Digital Workforce Development
Best Practices

Organizers: Olivia Pinon Fischer (Georgia Tech), John Matlik (Rolls-Royce Corporation)
Moderator: John Matlik
Panel Focus & Objectives

Panel Focus
- Discuss workforce development examples, challenges and opportunities to accelerate the upskilling & development of the Digital Engineering savvy workforce needed to respond to the current Customer & Business landscape & needs

Panel Objectives & Themes
- Best practices: Present education & workforce development ‘best in class’ examples and new paradigms for how Academia is helping to both upskill current workforce and equip new/incoming workforce with the needed Digital skills.
- Digital Engineering Curriculum: What does a robust curriculum for Digital Engineering look like for current workforce, new workforce, and how this can be robustly trained out? What new roles? How do we evaluate/measure literacy?
- Challenges & Blockers: What are the key things that block, slow or prevent robust development & training of the workforce in latest Digital techniques and capabilities? We’re teaching “what we know today”, but how do we ‘future proof’/adapt to new learning?
- Collaboration Opportunities: Where might there be opportunities to accelerate digital engineering workforce development together through cross-Industry/cross-Academia partnerships?
Digital Workforce Development - Best Practices
Working Group Objectives & Intent

Objectives

- Document, in a white paper, workforce development examples, challenges/opportunities and recommendations to accelerate the upskilling & development of the Digital Engineering savvy workforce needed to respond to the current Customer & Business landscape & needs

Intent

- Engage with passionate participants from Industry, Government, and academia to build upon the many exchanges we had during both the AIAA panel session by the same title and the USAF DTO Digital Transformation Workshop that took place at SciTech in January
OUR DISTINGUISHED PANEL MEMBERS

Dr. Olivia Pinon Fischer
Chief, Digital Engineering Division
Aerospace Systems Design Laboratory (ASDL)
Georgia Institute of Technology
Presentation: “Georgia Tech ASDL’s Grand Challenges”

Dr. Marianna Maiaru
Associate Professor
Department of Mechanical Engineering
University of Massachusetts Lowell
Presentation: “Lessons learned and best practices from the AIAA ICME prize competition”

Dr. Gokcin Cinar
Assistant Professor
Integrated Design of Environmentally-friendly Aerospace Systems (IDEAS) Lab
University of Michigan
Presentation: “x88 and MBSE at the University of Michigan”

Dr. H. Alicia Kim
Jacobs Scholar Chair Professor
Structural Engineering Department
University of California San Diego
Presentation: “Challenges Today”

Elizabeth Generas
Program Manager
Workforce Development
Sinclair College
Presentation: “Digital Thread Initiative”

Lori Baukus
Director Training, Education, and Outreach
ARCTOS Technology Solutions
Presentation: “Education at the Speed of Industry: How Community Colleges Train an Advanced Technology Workforce for SMMs”
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS
Aerospace Systems Design Laboratory's Grand Challenges
Responding to the Challenges, Barriers and Needs for the Development of a Digital Workforce

Olivia Pinon Fischer, Ph.D. (olivia.pinon@asdl.gatech.edu)
Chief, Digital Engineering Division – Senior Research Engineer
Aerospace Systems Design Laboratory (ASDL)
School of Aerospace Engineering | Georgia Institute of Technology

2023 Dayton Digital Transformation Summit | Dayton, OH | May 11th, 2023
Responding to the Challenges, Barriers and Needs for the Development of a Digital Workforce

Centers of Excellence

Siemens Invests in Georgia Tech, Launches Center of Excellence for Simulation and Digital Twin

On October 4, 2021, Siemens Technology and Georgia Institute of Technology officially launched the Center of Excellence for Simulation and Digital Twin, an initiative dedicated to advancing digital twin research as a new underpinning of products and processes.

Siemens will invest nearly $20 million to establish this center. The center will bring together researchers, engineers, and developers from both Siemens and Georgia Tech to collaborate on simulation and digital twin technologies.

Sponsored Research

Boeing-Georgia Tech Collaboration Still Strong After 10+ Years

The Boeing-Georgia Tech Collaboration (BGTC), established in 2004, continues to thrive. The collaboration focuses on advancing research in aerospace engineering and technology.

BGTC has supported numerous projects in areas such as aircraft design, propulsion systems, and materials science. The collaboration has produced numerous publications and patents, and has contributed to the development of new technologies and innovations.

Responding to the Challenges, Barriers and Needs for the Development of a Digital Workforce

Grand Challenges

- Part of the ASDL core academic and research methods training for our first-year graduate students
- Projects are divided into two categories: **System of Systems** and **Vehicle Design**
- Conducted over two entire academic semesters (Fall & Spring)
- Broad, open-ended problems related to topics that are current and relevant to the aerospace industry
- Work in close collaboration with industry and/or government experts
- Require
  - Ability to work outside of their comfort zone – most topics are new to the students
  - A very deep understanding of the problem, underlying theory and assumptions
  - Practical implementation of advanced methods and development of decision-support environments
General Guidelines for Grand Challenges

- Emphasize story telling—every story must have a beginning, a middle, and an end
- Make the story interesting and clear
- Formulate the problem clearly:
  - What is the problem to be addressed?
  - What motivates interest?
  - Why is it hard? Why is it important?
  - How is it done today, by whom, and what is wrong with it?
- How do you propose to address it?
- What’s the new idea here, and why can we succeed now but not before?
- What recent breakthroughs now make this possible?
- What is your plan and technical approach?
- What are the biggest challenges and why?
- Formulate the Grand Challenge as a decision support problem
- Create an interactive parametric M&S environment to support decision making
2022-2023 System of Systems and Vehicle Grand Challenges

Themes
- Aerospace System of Systems
- Defense: Mission Planning
- Defense: Affordability
- Defense: Hypersonics
- Digital Enterprise
- Disaster Management
- Space: Planetary Missions
- Space: Cis-Lunar Missions
- Safe and Efficient System Design
- Sustainable Aviation and Cities
- Sustainable System Design
- System Design and Optimization
Responding to the Challenges, Barriers and Needs for the Development of a Digital Workforce

Grand Challenges

Examples of Recent/Ongoing Digital Engineering Related Grand Challenges

- Digital Enterprise Across the Lifecycle
- Implementing the Digital Thread – A Proof-of-Concept
- JADC2 in a Contested Logistics Environment – The Role of Digital Twins
- Enterprise Big Data
- Demonstrating the Value of Digital Engineering through the Reuse of Knowledge, Models and Data in the Design of Low Cost Attritable Vehicles
- A Methodology for the Definition, Evaluation and Design of an Enterprise for Agility
- 

Allow students to develop foundational digital literacy, be exposed to digital engineering methods, tools and processes, and increase their understanding of digital systems
Responding to the Challenges, Barriers and Needs for the Development of a Digital Workforce

Centers of Excellence

Siemens Invests in Georgia Tech, Launches Center of Excellence for Simulation and Digital Twin

Sponsored Research

Boeing-Georgia Tech Collaboration Still Strong After 10+ Years

Grand Challenges

IoWT: Internet of Warfighting Things

Involvement in Professional Societies & Working Groups

Professional Master’s in Applied Systems Engineering (PMASE)
ICME of Advanced Composites

Our team demonstrated a new ICME platform to re-design the Aurora’s D8 Y-joint

- **Performance:** Pull off load-to-weight improvement of 43%
- **Cost:** Manufacturing cost reduction of up to 17%
- **Return on investment:** as high as 200:1

~10 Students
NASA Award #: 34082

Marianna Maiaru

**iComp²** Research Group @ Umass Lowell – Specialized in Process Modeling and ICME
We bridge material science and computational mechanics to establish material-processing-property relations in advanced composites.

(c) 2023 iComp² – Marianna Maiaru – All Rights Reserved
AIAA Prize 2022 & ICME Class

We were awarded the 2022 AIAA ICME Prize

Spring 2021 Class was invited to present to a virtual seminar at NASA Glenn on Dec 9 2021

60+ Students worked on our ICME project at UML over 2 years
Hearing from the Students...

The ICME project gave students a strong feel of what working as part of a real multi-disciplinary engineering team is like.

A shared, class-wide project objective required student groups working across the design length scales to collaborate and establish an interconnectivity amongst each other's goals. As opposed to traditional class projects, the ICME project encourages consideration for the "big picture" in engineering design.

Within project groups, students were assigned a length scale. They were given the task of learning the fundamentals associated with their assigned scale, as well as how it related directly to the design case. When collaborating as a class, groups focused on what was needed as an input/output between other groups and how to facilitate transfer and communication of the relevant data. These key aspects of the ICME project led to a unique, dynamic, and interesting project for students to experience over the course of a semester.

Michael O.
Hearing from the Students…

I’ve learned how to work collaboratively within an interdisciplinary team containing a multitude of perspectives.

The novelty of the project forced me to think more critically.

I learned how to approach a project by breaking it down into smaller parts; determining milestones to achieve the end goal.

Kalima B.
Hearing from the Students…

It was interesting to learn how a project of such magnitude was planned, managed, and executed to completion by a multidisciplinary team of industry professionals, research scientists, experimentalists, and peers where everyone brought a unique perspective to the discussion all the while focusing on the big picture.

I mentored graduate students and learned the importance of teamwork, leadership, task delegation, time management, and critical assessment of results.

The experience I have gained through the project has made me a better researcher and engineer, who can not only work in a multidisciplinary team but also lead and manage projects.

Working in a large team taught me the importance of systematic data management for the smooth exchange of information.

Sagar S.
Hearing from the Students…

I learned how to communicate your work in an effective manner. I am a computational modeler, so I learned **how to communicate** and work with experimentalists to tailor my modeling work accordingly. Always look at the bigger picture of the project and be flexible to change your when necessary.

I learned the need for strategic planning and efficient execution of work based on inputs from experimentalists, industry professionals, and researchers, as everyone have a different way of thinking based on their professions.

Working with students, I learned a lot about mentorship, time management, and careful assessment and critical review of their work.

All these things combined make me an all-around engineer who can not only plan and execute the plan efficiently but also can effectively communicate it to the audience.

Sagar P.
Hearing from the Students...

Being a team lead for a subgroup of students contributed to the development of my project management skills. Having to organize and divide tasks and building blocks for a 2-year project showed me a smaller-scale project management version of how a project in the aerospace industry can be developed and carried out for several years. All those skills acquired make me a better and more well-rounded engineer.

Collaborating with people from different disciplines taught me how important it is to be able to understand and communicate findings between people with different background.

Working with people from the industry step by step from the start of the project to end, educated me about the engineering process followed by aerospace companies. It is hard – almost impossible - to gain intuition and perspective toward how realistic a design can be for a certain application through a traditional course, and implementing projects like the ICME prize project into the coursework is a great benefit!

Through the ICME prize project, I had the opportunity to work on a real-life aerospace project which would have not been able otherwise in my university curriculum. It taught me to use the theories learned in courses on a real engineering problem.

Evgenia P.
x88 and MBSE at the University of Michigan

Dr. Gökçin Çınar
Assistant Professor of Aerospace Engineering
Director, Integrated Design of Environmentally-friendly Aerospace Systems (IDEAS) Laboratory
University of Michigan
Email: cinar@umich.edu
Web: gokcincinar.com
NEED FOR CHANGE

The Systems Engineering Practices Opportunity

What are Space Failure’s Common Threads?

- Systems Engineering Deficiencies Lurk Behind Most Failures:
  - Incomplete requirement flowdown and implementation
  - Misleading requirement language
  - Insufficient verification of ad-hoc adaptation
  - Lack of independent verification
  - Unexpected interaction among subsystems, between hardware and software, or between launch vehicle and satellites
  - Over-optimistic “heritage” assumptions
  - Inability to handle software risk
  - Ineffective verification and validation
  - Ineffective communication processes

Source: NASA Marshall Space Flight Center in Huntsville, AL - 6th floor, building 4203 elevator
Team Competes with Verified and Validated Design

CLOSED LOOP

Student Project Team Cycle

- New Requirements Establishment
- Requirements Cascade
- Design
- Build
- Test
- Knowledge Transfer
- Build
- Test
- Knowledge Transfer
- Requirements Cascade
- Design
- Build
- Test
- Knowledge Transfer
- New Requirements Establishment

Competition Committee Rules & Regulations

Team Competes with Verified and Validated Design
x88 COURSE OUTLINE

488 students will mentor and coach 288 and 388 students

AEROSP 488
(Jr/Sr) (4)
Product Development Leadership

- Systems Engineering
- Financial Budgets
- Ethics & Culture, DEI
- Effective Executive Presentations
- Complex Project Management
- Cost/Profit
- Knowledge Capture
- Delivering at Milestones
- Team Leadership
- Giving/Receiving Feedback
- Selecting & Grooming Future Leaders
- Servant Leadership & Empathy

AEROSP 288
(Soph/Jr) (3)
Fundamentals of Product Development

- Model-Based Systems Engineering (MBSE)
- Conducting Effective Design Reviews
- Manufacturing Process/Material Selection
- Intro to Quality Engineering
- Statistical Modeling
- 6σ Root Cause Analysis
- Deep Dive
- Basic Project Management
- Technical Presentations
- Geometric Dimensioning & Tolerancing (GD&T)
- Physical Testing Methodologies
- Model/Testing Correlations
- Multi-Criteria Decision Making
- FMEA/DVPR/Risk Management
- Team Dynamics, DEI
- Technical & Cost Budgets
- Design of Experiments
- Managing Product Variability
- Field Validation/Flight Testing
- FME/ DVPR/ Risk Management
- FMEA
- Design
- Technical
- Manufacturing

AEROSP 388
(Soph/Jr) (4)
Aerospace Tools & Methods (MBSE)

- Systems Engineering
- Financial Budgets
- Ethics & Culture, DEI
- Effective Executive Presentations
- Complex Project Management
- Cost/Profit
- Knowledge Capture
- Delivering at Milestones
- Team Leadership
- Giving/Receiving Feedback
- Selecting & Grooming Future Leaders
- Servant Leadership & Empathy

TM Proprietary
Students learn MBSE in a controlled series of experiments on a relevant system before application on their own craft.
All students participate in group projects
- Systems Engineering processes and MBSE tools taught to inform students how to execute their projects
- 488 students will take leadership roles in their project groups
- Gateway Reviews by corporate partners
Traditional model

ACADEMIA → INDUSTRY
Transformational model
Our Team - Faculty

**George Halow**
Professor of Practice, Aerospace Eng
gfhalow@umich.edu
Director, Aerospace Leadership Master of Engineering Program

**Gokcin Cinar**
Assistant Professor, Aerospace Eng
cinar@umich.edu
Principal Investigator, Integrated Design of Environmentally-friendly Aerospace Systems (IDEAS) Lab
Education at the Speed of Industry: How Community Colleges Can Help Small to Medium Manufacturers Fill the Workforce Gap for Advanced Manufacturing

Lori Baukus, Director of Training, Education, & Outreach
ARCTOS® is a leading Small Business provider of digitally-integrated technologies and agile mission-focused solutions for aerospace and defense.

- Main offices in Dayton OH, Arlington VA, & Torrance CA
- ~175 employees, $50M+ annual revenue
- Core competencies:
  - Aerospace Systems
  - Advanced Materials
  - Smart Manufacturing
  - Digital Engineering
  - Modeling & Simulation
  - Sensing & Analytics
Technology-Focused Workforce Development

We provide professional services supporting workforce development across critical aerospace technology domains. We offer technical and project management leadership, enabling education/training partners to accelerate & excel!

- New technology training program development
- Workforce development optimization and acceleration for the Defense Industrial Base
- Facilitated partnerships for optimum collaboration and synergy
- Innovation and leadership for new opportunities
- Technology roadmaps for the Future of Work
Example Project Success

Air Force Prime Contract No. FA8650-21-F-5579
AFRL Manufacturing and Industrial Technologies (MITS)
Prime Contractor: ARCTOS Technology Solutions, LLC

“Regional Fabrication and Certification Training Labs”

Training and education partners:
Lorain County Community College
Sinclair Community College
Clark State College
Define, Develop, Validate and Deploy models, training, and pilots to facilitate scale across multiple institutions

- Support the creation of fully capable training partners in future technologies
- Drive consistency of quality in education and training
- Facilitate DoD Air Force Base training Replication Projects

A FANUC robot tends a HAAS CNC machine fitted with data monitoring sensors
# CONOPS – Concept Of Operations

<table>
<thead>
<tr>
<th>Stage 1 Define</th>
<th>Stage 2 Develop Training Packages</th>
<th>Stage 3 Validate</th>
<th>Stage 4 Deploy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training Needs Assessment</td>
<td>Define <strong>Industry Engagement</strong>: Industry Engagement to solicit pilot projects directly and via regional and state partners</td>
<td>Define training package needs, validate credentials, equipment required, schedule.</td>
<td>Demonstrate Increased enrollment</td>
</tr>
<tr>
<td>Define <strong>Credentials and Certifications</strong>: Leverage existing or create new</td>
<td>Define <strong>Projects</strong>: Project is assessed for readiness. Projects that aren’t ready are connected to support partners for further development (MEP’s, SME’s)</td>
<td>Fund and Implement Pilot: Purchase equipment, conduct training</td>
<td>Share Model for replication and scaling</td>
</tr>
<tr>
<td><strong>Go/ No Go</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry Validated List</td>
<td>List of Engaged partners</td>
<td>Pilot Teams formed: Education Partner, Technical Partner, Industry Partner</td>
<td>Conduct Train the Trainer</td>
</tr>
<tr>
<td></td>
<td>Pilot Teams formed: Education Partner, Technical Partner, Industry Partner</td>
<td>Define new credentials if required</td>
<td>White Paper</td>
</tr>
<tr>
<td></td>
<td>Draft Plan</td>
<td>Credential/Certifications Issued</td>
<td></td>
</tr>
</tbody>
</table>
### Bachelor of Applied Science Smart Industrial Automated Systems Engineering Technology

#### Advanced Product ID
- Vision Technology II
- Near Field Communications
- RFID II
- Potential & Impact

#### HMI
- Manufacturing Processes
- Programming
- Creating Visual Awareness
- Recipe Creation
- Data Acquisition

#### Advanced Robotics
- Collaborative Robots
- Augmented Reality
- IRA Safety Standards
- Integration of PLC’s w/Robotics
- Virtual Commission

#### Advanced PLC
- Sensors III
- OPCUA w/MES & PLC
- I/O Condition Monitoring
- Advanced Networking & Connectivity

#### Smart Maintenance
- Predictive Maintenance
- Data Analysis
- LEAN & Visual Awareness
- Top Floor- Shop Floor Communication

#### Cyber Security
- Data Correlation: Understanding Risks & Consequences
- Preventing Cyber Attacks

### Bachelor of Applied Science Smart Industrial Automated Systems Engineering Technology and Specialist Certificate

#### Product ID Fundamentals
- Vision Technology 1
- RFID 1
- Bar Coding 1

#### Applied Fluid Power
- Maintenance & Troubleshooting
- Energy Efficiency
- Vacuum Technology

#### Applied Mechanical Systems
- Gear Drives
- Bearings & Gaskets, Seals
- Clutches & Brakes
- Ball Screws and Linear Rexines

#### Applied PLC
- Sensors II
- PLC Technology II
- Basic Networking
- CoDeSys

#### Applied Robotics
- Programming & Editing
- Maintenance & PM
- Welding
- Material Handling
- Palletizing

#### Applied Industry 4.0
- Introduction to MES
- Introduction to HMI
- Introduction to Data Safety
- Introduction to 3D Modeling

### Associate of Applied Science in Automation Engineering Technologies – Systems Specialist

#### Electricity Fundamentals
- Electricity AC
- Electricity DC

#### Fluid Power Fundamentals
- Basic Hydraulics
- Basic Pneumatics

#### Mechanical Systems
- Mechanical Drive Systems Components & Calculations
- Belts, Chains, & Lubrication
- Maintenance & Installation of components

#### PLC Fundamentals
- Sensors I
- PLC Technology 1

#### Robotics Fundamentals
- Introduction to Robotics

#### Industry 4.0 Fundamentals
- Introduction to Industry 4.0

---

### I4.0 Thread + Occupation-Based Learning Outcomes + Competency Led + Embedded Stackable Credentials and Certificates

---

### Industry 4.0 Roadmap

**Level 1: Robotics Technician**

**Level 2: Robotics Specialist**

**Level 3: Robotics Integrator**

---

Lorain County
Community College
Learn how to Incorporate I4.0 Skills, Competencies, Technologies
Customized Topics to the Industry

Introduction to Advanced Manufacturing Systems Approach and Integrating Industry 4.0
Experience and Implement Industry Relevant Capstone projects for Students
FANUC and Allen Bradley Industry Recognized Credentials
0-25% Robotics Experience
Led by ARCTOS, Sinclair College is advancing a project to create new training models and materials enabling small to medium-sized companies to rapidly and successfully transition to a digital manufacturing paradigm.

UAS and AAM aircraft are leveraged throughout the curriculum as a linkage to the advanced aerospace defense and dual-use manufacturing needs of the Air Force Research Laboratory and private industry.
CENTER FOR ADVANCED MANUFACTURING AND LASER MATERIAL PROCESSING

INDUSTRY OUTREACH
- Developing a Curriculum (DACUM)
- Tours
- Training Needs Assessment
- Skilled LMP Pipeline

TRAIN THE TRAINER
- High School Teachers
- Manufacturing Foundations Certification
- Dual Enrollment
- Lending Lab

INDUSTRY RECOGNIZED CREDENTIALS
- OSHA 10-General Safety
- Laser Safety
- TruLaser 3000 Operator
- SME Certified Additive Manufacturing Fundamentals

TRAINING PATHWAYS
- Customized Industry Training
- Stackable Certifications

K-16 COLLABORATION
- Interactive Onsite Demonstrations
- Career Fairs
- Manufacturing Days
- Dayton Regional STEM School
- University of Dayton
- Wright State
Collaboration Opportunities for Industry and Education

- Develop training, course materials, and programs
- Audit training
- Teach
- Act as advisors
- Guest lecture on key topics
- Host tours for faculty
- Connect to Defense Industrial Base Partners
- Provide Technical Use Cases
- Earn & Learn, Internships
Thank you!

Mission-focused innovation.
Customer-focused delivery.
Sinclair Community College
Elizabeth Generas, Program Manager
Dayton, Ohio

Digital Thread Initiative
Digital Thread Initiative Mission

Develop and deliver smart manufacturing training programs for current and future workforce centered on technologies and processes related to digital transformation in advanced manufacturing.

K-12 STEM Programs

Academic Programs

Workforce Programs
Grade 6-12 STEM Learning Experiences

Design

Sustain & Dispose

Manufacture

Test & Assemble
Academic Programs

- Short-Term Technical Certificate “Digital Thread Engineering Technology”
  - 5 new courses from 4 departments; Industrial Systems Engineering, Computer & Information Science, Management, Business Information Systems

- Bachelor of Applied Science Integrated Systems Technician
  - Business Processes - Operations, Accounting
  - Cloud Computing - Data Analytics & Viz, Database Mgt, Cyber Security
  - Factory Operations - Logistics, Devices
  - Automation & Data Acquisition - Industry 4.0, Cyber Security
## Short-Term Technical Certificate:
### Digital Thread Engineering Technology (16 hours)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISE 1401</td>
<td>Intro to Digital Thread Technology</td>
</tr>
<tr>
<td>ISE 1402</td>
<td>Digital Thread Enabled Manufacturing</td>
</tr>
<tr>
<td>MAN 1010</td>
<td>Digital Thread Enhanced Logistics</td>
</tr>
<tr>
<td>CIS 1010</td>
<td>Digital Thread Cyber Security</td>
</tr>
<tr>
<td>BIS 1010</td>
<td>Digital Thread Data Management</td>
</tr>
<tr>
<td>MET 1131</td>
<td>Personal Computer Applications for Engineering Technology</td>
</tr>
</tbody>
</table>
Workforce Programs

- Digital Tapestry Series
  - Podcast – ‘Digital Thread Bytes’
  - Workshops

- Topics:
  - Data for Shop Operators
  - Data Analytics for Supervisors
  - Cyber Security
Opportunities

- National Advanced Air Mobility Center of Excellence (NAACE)
- Augmented Reality
  - Training
  - Maintenance
  - Operations
- Next Generation Training

Contact
Program Manager Elizabeth.Generas@sinclair.edu
Project Director Andrew.Shepherd@sinclair.edu
Workforce Director Greg.Wasmund@sinclair.edu
Workforce.Sinclair.edu