Virtual Manufacturing Lab (VM-Lab)

A Multimedia Design House for Digital Learning in Manufacturing-USA Workforce Education

Lead organization: MIT, AIM Photonics Academy
Sub-awards: Clemson University, University of Arizona

There is a critical need to create an online education vehicle that is cost-effective, scalable, and perennially updated to address advanced manufacturing knowledge gaps.

The multi-university VM-Lab team is creating 40 online learning modules that will:

- create remote education opportunities for the nascent advanced manufacturing workforce
- incorporate game-based learning principles to increase student engagement and exploration
- deliver virtual laboratories and online tools that drive the creation of blended-learning offerings

VM-Lab's online learning pedagogy combines (i) desktop VR training simulations, (ii) video instruction, (iii) programmable notebooks, and (iv) assessment exercises to meet U.S. advanced manufacturing workforce training needs for both engineering and technician audiences.

Online learning modules will be deployed in the following focus areas:

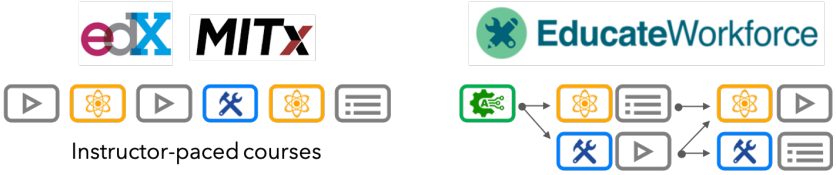
Optics and photonics fundamentals – fundamentals of fiber optics and integrated photonics including electro-optic design, test, assembly, and packaging

Tool-training VR simulations – immersive VR learning environments targeting workforce training overlap between Manufacturing USA institutes

Application-focused educational games – engaging, real-world application systems (e.g. hyperscale data centers, wireless avionics communication, LiDAR for self-driving cars)

Figure 1 – Circuit-level interactive simulations (left); fab floor and tool-training VR experiences (center); learning science research and assessment (right).

VM-Lab modules will be featured in AIM Academy's online edX courses, and hosted on the Open edX platform *EducateWorkforce* as an interactive module library for application-driven exploration.



Years 1 & **2** of the project will focus on workforce training in integrated photonics (AIM Photonics) and specialty fiber optics (AFFOA). In **Year 3**, proof-of-concept modules will be developed for robotics (ARM), functional fabrics (AFFOA), lightweight materials (LIFT), and flexible photovoltaics (NextFlex).

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