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## When Optimal Isn't Optimal

Robin Burk

*University of Arkansas, Fayetteville*

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Burk, R. (2020). When Optimal Isn't Optimal. *Operations Management Presentations*. Retrieved from <https://scholarworks.uark.edu/opmapub/2>


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**WELCOME!**

**ENGINEERING AND OPERATIONS MANAGEMENT  
LUNCH & LEARN WEBINAR SERIES**


**APRIL 16, 2020**

# ONLINE DEGREE OPTIONS


 UNIVERSITY OF ARKANSAS College of Engineering  
Industrial Engineering


## M.S in Operations Management


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**PLAN, LEAD & MANAGE BUSINESS OPERATIONS USING INDUSTRIAL ENGINEERING TECHNIQUES** 

**100% ONLINE**  
FIVE 8-WEEK SESSIONS  
GRE WAIVED WITH 3.0 GPA  
COMPREHENSIVE EXAM  
NO THESIS!

 IN-STATE TUITION FOR U.S RESIDENTS

**RELEVANT COURSES DESIGNED TO DELIVER PRACTICAL KNOWLEDGE FOR THE WORKPLACE** 

 **4 UNDERGRADUATE PREREQS (IF REQUIRED)**

**10 GRADUATE COURSES:**

- 4 REQUIRED
- 6 ELECTIVES

Any Regionally Accredited Bachelors degree Required

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msem@uark.edu

**PROVIDE LEADERSHIP & BUSINESS SKILLS TO MANAGE TECHNOLOGY TEAMS** 

**100% ONLINE**  
FIVE 8-WEEK SESSIONS  
GRE WAIVED WITH 3.0 GPA  
COMPREHENSIVE EXAM  
NO THESIS!

 IN-STATE TUITION FOR U.S RESIDENTS

**RELEVANT COURSES DESIGNED TO DELIVER PRACTICAL KNOWLEDGE FOR THE WORKPLACE** 

 **10 GRADUATE COURSES:**

- 4 REQUIRED
- 3 ENGINEERING SEQUENCE &
- 3 ELECTIVES

ABET Accredited Bachelor Degree in Engineering Required

 UNIVERSITY OF ARKANSAS College of Engineering  
Industrial Engineering

## M.S in Engineering

mse@uark.edu

**BROADEN ENGINEERING & MANAGERIAL KNOWLEDGE BASE WHILE DEVELOPING ADDITIONAL EXPERTISE** 

**100% ONLINE**  
FIVE 8-WEEK SESSIONS  
GRE WAIVED WITH 3.0 GPA  
COMPREHENSIVE EXAM  
NO THESIS!

 IN-STATE TUITION FOR U.S RESIDENTS

**RELEVANT COURSES DESIGNED TO DELIVER PRACTICAL KNOWLEDGE FOR THE WORKPLACE** 

 **10 GRADUATE COURSES:**

- 4 REQUIRED
- 3 ENGINEERING SEQUENCE &
- 3 ELECTIVES

ABET Accredited Bachelor Degree in Engineering Required

# TODAY'S PRESENTER

## *Dr. Robin Burk*

From her days writing code in Silicon Valley, to her leadership in tech-based companies doing business globally, to her support for a brand new scientific discipline, Dr. Robin Burk has been on the cutting-edge of tech-driven change. She holds a Ph.D. in artificial intelligence and an MBA in finance and operations, taught at West Point for over seven years after the attacks of 9/11, and served as one of the Chief Scientists at a major R&D organization addressing complex decisions for national security and commercial sectors. We are also very lucky to have her as an instructor and colleague.





# WHEN OPTIMAL ISN'T OPTIMAL

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# LINEAR PROGRAMMING

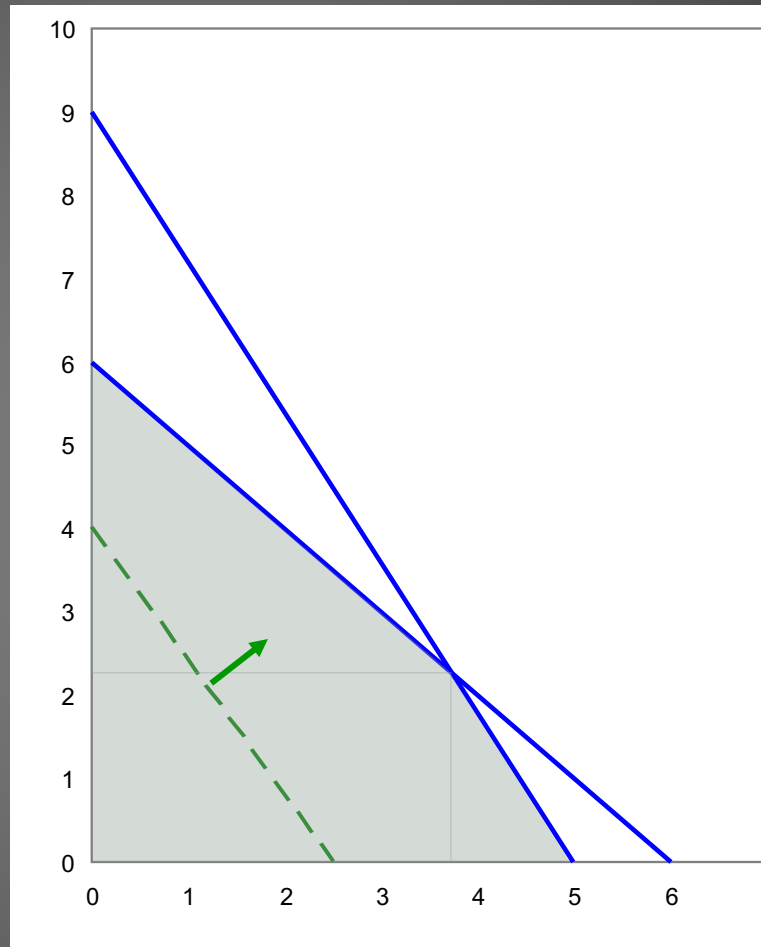
Maximize  $8x + 5y$

Subject to

$$\begin{aligned}x + y &\leq 6 \\9x + 5y &\leq 45\end{aligned}$$



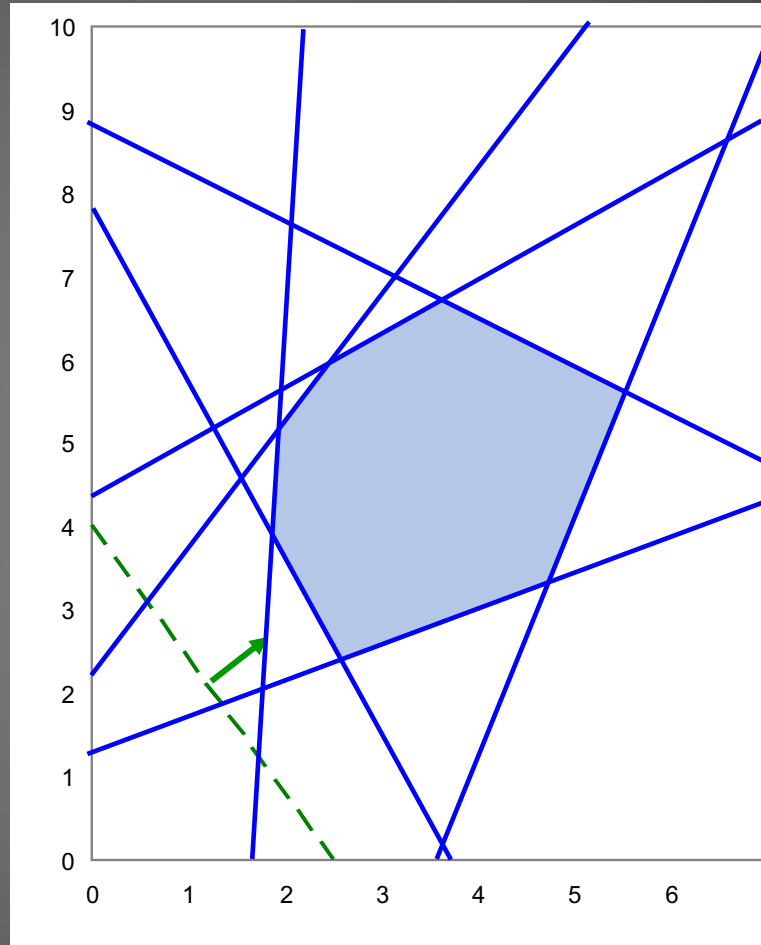
Feasible Region



# MULTIPLE CONSTRAINTS

Maximize  $8x + 5y$   
Subject to . . . .

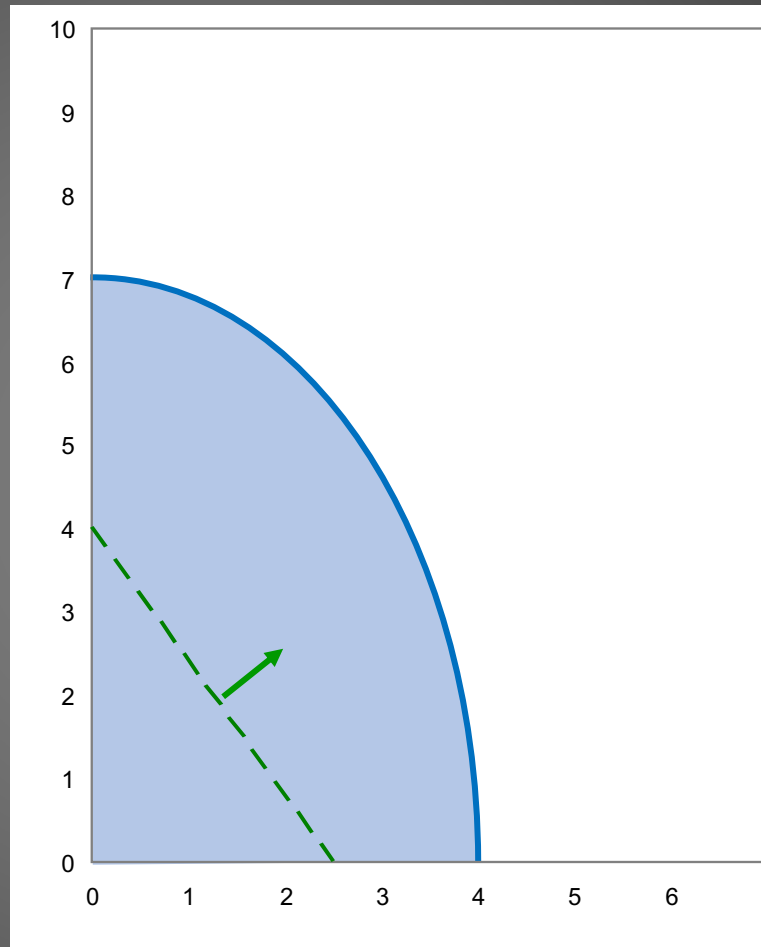
 Feasible Region



# NONLINEAR PROGRAMMING

Maximize  $8x + 5y$   
Subject to  
 $49x^2 + 16y^2 \leq 784$

 Feasible Region



# INTEGER PROGRAMMING

Maximize  $8x + 5y$

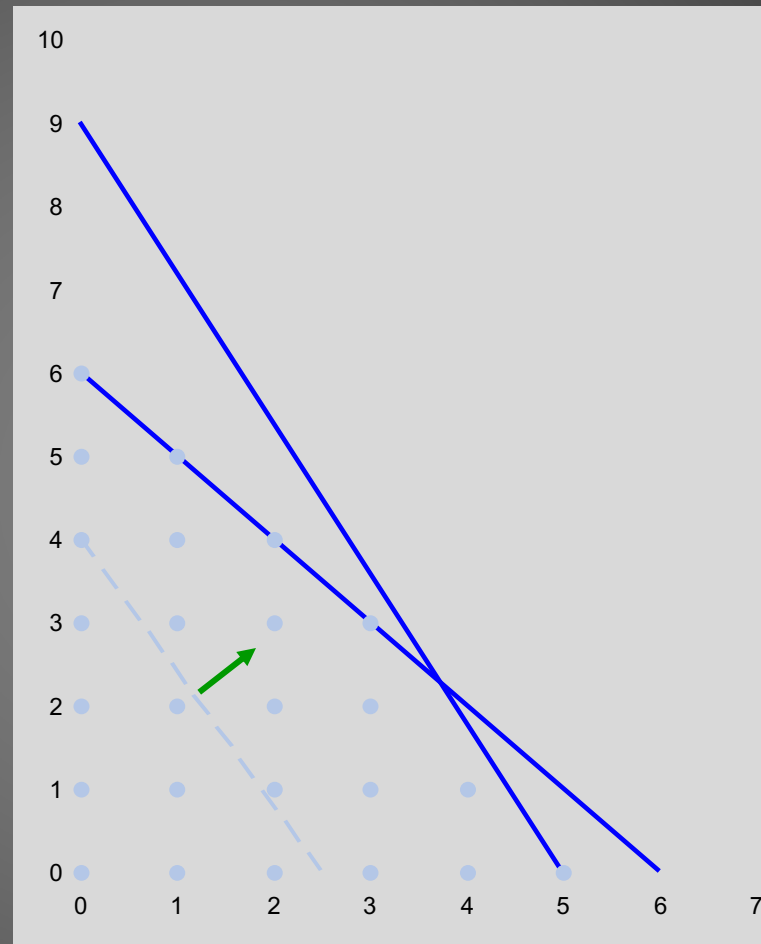
Subject to

$$x + y \leq 6$$

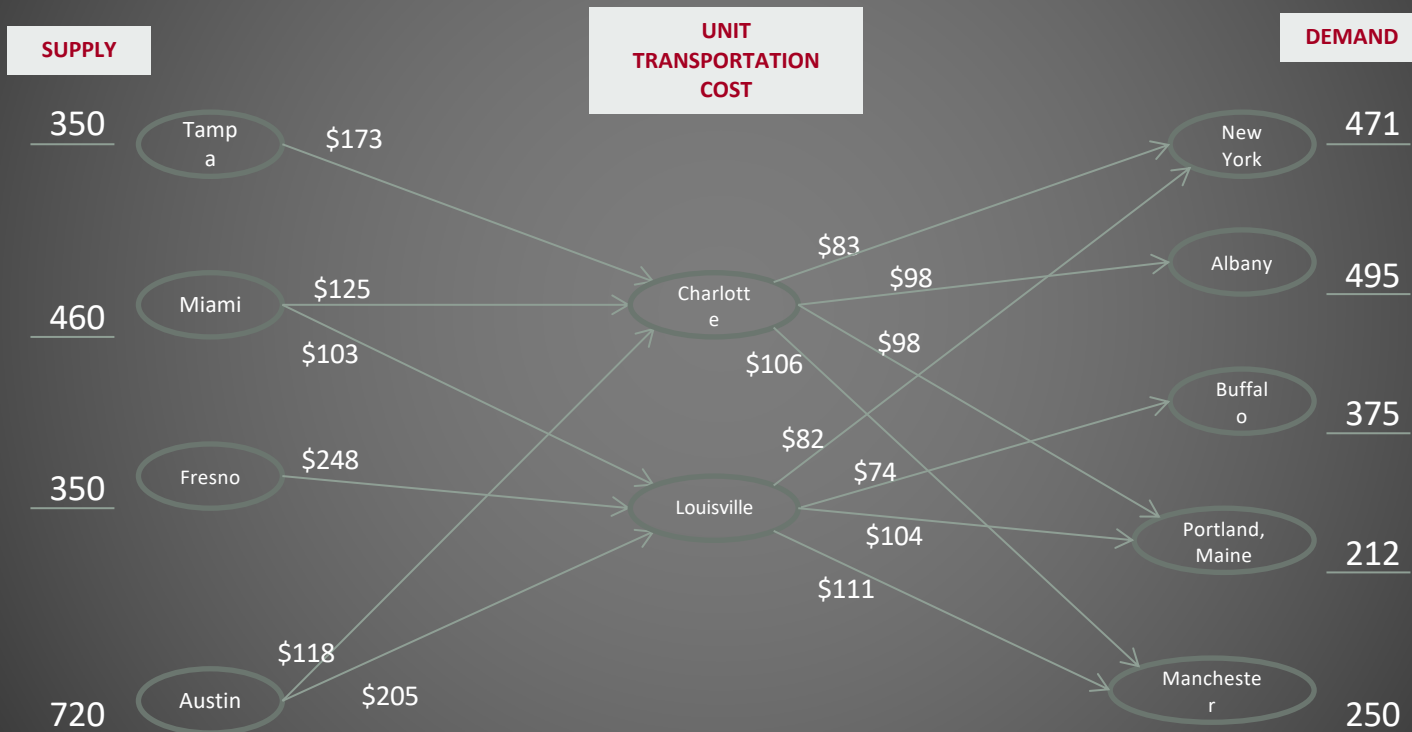
$$9x + 5y \leq 45$$

$x$  and  $y$  are integers

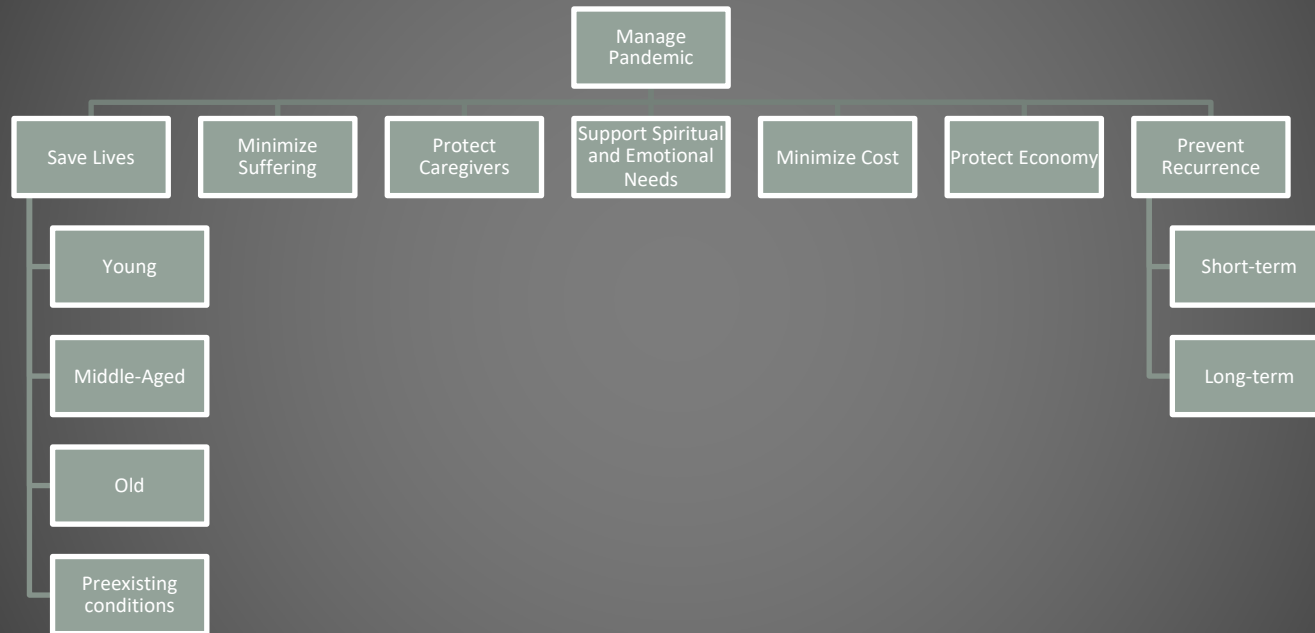
● Feasible Points



# NETWORK PROBLEMS



# MULTIPLE OBJECTIVES





# MULTIPLE CRITERIA DECISION ANALYSIS

- Translate objective diagram to a **value model**
  - Define **measures of evaluation** with minimum acceptable & maximal aspiration
  - **Assign weights to the ranges of variation**
  - Elicit the decision maker's **value curves** for each objective
- Identify alternate courses of action
- Compute the **total weighted value** of each COA against its cost
- Select the COA that has the best value to cost tradeoff

# ALTERNATELY, **SATISFICE**

- “Good enough” solution – meets minimal acceptability on each objective
- Reduces cost and time to decision
- Useful when stakes are not high &/or flexible adaptation to events is acceptable
- **MAY PRESENT BARRIERS TO BUY-IN**

# WORLD CHANGER: DOD's TCP/IP



# COMPLEXITY & EMERGENCE



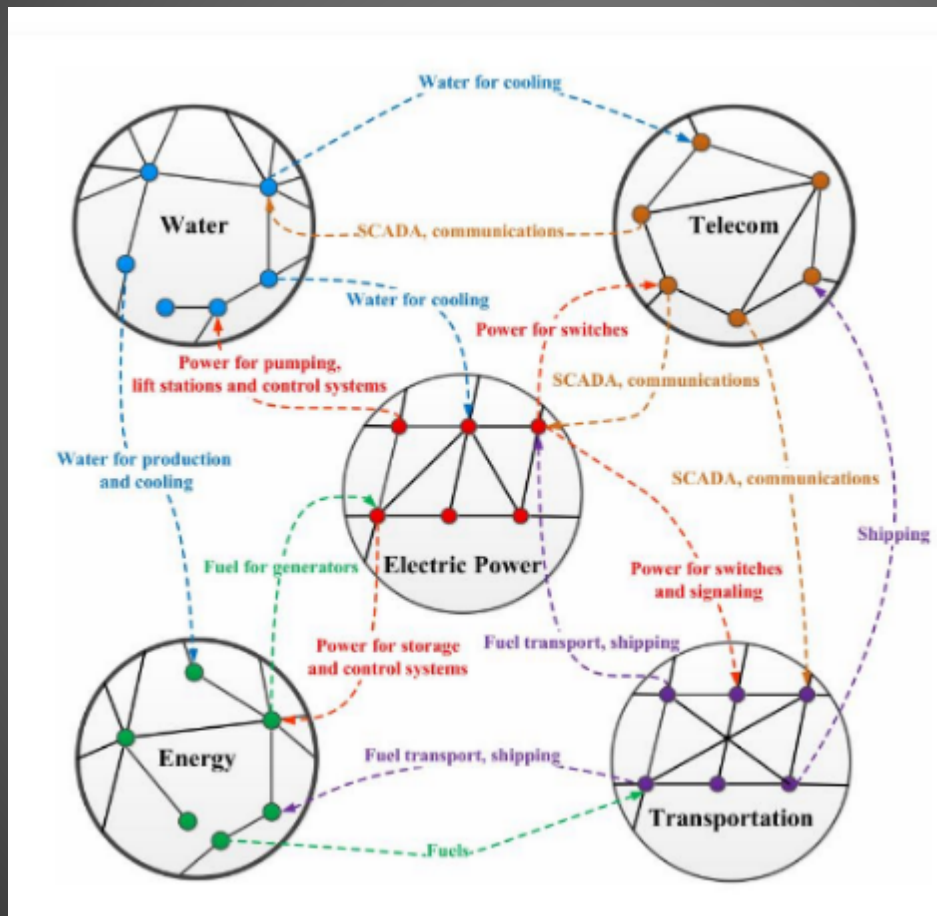
Credit CC0 Public Domain

Complex  
Adaptive  
Systems

Complex  
Adaptive  
**Network**  
Systems



# INTERDEPENDENT NETWORKS



PLUS:

Finance  
Banking  
Supply Chains  
Regulatory bodies

And more!

Yael Grossnass  
CC4.0



# HIDDEN FRAGILITY & CASCADING FAILURES

- Example: 2003 Blackout
- Example: 2008 financial unravelling

# RESILIENCE & ANTIFRAGILITY

- Local and regional redundancy slows / halts cascading failure – c.f. Houston, Harvey, & the Cajun Navy
- Information is a key resource for nimble anti-fragile responses to external events



# HOW OM PROFESSIONALS CAN HELP

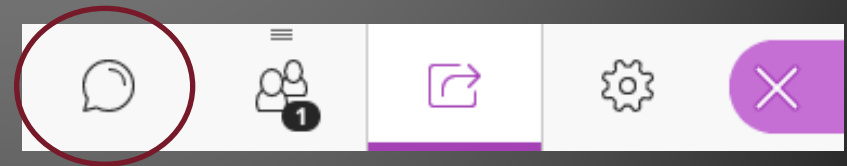
- Identify key resources on which multiple functions depend
- Identify key indicators to track for early awareness of events & opportunities
- Frame information to decisionmakers in terms of operational impacts



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# Question and Answer with Dr. Robin Burk

Type your questions  
in the chat section of  
this session.



# M.S. OPERATIONS MANAGEMENT

## AT A GLANCE:

- 100% Online (or live)
- In-State Tuition for Everyone!
- 10 Graduate Course Program (30 hours)
  - Up to 4 prerequisite classes may be required
- Five 8-week Sessions Per Year
- Pair Master's with Graduate Certificate with no extra hours required
- No GRE/GMAT required with 3.0 Bachelor's GPA
- Total Program Cost is \$12,000 to \$15,000 (depending on prereqs needed)

## **Covid-19 Special Announcement:**

Effective for Summer and Fall 2020 terms, at this time we are waiving the GRE for applicants with a 2.5-2.99 undergraduate GPA. Applicants with above a 3.0 GPA is automatically waived for any term.

Once GRE testing centers resume operations, the standard admissions requirements will go back into full effect.

Earn a Graduate Certificate separately,  
or as part of your MSOM degree  
without additional coursework.



## GRADUATE CERTIFICATES

**PROGRAM MANAGEMENT  
LEAN SIX SIGMA  
HOMELAND SECURITY**

### CERTIFICATES



- Only 4 Classes
- 2.5 Undgr GPA
- No GRE/GMAT
- Stand alone or concurrent with M.S.

### Proj. Mgmt



Designed to provide skills to become better project managers & prepare for PMP Certification

### Lean Six Sig

# 6σ

Learn how to eliminate problems, remove waste and reduce variation to improve operations

### Homeland Sec.



Designed for industry and safety professionals to learn how to mitigate risk

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# NEXT WEBINAR: May 28, 2020

## Maintenance Isn't Just About Grease Under Your Fingernails

Presented by Mr. Jim Burgin, MSOM Instructor

Document maintenance is becoming a bit of a challenge. Couple that with everyone in your office putting things on the intranet or the cloud without where only they can find the file—and they just got sick – or quarantined!

Maintenance is a broad concept, and this webinar is just to get you thinking about maintenance in a different way.

Register on our website today!



# THANKS FOR ATTENDING!

- For information about our flexible degree program options, email Karin Hickenbotham [kahicken@uark.edu](mailto:kahicken@uark.edu) or visit [operations-management.uark.edu](http://operations-management.uark.edu)
- The video from today's webinar will be available on our website within about a week, registered participants will receive an email with the video link.
- We hope to see you online next month!