COURSE NUMBER: VM466	**COURSE TITLE: Statistical Quality Control and Design**
CREDIT: 3	**PREREQUISITES:** **Undergraduate course in engineering probability and statistics**
TEXTBOOKS/REQUIRED MATERIAL: **R. E. DeVor, T. Chang and J. W. Sutherland, *Statistical Quality Design and Control, Contemporary Concepts and Methods*, 2nd Edition, Pearson, 2006.**	**PREPARED BY: Dragan Djurdjanovic** **DATE OF PREPARATION:** **DATE OF UC APPROVAL: April 2018**
INSTRUCTOR(S): Prof. Dragan Djurdjanovic	**SCIENCE/DESIGN:**
CATALOG DESCRIPTION: This course will teach students about key methods and applications related to the use of statistical data-driven methods for modeling, analysis and optimization of processes. Applications examples include manufacturing, oil/gas extraction, measurement systems analysis, statistical polling, etc. First part of the course will focus on understanding and use of key tools for data-driven process modeling and monitoring using various statistical process control charts. The focus will then move to regression analysis and Design-of-Experiments (DOE) theory to understand how data can be strategically generated through experiments in a way that enables one to learn the most about the underlying processes. Finally, methods for DOE based optimization will be taught to teach the students how optimization/design of real-life engineering systems and processes can be conducted efficiently.	**COURSE TOPICS:** • **Descriptive statistics** • **Behavior of process over time** • **Design and interpretation of control charts** • **Process capability studies** • **Measurement system analysis** • **Correlation and regression analysis** • **Design and analysis of two level factorial experiments** • **Design and analysis of two level fractional factorial experiments** • **Response surface methodology** • **Taguchi approach to robust design**
COURSE STRUCTURE/SCHEDULE: **The course will meet three times a week; Midterm will be in-class and will take place after lectures on measurement systems analysis. Final exam will take place after all lectures are done (after lessons on Taguchi based surface response methodology).**	

COURSE OBJECTIVES [Corresponding Course Outcomes in brackets]	**1. Gain understanding of the non-deterministic behavior of engineering processes and systems [1].** **2. Learn to understand and design control charts as well as to use them to monitor the process behavior over time [2,3,4,5].** **3. Gain ability to design and analyze experiments statistically [6,7,8].**
COURSE OUTCOMES	**1. Give a set process data, characterize the process behavior using descriptive statistics [1].** **2. Give sampled process data over time, establish control charts for monitoring processes [2]** **3. Identify if the process is in-control. If not, identify special patterns that may exist [2]** **4. Given a process that is in-control and the process specification, identify if a process is capable [2].** **5. Give a measurement system, design a plan to identify if the measurement system is capable. [2]** **6. Design experiments to identify the main effects, interaction effects and their significance [3].** **7. Design fractional factorial experiments to identify the main effects and confounding structures [3].** **8. Design experiments according to Taguchi's parameter design concept [3].** **Numbers in brackets show the corresponding course objectives.**
ASSESSMENT TOOLS	**a) Homeworks** **b) Midterm exam** **c) Final exam**