Instructor: S. Lakshmivarahan  
Email: varahan@ou.edu  
Office Hours: T-Th 9:00 – 10:00am and 3:00 – 3:30pm

LEARNING MANAGEMENT SYSTEM  
https://janux.ou.edu

COURSE MEETING TIME & LOCATION  
100% Online course.

PREREQUISITES  
Departmental permission. DSA/CS Graduate Standing.

REFERENCES  

DATA SOURCES  
1) Department of Labor Statistics  
2) http://www.qlik.com/us/products/data-market provides examples from a number of application domains

PROGRAMMING  
1) MATLAB Time Series Tool box  
2) Open source programs in R

COURSE CONTENT  
Part 1 Introduction  
   Module 1.1 Data Mining and Time Series Analysis  
   Module 1.2 Examples of Time Series  
   Module 1.3 Basic Concepts in Time Series  
Part 2 Statistical Estimation  
   Module 2.1 Some Standard distributions  
   Module 2.2 Statistical Estimation - basic concepts  
   Module 2.3 Hypothesis Testing – an overview  
   Module 2.4 Estimation of Second-order Properties  
   Module 2.6 Gaussian distribution  
Part 3 Transformations and Decomposition of Time Series
Module 3.1 Basic goal
Module 3.2 Estimating Trend component
Module 3.3 Estimating Seasonal Component

Part 4 Quantifying Correlation Structure in Standard models
Module 4.1 Standard ARMA (p, q) models
Module 4.2 Difference Equations
Modules 4.3 Anatomy of MA (q) models
Module 4.4 Anatomy of AR (p) models
Module 4.5 Anatomy of ARMA (p, q) models

Part 5 Spectral Properties of standard models
Module 5.1 Generating function and Power Spectrum

Part 6 Forecasting Methods
Module 6.1 Forecasting in Times Series: problems and challenges
Module 6.2 Structure of optimal forecast
Module 6.3 Optimal linear forecast – Wiener’s approach
Module 6.4 Forecasting using ARMA (p, q) models
Module 6.5 A recursive algorithm optimal linear forecasting
Module 6.6 Forecasting using innovations – basic idea
Module 6.7 Recursive version of innovation based forecasting

Part 7 Linear Least Squares Method
  7.1 Linear Regression - a historical view
  7.2 Linear Regression - univariate least squares
  7.3 Linear Regression - multivariate least squares

Part 8 Estimation of Parameters in Standard models
  Module 8.1 Estimation problem in Time Series – an overview
  Module 8.2 Estimation in AR (p) models: Maximum likelihood and least squares approach
  Module 8.3 Estimation in MA (q) models
  Module 8.4 Estimation in ARMA (p, q) models

Part 9 Partial Autocorrelation function (PACF)
  Module 9.1 Computation of PACF

Part 10 Wold’s decomposition
  10.1 Deterministic component
  10.2 Nondeterministic component

Part 11 Model Selection – Box and Jenkin’s approach
  Module 11.1 Model Selection Criteria
  Module 11.2 Examples

Part 12 Volatility models
  Module 12.1 ARCH models
  Module 12.2 GARCH models

WORKLOAD
This course will have 8 assignments with both theoretical and programming problems. The exams will consist of both closed book part - to test the theoretical understanding and take home part to test the experimental part. There will be one mid-term and a final.
GRADING
Assignments and home work will account for 50% and the exams will cover the rest of 50 % of the overall grades. 90 and above will be A, 80 to 89 will be a B, 70 to 79 will be a C, 60 to 69 will earn a D.

LATE POLICY
All assignments will be considered late if not turned in when due, although assignments can be turned in early. Assignments submitted within five days after due date will get partial credit; however assignments submitted more than five days after due date will get 0 point for assignment.

COURSE POLICY ON ACADEMIC INTEGRITY
Cheating is strictly prohibited at the University of Oklahoma. As a member of the OU community it is your responsibility to protect your educational investment by knowing and following the rules. Should you see someone else engaging in this behavior, I encourage you to report it to myself or directly to the Office of Academic Integrity Programs. That student is devaluing not only their degree, but yours, too. Be aware that it is my professional obligation to report academic misconduct, which I will not hesitate to do. Sanctions for academic misconduct can include expulsion from the University and an F in this course, so don’t cheat. It’s simply not worth it. For specific definitions on what constitutes cheating, review the Student’s Guide to Academic Integrity at http://integrity.ou.edu/students_guide.htm.

REASONABLE ACCOMMODATION POLICY
Students requiring academic accommodation should contact the Disability Resource Center for assistance at (405) 325-3852 or TDD: (405) 325-4173. For more information please see the Disability Resource Center website http://www.ou.edu/drc/home.html. Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

RELIGIOUS OBSERVANCE
It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty.

TITLE IX RESOURCES AND REPORTING REQUIREMENT
For concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on call 24/7. To learn more or to report an incident, please contact the Sexual Misconduct Office at 405-325-2215 (8 to 5, M-F) or OU Advocates at 405-615-0013 (24/7). For more information, please see http://www.ou.edu/eoo.
ADJUSTMENTS FOR PREGNANCY/CHILDBIRTH RELATED ISSUES
Should you need adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me or the Disability Resource Center at 405/325-3852 as soon as possible.
http://www.ou.edu/eoo/faqs/pregnancy-faqs.html