

SYE8102: FORECASTING AND CONTROL USING REGRESSION, TIME SERIES, AND DYNAMIC MODELS

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Forecasting and Control Using Regression, Time Series, and Dynamic Models

Subject Code

SYE - Systems Engineering

Course Number

8102

Academic Unit

Systems Engineering (SYE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

R8 - Research Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

University level mathematics

Precursors

University level course in probability and statistics

Equivalent Courses

SEEM8102 Forecasting and Control Using Regression, Time Series, and Dynamic Models (offered until 2021/22)

ADSE8102 Forecasting and Control Using Regression, Time Series, and Dynamic Models (offered until 2023/24)

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims to educate and to train students and other professionals in business, engineering, mathematics, economics, and statistics, to the principles and the methods for predicting, forecasting, and controlling, using probabilistic and statistical methods. It will start with an overview of methods for quantifying uncertainty, followed by methods of predicting binary outcomes. It will then discuss regression and time series based models, such as autoregressive-moving average processes, for predicting non-binary outcomes. This will be followed by a use of dynamic (or state-space/Kalman Filter) models for prediction and control. Theoretical underpinning will be emphasized and assignments will entail exercises as well as the analysis of data and/or the class participants.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Quantify uncertainty by probability and statistical methods	30	x	x	
2	Predict binary exchangeable sequences	20		x	x
3	Use regression based models for forecasting	10		x	x
4	Use time series based (stochastic process) models for prediction	15		x	x
5	Use dynamic (Kalman Filter) models for prediction and control	5		x	x
6	Communicate orally and in writing, project and results.	20			

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Appreciate Underlying Theory	1, 2, 3, 4, 5	25 hours/sem
2	Tutorial	Application of Theory	1, 2, 3, 4, 5	14 hours/sem

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignment	1, 2, 3, 4, 5, 6	40	-	No

Continuous Assessment (%)

Examination (%)

60

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Assessment Rubrics (AR)

Assessment Task

Assignment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

20%

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

80%

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Assignment (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

20%

Excellent

(A+, A, A-) Excellent

Good

(B+, B) Good

Marginal

(B-, C+, C) Marginal

Failure

(F) Failure

Assessment Task

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

80%

Excellent

(A+, A, A-) Excellent

Good

(B+, B) Good

Marginal

(B-, C+, C) Marginal

Failure

(F) Failure

Part III Other Information

Keyword Syllabus

Prediction, Forecasting, Kalman Filtering, Control, Stochastic Process, Regression, Time Series analysis.

Reading List

Compulsory Readings

Title	
1	NIL

Additional Readings

Title	
1	NIL