

Content

| Course Code             | Course Name   | Semester | Theory | Practice | Lab | Credit | ECTS |
|-------------------------|---|----------|--------|----------|-----|--------|------|
| IND405                  | Introduction To Stochastic Processes  | 7        | 3      | 0        | 0   | 3      | 4    |
| Prerequisites           | ING241  |          |        |          |     |        |      |
| Admission Requirements  | ING241  |          |        |          |     |        |      |
| Language of Instruction | English   |          |        |          |     |        |      |
| Course Type             | Elective  |          |        |          |     |        |      |
| Course Level            | Bachelor Degree   |          |        |          |     |        |      |
| Objective               | <p>The stochastic processes enable students to model and analyze systems with random components. These stochastic models have several application areas such as supply chain management, inventory systems management, and call-center management. This course aims at introducing different types of stochastic models and their analyses, which can further be useful for students in their graduate studies and in industry. Consequently, the objectives of this course are as follows:</p> <ol style="list-style-type: none"> <li>1- Enable students to model a given problem through different types of stochastic models</li> <li>2- Enable students to analyze stochastic models</li> <li>3- Enable students to apply their knowledge of stochastic processes to queueing and inventory models</li> </ol> |          |        |          |     |        |      |
| Content                 | <p>Review of probability (Ross, Chapter 1)<br/>           Conditional probability and conditional expectation (Ross, Chapter 3)<br/>           Markov chains, Chapman-Kolmogorov equations, and classification of states (Ross, Chapter 4)<br/>           Gambler's ruin problem, branching process (Ross, Chapter 4)<br/>           Poisson processes and exponential distribution (Ross, Chapter 5)<br/>           Markov processes, birth and death processes (Ross, Chapter 6)<br/>           Birth and death processes, transition and limiting probabilities (Ross, Chapter 6)<br/>           Queueing models (Ross, Chapter 8)<br/>           Inventory models (Ross, Chapter 9)</p>   |          |        |          |     |        |      |
| References              | <p>Ross, S., "Introduction to Probability Models", 9th Edition, Academic Press, New York, 2007.</p>   |          |        |          |     |        |      |

Theory Topics

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