluation of alternate system design – Simulation Based Optimization (SBO).</p> <p>Simulation packages spreadsheet, witness, Arena etc., Simulation of queuing models, inventory models, Material handling, assembly systems, logistics and supply chains –Tutorial.</p>			
<b>COURSE OBJECTIVES</b>			
To acquire knowledge on the design/evaluation of different manufacturing systems using simulation modeling.			

<b>COURSE OUTCOMES (CO)</b>	
<b>Course Outcomes</b>	<b>Aligned Programme Outcomes (PO)</b>
1. Understand the role of simulation in decision making	1,2,5,6,7,8,11,12
2. Develop and analyze simulation models for manufacturing system	1,4,5,7,9,11
3. Understand the applications of probability in simulation	1,2,4,5,7,11
4. Understand the methods for random number and variate generation	1,2,4,5,7,11
5. Understand the statistical methods used for input and output modeling in simulation	1,2,4,5,7,11

<b>COURSE PLAN – PART II</b>				
<b>COURSE OVERVIEW</b>				
<p>The course will cover modeling techniques, random number generators, discrete-event simulation approaches, input and output modeling and state-of-the-art simulation software. In the simulation laboratory, the students will get exposure on how to build and analyze simulation models using the simulation packages such as Flexsim, Witness, Arena.</p> <p>This course will enable students to analyze and develop simulation models of given problems.</p>				
<b>COURSE TEACHING AND LEARNING ACTIVITIES</b>				
<b>S.No.</b>	<b>Week/Contact Hours</b>	<b>Topic</b>	<b>Mode of Delivery</b>	
1	1	1	Introduction to Simulation	C&T
		2	Components of a system, types	C&T
		3	Models, Types of models, Monte Carlo Simulation, Steps in simulation	PPT
		4	Introduction to lab softwares simquick	Lab- Tutorial Model1
2	2	4	Advantages, limitations and applications	PPT
		5	Discrete Event Simulation – Examples,	PPT
		6	Components of DES, Time advance mechanism, model	PPT
		8	Lab-Simquick	Lab- Tutorial Model2
3	3	9	Introduction – pmf, pdf	C&T
		10	Statistical models –Examples	C&T
		11	Discrete distributions – Bernoulli, Binomial, Poisson, Geometric	C&T
		12	Lab-Flexsim	Lab- Tutorial Model3
4	4	13	Continuous distributions –Normal, Uniform, Exponential	C&T
		14	Gamma, Triangular	C&T

		15	Empirical Distributions Problems	C&T
		16	Lab-Flexsim	Lab- Tutorial Model4
5	5	17	Properties of random numbers	C&T
		18	Random number generation techniques – midsquare, mid product	C&T
		19	Constant multiplier, linear, additive congruential, Test for random numbers-uniformity, independence	C&T
		20	Lab-Flexsim	Lab- Tutorial Model5
6	6	21	Kolmogorov simronov test, chi square	C&T
		22	Runs test, Gap test, poker test,	C&T
		23	Autocorrelation test, Random variate generation-Inverse transform	C&T
		24	Lab-Witness	Lab- Tutorial Model6
7	7	25	Acceptance rejection, convolution method	C&T
		26	Input Analysis Methods	PPT
		27	Examples, Verification of simulation models	PPT
		28	Lab-Witness	Lab- Tutorial Model7
8	8	29	Validation of simulation models	C&T,PPT
		30	Measure of performance and their estimation	C&T,PPT
		31	Out put Analysis Methods, Examples	C&T,PPT
		32	Lab-Arena	Lab- Tutorial Model8
9	9	33	Transient and steady state behavior	PPT
		34	Simulation packages	PPT
		35	Simulation of queuing models-case study	PPT
		36	Lab-Arena	Lab-revision/demo
10	10	37	Simulation of inventory models	PPT
		38	Simulation of supply chain	PPT
		39	Simulation of material handling systems	PPT
		40	Lab-case examples	Lab-revision/demo
<b>COURSE ASSESSMENT METHODS (shall range from 4 to 6)</b>				
S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle test 1	4	1 hour	20
2	Cycle test 2	8	1 hour	20

3	Objective type test/assignment	9	0.5 hour	10
CPA	Compensation Assessment*	11	1hour	20
4	Final Assessment *- (Lab)	12	1hour	10
5	Final Assessment *- (Theory)	13	2hour	40

**\*mandatory; refer to guidelines on page 4**

**COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)**

Course Exit survey will be collected at the end of the semester before the start of final assessment examination through online. Students can log in their MIS account to give the feedback. Mid-semester anonymous feedback shall be collected to improve the teaching-learning process. Apart from this, students can share feedback during class committee meetings.

**COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)**

**MODE OF CORRESPONDENCE (email/ phone etc)**

The Course faculty is available for consultation based on prior appointment to his email at - prasanna@nitt.edu

**COMPENSATION ASSESSMENT POLICY**

Attending classes regularly and continuously is required for the students to understand the concepts.

Participation in the discussions is mandatory during the classes.

If any student is not able to attend any of the continuous assessments (1 and 2) due to genuine reason, student is permitted to attend a compensation assessment with 20% weightage. A candidate may appear for a compensation assessment only once.

Attending the final assessment (Lab and theory) is a must. Final assessment will be on the entire syllabus.

**ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)**

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying

from others during an assessment will be treated as punishable dishonesty.

- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION**

-Nil-

**FOR APPROVAL**

Course Faculty *S. P. M.* 23/10/18 . CC-Chairperson *A. M. H.* 23/10/18 HOD *[Signature]*