INC 691 System Identification

Semester: 1/2017

Schedule: Th 13.30–16.20 **Classroom:** CB40609

Exams: to be announced

Instructors:

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Course web: `https://staff.kmutt.ac.th/~sudchai.boo/Teaching/inc961/`

Required pre-requisites:
Control system analysis and design based on transfer functions and state-space models (INC 341 and EEE 600, or equivalent courses)

Course Description:

Introduction to System Identification, Systematic identification, Identifiability, Signal-to-Noise ratio, Overfitting Non-Parametric Model, Parametric Model, Prediction, Identification of Parametric Time-Series Models, Identification of Non-Parametric Input-Output Models, Identification of Parametric Input-Output Models, Statistical and Practical Elements of Model Building, Identification of State-Space Models

Learning Outcomes:

- Can explain the different between "System Identification" and "System Modelling"
- Formulate estimation problems into least-squares estimation problem
- Apply various system identification methods; prediction error method, instrumental variable method or recursive identification to estimation problems in engineering
- Explain and implement the principle of model selection and model validation

Textbooks:

1. Arun K. Tangirala, "/Principles of System Identification: Theory and Practice/", CRC Press, 2015
2. L. Ljung, System Identification: Theory for the User, 2nd Edition, Prentice- Hall, 1999
3. T. Soderstrom and Petre Stoica, System Identification, Prentice-Hall, 1989
4. J.P. Norton, An Introduction to Identification, Dover, 1986
5. P.Van Overschee and B.D. Moor, Subspace identification for linear systems: TheoryImplementationApplications, Kluwer Academic Publishers, 2012
6. G. James and D. Witten, T. Hastie, and R. Tibshirani, An Introduction to Statistical Learning with Applications in R, Springer, 2013
7. R.E. Schumacker and R.G. Lomax, A Beginner Guide to Structural Equation Modeling, 3rd Edition, Routledge, 2010
8. R.B. Kline, Principles and Practice of Structural Equation Modeling, 3rd Edi- tion, Guilford, 2011
9. T. Raykov and G.A. Marcoulides, A First Course in Structural Equation Mod- eling, 2nd Edition, Lawrence Erlbaum Associates, 2006

Project:
Each graduate student is required to formulate a realistic identification l problem (preferably related to his/her own research, or otherwise we can help), to do analysis and design for the problem using the course material, to analyze the estimated model in simulation (and in implementation if possible), to give a seminar, and to submit a report. The project should show the usefulness and/or the limitation of system identification theory.

Grading scheme:
Homework: 30% Midterm Exam: 30% Project: 40%

- I reserve the right to modify the grading scheme.

Course Schedule (Tentative)
Note: All topics and timetable may be changed!