Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
IND405	Introduction To Stochastic Processes	7	3	0	0	3	4

Prerequisites	IND211
Admission Requirements	IND211

Language of Instruction	English
Course Type	Elective
Course Level	Bachelor Degree
Objective	The stochastic processes, which is one of the major areas of interest for an industrial engineer, enable the modeling of systems with random components. The stochastic models have several application areas including supply chain management, inventory systems management, and call-center management. The aim is to introduce the logic of modeling of stochastic systems, which can further be useful for academic studies and in industry. Hence, the objectives of the course are determined as follows: • Introduce discrete-time and discrete-state processes. • Introduce continuous-time and discrete-state processes. • Introduce the concepts of conditional expectation and conditional probability. • Make the students comprehend how they can analyze the performance of systems modeled through stochastic processes. • Make the students apply their theoretical knowledge to model queuing, reliability, and inventory systems.
Content	
References	Ross, S., “Introduction to Probability Models”, 9th Edition, Academic Press, New York, 2007. Çınlar, E., “Introduction to Stochastic Processes”, 2nd Edition, Dover, New Jersey, 2013.

Theory Topics

Week	Weekly Contents
1	Review of probability (Ross, Chapter 1)
2	Review of probability (Ross, Chapter 2)
3	Conditional probability and conditional expectation (Ross, Chapter 3)
4	Conditional probability and conditional expectation (Ross, Chapter 3)
5	Markov chains, Chapman-Kolmogorov equations, and classification of states (Ross, Chapter 4)
6	Gambler's ruin problem, branching process (Ross, Chapter 4)
7	Bernoulli process (Çınlar, Chapter 3)
8	Midterm
9	Poisson process and exponential distribution (Ross, Chapter 5)
10	Poisson process and exponential distribution (Ross, Chapter 5)
11	Markov process, birth and death processes (Ross, Chapter 6)
12	Birth and death processes, transition and limiting probabilities (Ross, Chapter 6)
13	Queuing models M/M/1, M/M/k, M/G/1 and M/G/k, and embedded Markov chain (Ross, Chapter 8, Çınlar, Chapter 6)
14	Reliability and inventory models (Ross, Chapter 9)