

MTV Nuclear Engineering Summer School 2020 – Working Schedule

Number of weeks: **12**

Start Week: **May 18, 2020**

Consortium for Monitoring, Technology, and Verification Nuclear Engineering Summer School



Students interested in strengthening their research capabilities are invited to register for the upcoming MTV Nuclear Engineering Summer School. This 12-week program will cover a range of topics and techniques that benefit student researchers at all academic levels.

Classes will be taught virtually by MTV faculty, national lab collaborators, and senior PhD students.

Course topics include:

- Nuclear Engineering Background
- Gamma Detection
- Neutron Detection
- Organic Scintillation Detectors
- Analyzing Experimental Data
 - (Including special nuclear material!)



Virtual classes start: May 18, 2020

Classes will occur for 1 hour daily. Tentative schedule: <https://bit.ly/MTVNESS2020>

MTV completion certificate will be granted to participating students.

There is no cost to participate! To reserve your seat, register using the Google form linked below.

<https://forms.gle/66W4WWhc9TfHwDjB7>



Prof. Sara Pozzi
Director

MTV.ENGIN.UMICH.EDU



Week #1: May 18-22, Title: Introduction Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|--|---|------------|-----------|
| 1.1 | Introduction to Nuclear Nonproliferation | Professor Sara Pozzi (University of Michigan) | 05/18/2020 | 1:00 PM |
| 1.2 | Neutron Interactions and Cross Sections | Michael Hua | 05/20/2020 | 3:00 PM |
| 1.3 | Gamma-Ray Interactions | Chris Meert | 05/21/2020 | 3:00 PM |
| 1.4 | Introduction to Detectors | Will Steinberger | 05/22/2020 | 3:00 PM |

Week #2: May 25-29, Title: Gamma Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|-------------------------|--|------------|-----------|
| 2.1 | Introduction to Fission | Dr. Jørgen Randrup (Lawrence Berkeley National Laboratory) | 05/26/2020 | 3:00 PM |
| 2.2 | Gamma Ray Detection | Nathan Giha | 05/27/2020 | 3:00 PM |
| 2.3 | Activation Analysis | Chris Meert | 05/28/2020 | 3:00 PM |
| 2.4 | Enrichment | Will Steinberger | 05/29/2020 | 3:00 PM |

Week #3: June 1-5, Title: Neutron Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|--|--|------------|-----------|
| 3.1 | Capture-Based Neutron Detection | Chris Meert | 06/01/2020 | 3:00 PM |
| 3.2 | Scatter-Based Neutron Detection | Will Steinberger | 06/02/2020 | 3:00 PM |
| 3.3 | History: Manhattan Project | Alan Carr (Los Alamos National Laboratory) | 06/03/2020 | 3:00 PM |
| 3.4 | Far-field Reactor Discovery and Monitoring using Antineutrinos | Professor Igor Jovanovic (University of Michigan) | 06/04/2020 | 4:00 PM |

Week #4: June 8-12, Title: Data Processing Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|----------------------------------|------------------|------------|-----------|
| 4.1 | Introduction to Pulse Processing | Will Steinberger | 06/08/2020 | 3:00 PM |
| 4.2 | Correlation Analysis | Stefano Marin | 06/09/2020 | 11:00 AM |

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|-----|--|--|------------|----------|
| 4.3 | Introduction to Neural Networks | Abbas Johar Jinia | 06/11/2020 | 11:00 AM |
| 4.4 | Generating Files with Matlab, Python or C++ | Michael Hua / Will Steinberger / Abbas Johar Jinia | | |
| 4.5 | Nuclear Arms Control and Verification: Past, Present, and Future | Professor Alexander Glaser (Princeton University) | 06/12/2020 | 3:00 PM |

Week #5: June 15-19, Title: Monte Carlo Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|---|---|------------|-----------|
| 5.1 | Monte Carlo Intro I | Michael Hua | 06/16/2020 | 11:00 AM |
| 5.2 | Monte Carlo Intro II | Shaun Clarke | 06/16/2020 | 3:00 PM |
| 5.3 | Fun MC Examples and Intro to Statistics | Prof. Christopher Perfetti (University of New Mexico) | 06/17/2020 | 3:00 PM |
| 5.4 | Invited Speaker Talk | Prof. Christopher Perfetti (University of New Mexico) | 6/19/2020 | 3:00 PM |

Week #6: June 22-26, Title: Detector Characterization Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|---|------------------|------------|-----------|
| 6.1 | Setting up Your Detector | Will Steinberger | 06/22/2020 | 3:00 PM |
| 6.2 | Energy Resolution, Time Resolution, Linearity | Stefano Marin | 06/23/2020 | 3:00 PM |
| 6.3 | Light Output | Will Steinberger | 06/24/2020 | 3:00 PM |

Week #7: June 29-July 3, Title: Break

Week #8: July 6-10, Title: Time-Correlated Neutron Analysis Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|--|--|------------|-----------|
| 8.1 | Nondestructive Assay for Nuclear Safeguards | Dr. Alexis Trahan (Los Alamos National Laboratory) | 07/06/2020 | 3:00 PM |
| 8.2 | Safeguarding Reactors and Spent Nuclear Fuel | Dr. Alexis Trahan (Los Alamos National Laboratory) | 07/07/2020 | 3:00 PM |
| 8.3 | Current Research in Time-Correlated Neutron Techniques | Michael Hua | 07/09/2020 | 3:00 PM |
| 8.4 | Research at the National Criticality Experiments Research Center | Mr. Jesson Hutchinson (Los Alamos National Laboratory) | 07/10/2020 | 3:00 PM |

Week #9: July 13-17, Title: Active Interrogation Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|--|---|------------|-----------|
| 9.1 | Neutron Active Interrogation | Chris Meert | 07/14/2020 | 3:00 PM |
| 9.2 | Photon Active Interrogation | Chris Meert | 07/15/2020 | 3:00 PM |
| 9.3 | Medical Applications | Noora Ba Sunbul | 07/16/2020 | 3:00 PM |
| 9.4 | Synergizing imaging, dosimetry, and radiotherapy with machine learning | Professor Angela Di Fulvio (University of Illinois at Urbana-Champaign) | 07/17/2020 | 3:00 PM |

Week #10: July 20-24, Title: Imaging Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|------------------------|---|------------|-----------|
| 10.1 | Antineutrino Detection | Professor Anna Erickson (Georgia Institute of Technology) | 07/20/2020 | 3:00 PM |

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|------|---|--|------------|----------|
| 10.2 | Cross-Sections and Criticality During the Manhattan Project | Mark Chadwick (LANL) | 7/22/20 | 11:00 AM |
| 10.3 | Introduction to Scatter-Based Imaging and Fundamentals | Will Steinberger | 07/22/2020 | 3:00 PM |
| 10.4 | Coded-Aperture Imaging | Dr. Erik Brubaker (Sandia National Laboratories) | 07/23/2020 | 3:00 PM |

Week #11: July 27-31, Title: Fission Week

| Lecture Number | Lecture Description | Speaker | Date | Time (ET) |
|----------------|--|--|------------|-----------|
| 11.1 | Spontaneous and Induced Fission | Stefano Marin | 07/27/2020 | 3:00 PM |
| 11.2 | Fission Event Generators | Stefano Marin | 07/28/2020 | 3:00 PM |
| 11.3 | Active Areas of Research | Stefano Marin | 07/29/2020 | 3:00 PM |
| 11.4 | Detection Systems at National Laboratories | Stefano Marin | 07/30/2020 | 3:00 PM |
| 11.5 | Invited Speaker Talk | Dr. Ramona Vogt (Lawrence Livermore National Laboratory) | 07/31/2020 | 3:00 PM |