

Military Operations Research Program

**Department of Systems Engineering and
Operation Research
School of Information Technology and
Engineering
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Philosophy of the MOR Program

- **Few educational opportunities exist outside the Government in the area of Military Operations Research – program is appropriate for both military personnel and civilians**
- **Military Operations Research is just an application area of OR – a solid grounding in the basics of OR is needed for the student to become an effective military analyst**
- **Student should attain familiarization with the major classes of problems encountered by Military OR Analysts - Learn how OR techniques are applied in a military context**
- **Student should experience solving realistic smaller scale problems that Military OR Analysts must regularly solve in course work and projects**
- **A close relationship must be maintained with Military OR activities in the National Capital Region to ensure continued relevance of the program content**

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Military Specific Courses

- **OR 651 Military Operations Research I – Cost Analysis**
– Taught at IDA
- **OR 651 Military Operations Research I – Effectiveness Analysis** – focuses on Macro-MOR (i.e. Department and National level analytical methods)
- **SYST 683 – Combat Modeling**
- **SYST 680 – Intro to C3I**
- **OR 649 – Analysis of Peacekeeping Operations**

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Accessing the Available Instruction

- **Non-Degree Status** – just come and take courses
- **Graduate Certificate in Military OR** – 15-18 credits concentrating on military applications
- **MS in OR, Military OR track** – 30 credit program
- **PhD in Information Technology with specialization in OR or Systems Engineering** – many students are working on military problems for their research

Note: If the government pays 75% or more of your educational expenses, you get In-State tuition rates (\$216/credit)

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Some examples of recently completed MS projects

- **The Effects of Restrictions during the Air War Over Serbia, sponsored by Air Force Studies and Analysis Agency**
- **Predator Short Range Assault Weapon Product Improvement Concept Analysis, sponsored by the Naval Surface Warfare Center**
- **Reception, Staging, Onward Movement, and Integration (RSOI) in North East Asia, sponsored by the Center for Army Analysis**
- **U.S. Coast Guard Island Class Cutter Conversion Scheduling Optimization, sponsored by U.S. Coast Guard Headquarters.**

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Ongoing Research Topics and Issues

- **Optimization of the Unattended Ground Sensor Network – doctoral dissertation of LTC Charrboneau**
- **Optimization of the Army Resourced Force – doctoral dissertation of Ms. Linda Coblentz**
- **Advisory panel on critical infrastructure modeling and simulation – Andy Loerch**
- **Establishment of the Laboratory for Homeland Defense and Military Transformation**
 - **Information architecture for missile defense as part of Missile Defense Agency’s Project Hercules – Kathy Laskey**
 - **New fusion technique that can assist in detection of multi-site terrorist attacks – K.C. Chang**
- **JICM on-site**

Goal of the Military OR Program

- **Produce knowledgeable OR analysts that have familiarity with how OR is applied to Military problems**
- **Maintain close ties with the military analytic community**
- **Perform research on pressing problems of Military OR**
 - **Homeland Defense**
 - **Future Combat System**
 - **National Missile Defense**

Back Ups

Military Operations Research

Requirements for Master's Degree in MOR

At least 30 credits of coursework divided as follows:

- **Required Courses:**
 - OR 541 Operations Research: Deterministic Models
 - OR 542 Operations Research: Stochastic Models
 - OR 635 Discrete System Simulation
 - OR 651 Military Operations Research I: Cost Analysis
 - OR 652 Military Operations Research II: Effectiveness Analysis
 - OR 680 Applications Seminar (Project Course)
- **Four elective courses which may include:**
 - SYST 683 Modeling Simulation and Gaming
 - OR 649 Systems Analysis of Peacekeeping Operations
 - Other OR courses in optimization, stochastic models, statistics, and decision analysis

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Graduate Certificate Program in Military OR

- **Requirements for admission same as for Master of Science program**
- **Program is right for:**
 - **Students that already have a quantitative graduate degree that want concentrated study in MOR**
 - **Students who do not have time to complete an entire MS program, but want to attain knowledge in MOR**
- **Course requirements (6 courses for 18 credits)**
 - OR 541 Operations Research: Deterministic Models
 - OR 542 Operations Research: Stochastic Models
 - OR 635 Discrete System Simulation
 - OR 651 Military Operations Research I: Cost Analysis
 - OR 652 Military Operations Research II: Effectiveness Analysis
 - SYST 683 Modeling Simulation and Gaming

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Detailed Descriptions of Military OR Courses

OR 651 Military Operations Research I – Cost Analysis

- **Comprehensive treatment of Defense Cost Analysis**
- **Extremely important topic in the support of defense decision-making at National level – thus required of all MOR students**
- **Offered off campus at the facilities of the Institute for Defense Analyses**
- **Different expert lecturer each week**

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Detailed Descriptions of Military OR Courses

(continued)

OR 651 Military Operations Research I – Cost Analysis

- **Topics covered include:**
 - **Economics in Cost Analysis**
 - **Cost Data collection**
 - **Estimating Relationships**
 - **Learning or Progress Curves**
 - **Software costing**
 - **Force costing**
 - **Acquisition schedule estimation**
 - **Life-Cycle Costing**
- **A Cost Analysis Project is required**

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Detailed Descriptions of Military OR Courses
(continued)

OR 652 Military Operations Research II: Effectiveness Analysis

- Focus on issues for National Level military analysis
- Examination of models and techniques presently in use in the military analysis community
- Guest speakers from the local analytical community
- Realistic case studies based on actual problems encountered by military analysts within the last 1 ½ years

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Detailed Descriptions of Military OR Courses
(continued)

• **OR 652 Military Operations Research II: Effectiveness Analysis**

- Topics covered include:
 - Theater Campaign Analysis
 - Equipment Modernization
 - Force Structure
 - Strategic Mobility and Deployment
 - Small Scale Contingencies
 - Decision Analysis for Military Problems
 - Logistics and Requirements
- Realistic problem from defense analysis addressed in a group project in this course

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Detailed Descriptions of Military OR Courses

(continued)

SYST 683 Models, Gaming, and Simulation

- Concentrates on the design and use of combat simulation models as aids to defense decision making
- Students will understand techniques for representing acquisition, attrition, movement, battlefield environment, command and control, communications, intelligence, air-to-air combat, and decision making
- Discussion of advanced modeling techniques (e.g., object-oriented programming, advanced distributed simulation, High-Level Architecture)
- A Project is required in this course

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Detailed Descriptions of Military OR Courses

(continued)

OR 649 Systems Analysis for Peace Operations

- Emphasizes differences between “standard” military OR and analysis of Peace Keeping and other Operations Other than War
- Provides a structure for analyzing Peace Keeping Operations based on significant research performed at GMU in the area
- Examines various techniques for performing this analysis
 - Decision/Game Theoretic methods
 - Bayesian and Belief networks
 - System Dynamics
 - Others
- Group project required

Requirements for Admission

- **Fulfill all admission requirements for graduate study, including 3 letters of recommendation**
- **Undergraduate degree in a related field:**
 - **Mathematics**
 - **Engineering**
 - **Computer Science**
 - **Etc.**
- **Mathematics courses:**
 - **Calculus I and II**
 - **Differential Equations**
 - **Linear Algebra**
 - **Probability and Statistics (2 courses)**
- **Knowledge of at least one scientific computing language**