

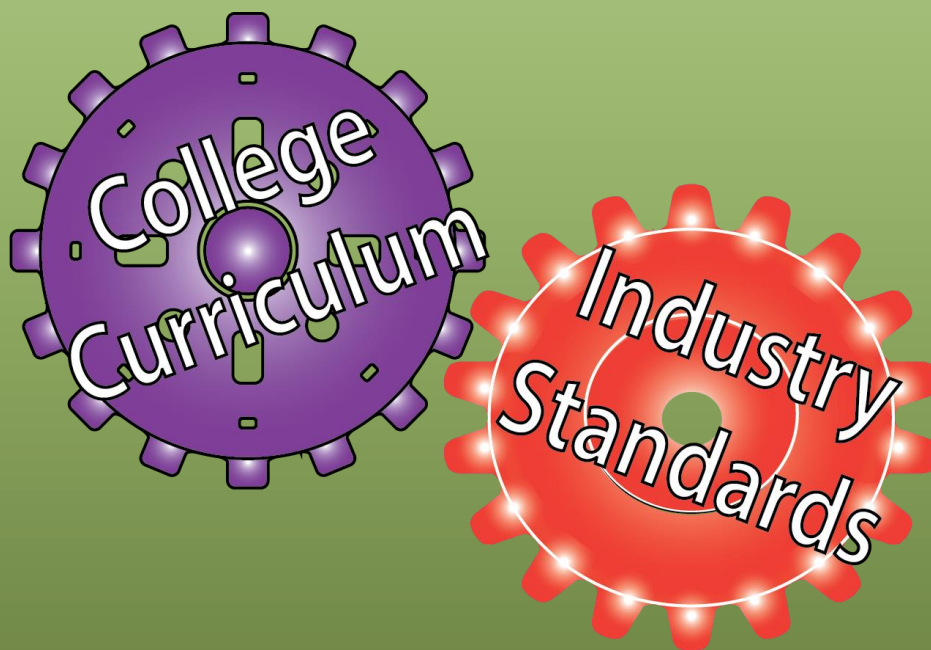


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## *EDUCATION PROGRAM ALIGNMENT TO NATIONAL CREDENTIALS AND STANDARDS*

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*A FLATE Best Practices Guide*  
*[www.fl-ate.org](http://www.fl-ate.org)*



# FLATE

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# Message from FLATE's Executive Director

## FLATE'S ROLE IN SHAPING THE FUTURE OF MANUFACTURING EDUCATION

**FLATE** is a National Science Foundation Advanced Technological Education (ATE) Center of Excellence in *high-technology manufacturing*, and serves as the primary resource organization for manufacturing and advanced technical education, best practices, and resources supporting the high-performance skilled workforce for Florida's manufacturing sectors.

NSF's ATE program "focuses on the education of technicians for the high-technology fields that drive our nation's economy. The program involves partnerships between academic institutions and industry to promote improvement in the education of science and engineering technicians at the undergraduate and secondary school levels."<sup>1</sup> FLATE exemplifies the important roles that community and technical colleges play in responding to labor market demands, and most importantly providing students with the skills they need to be immediately employable.

In partnership with the Florida Department of Education (FLDOE), FLATE worked closely with its partner colleges and industry representatives to rigorously review the standards and benchmarks that define both the Engineering Technology Core and the ten specialized tracks that make up the second-year of the degree program. FLATE harnesses industry partnerships, workforce opportunities, and educational synergy throughout the state of Florida by connecting industry and workforce needs to targeted educational endeavors at nineteen community and state colleges across Florida. The Engineering Technology (ET) degree and certificate programs conceived, engineered, and coordinated by FLATE are the first of their kind to deliver a cohesive, comprehensive, fully articulated inter-institutional program, which focuses on a set of core courses covering introductory computer-aided drafting, electronics, instrumentation and testing, processes and materials, quality, and safety.

These core skills support the Florida workforce, and ***align with the national Manufacturing Skill Standards Council (MSSC) Certified Production Technician certification***, providing value-added benefits to industry. The Engineering Technology Core coupled with a second-year degree specialization prepares students for high wage technician jobs in manufacturing, which are great foundational positions for their careers

We hope you will find this Best Practices Guide to be a useful tool as you think about industry credentials and alignment to national standards.

Sincerely,



Marilyn Barger, PhD, PE

Executive Director – Principal Investigator FLATE

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<sup>1</sup> [http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=5464](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5464)

# Industry-Recognized Credentials

## WHAT THEY ARE AND WHY THEY MATTER

A credential refers to a verification of a qualification or competence issued to an individual by a third party with the relevant authority or jurisdiction to issue such credentials. An industry-recognized credential can include any of the following: academic diplomas, certificates, and degrees; registered apprenticeship certificates; occupational licenses; certifications from industry or professional associations; other skill certificates for specific skill sets or competencies; and badges.

According to the Association for Career and Technical Education:

- The term “industry-recognized,” used with respect to a credential, means a credential that— A) is sought or accepted by employers within the industry or sector involved as a recognized, preferred, or required credential for recruitment, screening, hiring, retention, or advancement purposes; and B) where appropriate, is endorsed by a nationally recognized trade association or organization representing a significant part of the industry or sector.
- High-quality credentials are recognized by multiple employers across an industry.
- Credentials are valuable to employers, allowing them to determine the skill or education level.

## WHY USE INDUSTRY-RECOGNIZED CREDENTIALS IN ACADEMICS AT ALL LEVELS OF TECHNICAL EDUCATION

Industry-recognized credentials are informative and helpful for all levels of academics in technical education, starting in secondary schools, and continuing in post-secondary settings of community and technical colleges, and other colleges and universities. These credentials and national standards:

- Identify the fundamental skills employers in any discipline require for entry-level workers.
- Are vetted by rigorous processes (e.g., ANSI, ISO), and disseminated by national/international professional organizations.
- Provide a roadmap for educators and give them a current view of what industry says is important.
- Offer a solid framework and good starting point for educators to review, update, and build relevant programs and curriculum.
- Help schools and colleges deliver current technical education, and prepare graduates to respond to workforce needs.
- Help students in these programs prepare themselves for industry employment.

# Industry Credentials for Manufacturing Education

The forward-looking vision and mission of the National Association of Manufacturing (NAM) and the Manufacturing Institute's (MI) stackable credential system help frame the question of "why" align to industry credentials. MI offers an array of targeted research, skills certification for the workforce, identification of skills gaps in manufacturing, and the set of NAM-Endorsed Certifications. NAM shares this big picture view of today's global manufacturing environment. From their website:

*Manufacturers – and all Americans – need a vision that advance the principle of free enterprise, competitiveness, individual liberty and equal opportunity and thereby empowers manufacturing.*

**VISION:** The four goals laid out in NAM's Manufacturing Vision do just that.

- GOAL #1 -- **Attract Investment**
- GOAL #2 -- **Lead Innovation**
- GOAL #3 -- **Expand Global Market Access**
- GOAL #4 -- **Develop 21<sup>st</sup> Century Workforce**

NAM's vision and goals highlight why identifying and aligning industry credentials for Manufacturing Education are so critical to manufacturing education and the nation's advanced manufacturing competitiveness. NAM has vetted credentials for its industry – and endorses those on their list. See the NAM and MI websites listed respectfully for more information: [www.nam.org](http://www.nam.org), [www.themanufacturinginstitute.org](http://www.themanufacturinginstitute.org).

## ALIGNMENTS WITH NATIONAL STANDARDS

Aligning community college, high school, and post-secondary adult vocational (PSAV) curricula to national standards has numerous benefits to students, employers, and job seekers. This approach to curriculum development and curriculum gap analysis is at the core of FLATE's groundbreaking work in the Florida community college system.

Aligning curricula to national standards helps prepare the US technician workforce; builds STEM capacity for US competitiveness in the global market; and most importantly provides students with good jobs that pay living wages with the option to both work and upgrade/update their skills and credentials with numerous entry and exit points in a lifetime career pathway.

The importance of aligning curricula to national standards reflects the larger, recently federally acknowledged issue of ensuring that the nation's colleges and universities are cognizant of labor market needs and are working in tandem with employers to help students find immediate employment, minimize debt, and become lifelong learners.

In 2014, VP Joe Biden’s taskforce produced a paper entitled: *Ready to Work: Job Driven Training and American Opportunity*, which finds that:

To better match individuals with job opportunities and relevant job training, education and training institutions need to know what skills are in demand by employers and how job seekers can demonstrate those skills. Hiring based on well-defined competencies and credentials can help education and training programs offer better career guidance and develop job driven curricula for students and help students and job seekers make smarter choices.<sup>2</sup>

Likewise, the Bill and Melinda Gates Foundation and others have also recognized the importance of industry and academic credential alignment to support “Learn and Earn” strategies to increase enrollment and completion in post-secondary degree programs.<sup>3</sup> The Florida Plan for manufacturing education implements this approach using industry-validated stackable credentials.

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<sup>2</sup> [https://www.whitehouse.gov/sites/default/files/docs/skills\\_report.pdf](https://www.whitehouse.gov/sites/default/files/docs/skills_report.pdf)

<sup>3</sup> <http://www.themanufacturinginstitute.org/~media/EE75B4EF22F044E0B8D91641AC1A0035.ashx>

# A Model Industry-Education Partnership

## FLATE's Engineering Technology A.S. Degree:

FLATE, its industry and academic partners, together with the Florida Department of Education have designed a national model in the form of the statewide Engineering Technology A.S. (Associate of Science) Degree Program.

The Engineering Technology (ET) degree and certificate programs conceived, engineered, and coordinated by FLATE is the first of its kind to offer a cohesive, comprehensive, fully articulated inter-institutional program which focuses on a set of core courses covering introductory computer-aided drafting, electronics, instrumentation and testing, processes and materials, quality and safety. These core skills support the Florida workforce, and align with the national Manufacturing Skill Standards Council (MSSC) Certified Production Technician certification, providing value added benefits to industry. The Engineering Technology Core coupled with a second year degree specialization prepares students for jobs in manufacturing and high-technology industries.

Fifteen ET Degree granting colleges in Florida are charter members of the National Association of Manufacturer's Manufacturing Institute's "M-List." The M-List recognizes high schools, community colleges, technical schools, and universities that are teaching students using a manufacturing curriculum that is aligned to industry validated credentials.

They are:

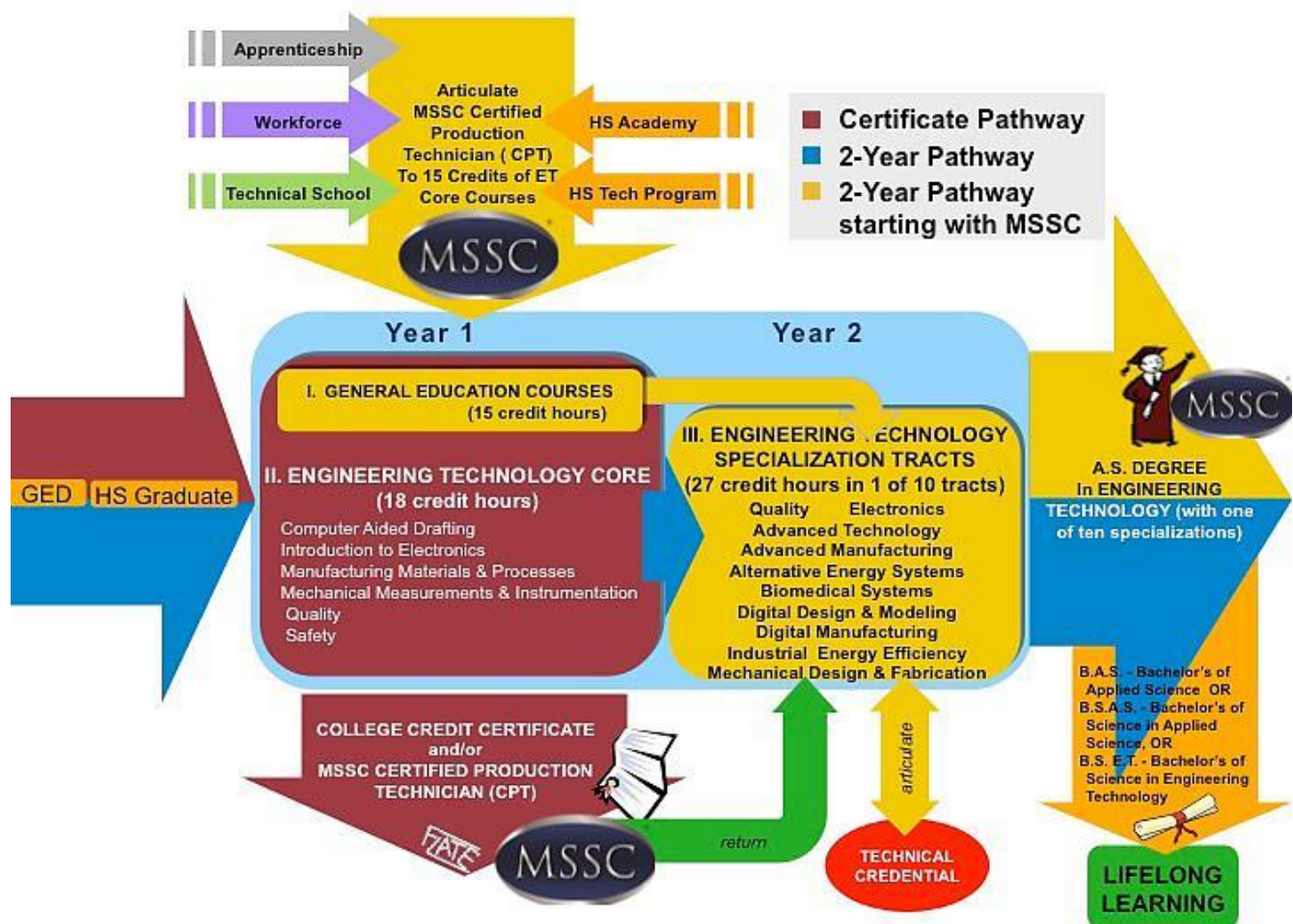
1. Broward College
2. College of Central Florida
3. Daytona State College
4. Eastern Florida State College
5. Florida Gateway College
6. Florida State College at Jacksonville
7. Hillsborough Community College
8. Indian River State College
9. Miami-Dade County College
10. Pasco-Hernando State College
11. Pensacola State College
12. Polk State College
13. St. Petersburg College
14. State College of Florida
15. Tallahassee Community College

The ET degree has three major components: (I) general education; (II) an ET technical core; and (III) specialization tracts that address regional industry needs. The ET Core aligns with the Manufacturing Skills Standards Council Certified Production Technician (MSSC-CPT)



national certification. The statewide articulation agreement provides 15 credit hours of the ET Core for anyone enrolling in the degree program and having a current CPT credential. Therefore, anyone in the country who holds a valid MSSC-CPT credential can graduate with the A.S. Engineering Technology degree after completing 45 instead of the required 60 credit hours. Building on this credential or the ET core courses, students take specific courses related to one of eight specialized technical tracks in their second year of study. College credit technical certificates aligned to each of the specialization tracks provide additional flexibility for students to earn while they learn.

*The AS/AAS Engineering Technology Degree represents a breath of fresh air for our College. With it and the direct help from FLATE we are able to respond to a local industry (Lockheed Martin, ProPoly Manufacturing) in an effective fashion. Frankly, our response to their needs would not have really met their needs if FLATE had not been there to help. — C. R. Dassance, President Central Florida Community College*



Under the leadership of Dr. Barger, FLATE has conducted comprehensive alignments for three program areas: machining technology, welding, and manufacturing. The Florida Department of Education Program Standards and Benchmarks for each program area were aligned with their corresponding National Standards from:

- National Institute of Metalworking Skills (NIMS), [www.nims.org](http://www.nims.org)
- America Welding Society (AWS), [www.aws.org](http://www.aws.org)
- Manufacturing Skills Standards Council (MSSC), [www.msscusa.org](http://www.msscusa.org)

Specific alignments were conducted for High School (Grades 9-12), Post Secondary Adult Vocational (PSAV) Program, PSAV Advanced Program, and College where applicable.

The following graphic exemplifies the close and constantly updated collaboration between FLATE, NIMS, and the FDOE to provide timely and relevant curriculum frameworks. All files can be accessed downloaded directly from this page.


<http://flate.pbworks.com/w/page/71061268/CNC%20Machining>

**This page houses links to the new 2015 Florida Machining Technology Curriculum Frameworks for High School and Post Secondary (PSAV) programs hosted on the FDOE website. It also hosts the alignment and crosswalk of the Curriculum Frameworks standards and benchmarks to the skills in NIMS Machining Level 1 & Level 2 credentials.**



[Link to FDOE Manufacturing cluster home page](#)

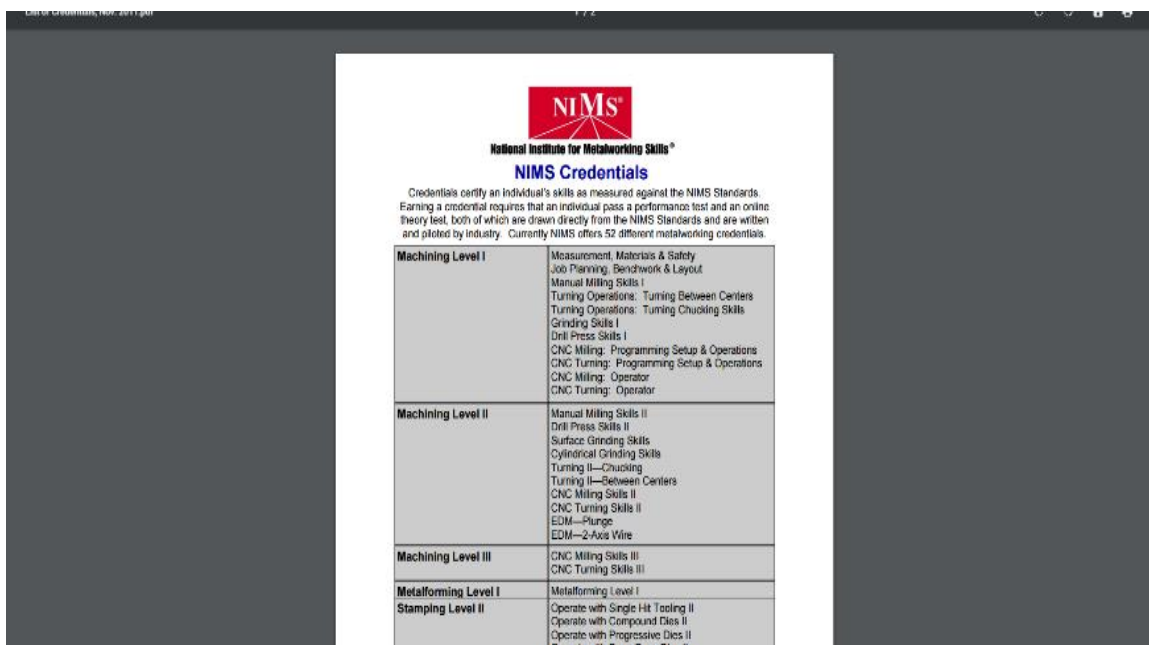
*\*\*NOTES to Educators and Users of the Alignments and Crosswalk Documents*

FLORIDA SECONDARY LEVEL ALIGNMENTS/CROSSWALKS	FLORIDA POST SECONDARY LEVEL ALIGNMENTS/CROSSWALKS
<a href="#">Link to current FLDOE Secondary Machining Technology Framework</a>	<a href="#">Link to current FLDOE Post Secondary Machining Technology Framework</a>
<a href="#">Secondary Machining Technology Framework alignment and crosswalk to NIMS credentials</a>	<a href="#">Post Secondary Machining Technology Framework alignment and crosswalk to NIMS credentials</a>
<a href="#">Secondary "High Level" Machining Tech-NIMS Alignment (alignment summary)</a>	<a href="#">Post Secondary "High Level" Machining Tech-NIMS Alignment (alignment summary)</a>
<b>FLORIDA A.S. LEVEL ALIGNMENTS/CROSSWALKS</b>	
<a href="#">Link to current FLDOE AS ET Degree Frameworks (w Mechanical Fabrication &amp; Design specialization)</a>	
<a href="#">ET Degree Mechanical Fabrication and Design Specialization alignment and crosswalk to NIMS credentials</a>	
Links to current FLDOE Frameworks for College Credit Certificates (CCCs) under Mechanical Fabrication and Design Specialization:	
<a href="#">CNC Machinist / Fabricator (CCC – 0648051002)</a>	
<a href="#">CNC Machinist Operator / Programmer (CCC – 0615000015)</a>	
<a href="#">Mechanical Designer and Programmer (CCC – 0615080503)</a>	
CCC-NIMS alignment files:	
<a href="#">CNC Machinist Operator CCC alignment and crosswalk to NIMS credentials</a>	
<a href="#">CNC Machinist-Fabricator CCC alignment and crosswalk to NIMS credentials</a>	
<a href="#">Mechanical Designer and Programmer CCC alignment and crosswalk to NIMS credentials</a>	
<a href="#">Florida AS ET Degree "High Level" Alignment (alignment summary)</a>	
<b>FLORIDA CAPE FUNDING LISTS and STATEWIDE ARTICULATIONS</b>	
 <a href="#">FLDOE Website for CAPE Certification Lists (Secondary and post-secondary) and statewide articulations</a>	

# The “How To” of Aligning Programs to National Standards

## STEP ONE:

- Begin by identifying the national body, such as professional society in the discipline or program area of interest, and locate their set of national standards (e.g., links to online resources, publications, etc).

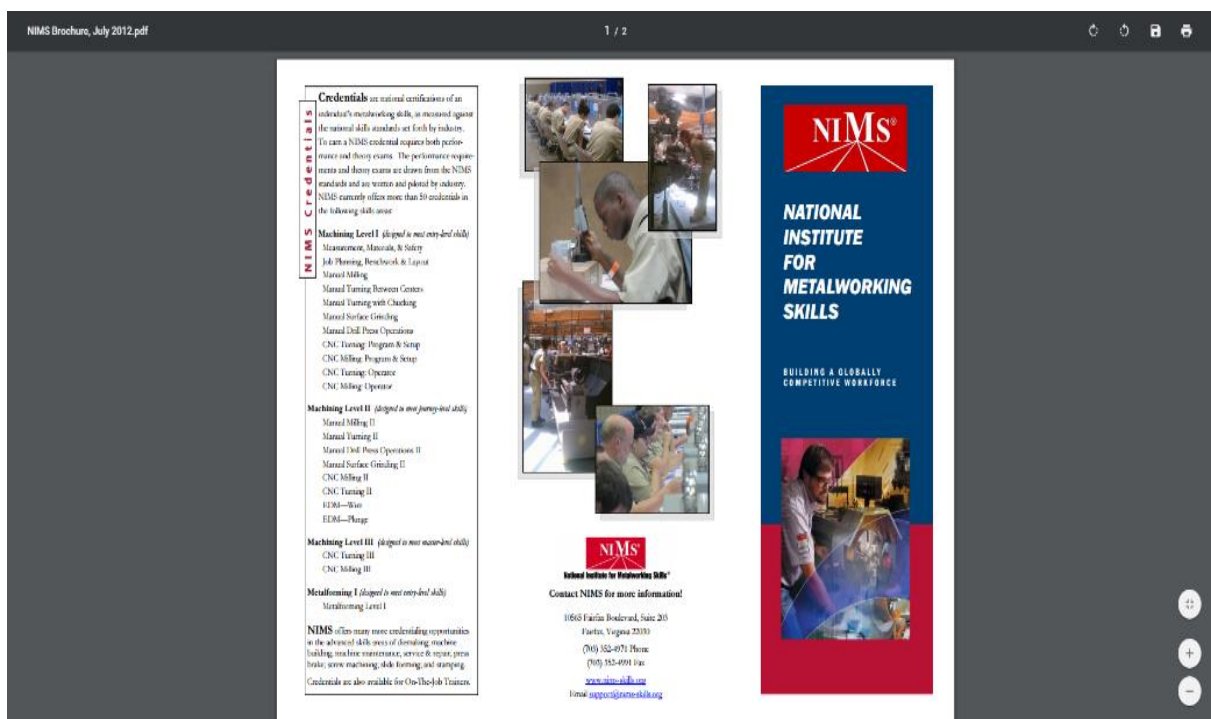


**NIMS<sup>®</sup>**  
National Institute for Metalworking Skills<sup>®</sup>

**NIMS Credentials**

Credentials certify an individual's skills as measured against the NIMS Standards. Earning a credential requires that an individual pass a performance test and an online theory test, both of which are drawn directly from the NIMS Standards and are written and piloted by industry. Currently NIMS offers 52 different metalworking credentials.

<b>Machining Level I</b>	Measurement, Materials & Safety Job Planning, Benchwork & Layout Manual Milling Skills I Turning Operations: Turning Between Centers Turning Operations: Turning Chucking Skills Grinding Skills I Drill Press Skills I CNC Milling: Programming Setup & Operations CNC Turning: Programming Setup & Operations CNC Milling: Operator CNC Turning: Operator
<b>Machining Level II</b>	Manual Milling Skills II Drill Press Skills II Surface Grinding Skills Cylindrical Grinding Skills Turning II—Chucking Turning II—Between Centers CNC Milling Skills II CNC Turning Skills II EDM—Plunge EDM—2-Axis Wire
<b>Machining Level III</b>	CNC Milling Skills III CNC Turning Skills III
<b>Metallforming Level I</b>	Metallforming Level I
<b>Stamping Level II</b>	Operate with Single Hit Tooling II Operate with Compound Dies II Operate with Progressive Dies II Operate with Press Brake Press II



**NIMS<sup>®</sup>**  
National Institute for Metalworking Skills<sup>®</sup>

**NATIONAL INSTITUTE FOR METALWORKING SKILLS**

**BUILDING A GLOBALLY COMPETITIVE WORKFORCE**

**CREDENTIALS**

Credentials are national certifications of an individual's metalworking skills, as measured against the national skills standards set forth by industry. To earn a NIMS credential requires both performance and theory exams. The performance requirements and theory exams are drawn from the NIMS standards and are written and piloted by industry. NIMS currently offers more than 50 credentials in the following skill areas:

**Machining Level I (designed to meet entry-level skills)**

- Measurement, Materials & Safety
- Job Planning, Benchwork & Layout
- Manual Milling
- Manual Turning Between Centers
- Manual Turning with Chucking
- Manual Surface Grinding
- Manual Drill Press Operations
- CNC Turning: Program & Setup
- CNC Milling: Program & Setup
- CNC Turning: Operator
- CNC Milling: Operator

**Machining Level II (designed to meet journey-level skills)**

- Manual Milling II
- Manual Turning II
- Manual Drill Press Operations II
- Manual Surface Grinding II
- CNC Milling II
- CNC Turning II
- EDM—Plunge
- EDM—2-Axis Wire

**Machining Level III (designed to meet master-level skills)**

- CNC Turning III
- CNC Milling III

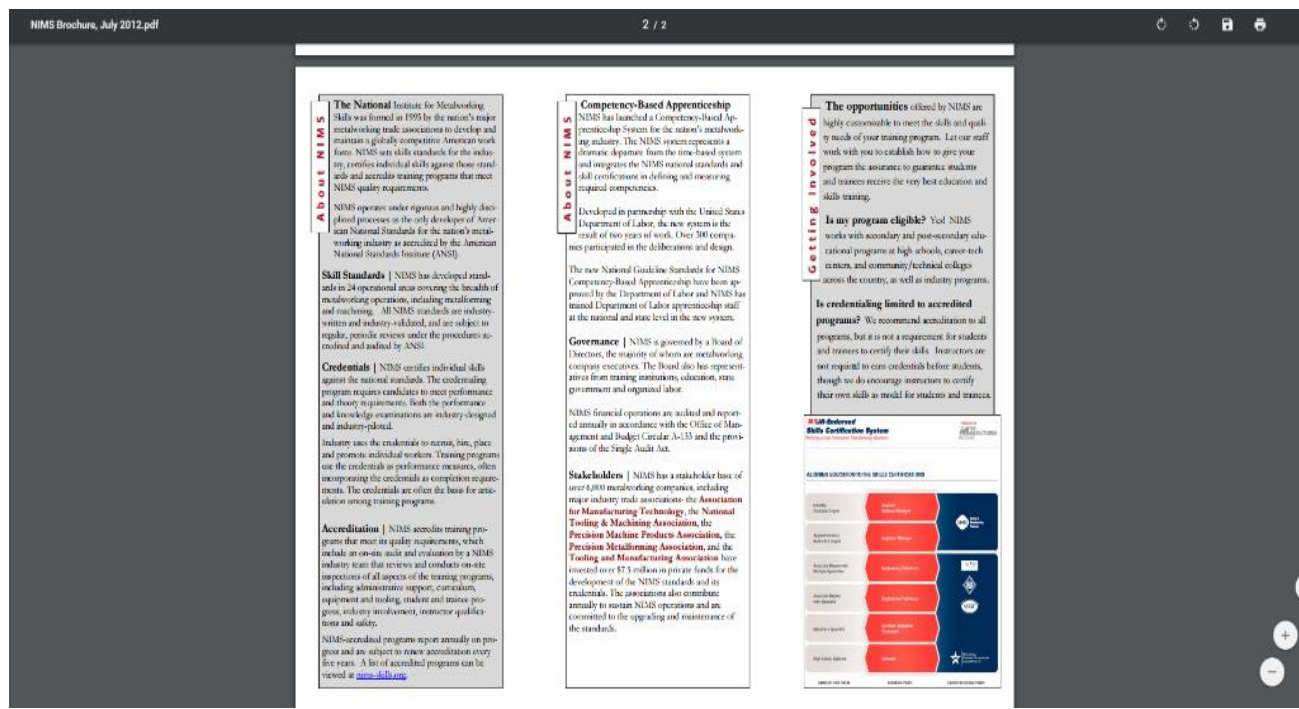
**Metallforming Level I (designed to meet entry-level skills)**

- Metallforming Level I

NIMS offers many more credentialing opportunities in the advanced skills areas of forming machine building, machine maintenance, service & repair, press brake, sheet metalworking, die casting, and stamping. Credentials are also available for One-Check Training.

**Contact NIMS for more information!**

11650 Fairfax Boulevard, Suite 205  
Fairfax, Virginia 22030  
(703) 552-0711 Phone  
(703) 552-4991 Fax  
[www.nims-skills.org](http://www.nims-skills.org)  
Email: [apcc@nimskills.org](mailto:apcc@nimskills.org)



- FLATE currently has conducted alignments for: the A.S. Engineering Technology Technical Core and High School Automation and Production Technology program, Machining Technology and Welding Technology. All are using the latest national standards published by the appropriate professional organization in this case, the American Welding Society (AWS); the Manufacturing Skills Standards Council (MSSC); and the National Institute for Metalworking Skills (NIMS).

## STEP TWO:

- Crosswalk/align the FLDOE CTE Standards and Benchmarks for Specific Program (e.g., Machining Technology) and Level with the corresponding national standards. *This is the heart of the alignment.*
- Crosswalking standard to standard provides a detailed alignment across the program levels and their accompanying standards and benchmarks. FLATE conducted this mapping and aligning using two program areas and the two national organizations of American Welding Society (AWS) and National Institute for Metalworking Skills (NIMS).
- Using the FL CTE program-specific standards and benchmarks as a baseline and worksheet/table of side-by-side cells, the language of the program content is analyzed and aligned with the national standards content for same or similar, then inserted in the cell next to the CTE standard or benchmark.
- The sum of this information may help guide educators and learners, and give them increased confidence in their teaching and learning.
- Once standards are reviewed and aligned with national standards, programs can adopt the standards (and fill any gaps or shortfalls), and offer industry-relevant education for the 21<sup>st</sup> century.



*Bottom line: Graduates of these programs, by definition, are better prepared for employment as measured by external standards bodies and professional associations.*

### **STEP THREE:**

- Once the detailed alignments have been completed, the next task is to “roll up” the standards.
- FLATE approaches this by taking the CTE Standards and Benchmarks, and extracting only the Standards and their corresponding national standard. See sample below.
- This step zooms in on the connections between the specific program standards (without accompanying benchmarks for each standard) more globally.
- The higher level standards (what the student should know and be able to do) of FL DOE CTE program, viewed next to the corresponding national standards, help reinforce the relevancy and integrity of the program under study.
- This step zooms in on the connections between the specific program standards (without accompanying benchmarks for each standard) more globally. The higher level standards (what the student should know and be able to do) of FLDOE CTE program, viewed next to the corresponding national standards, help reinforce the relevancy and integrity of the program under study.

### **STEP FOUR:**

- An optional step is to roll up again. FLATE’s set of alignments include this step.
- This allows CTE standards to be aligned to the preparation of national credentials, certifications, and certificates (based on national standards).
- This additional step provides educators with a view of the pathway from student to graduate to employee.

### **Step Five:**

- Depending on the source document for national standards, there may or may not be an additional set of skills (e.g., Knowledge, Skills, Abilities, and Other Characteristics, or KSAOs) to align with—beyond the set of technical skills.
- For these types of alignments, the same process is used to align the FLDOE CTE standards and benchmarks with the corresponding KSAOs.
- Color coding—to distinguish between technical standards and KSAOs—was employed to help guide the reader through the details of the alignment.

## EXAMPLE OF COLOR CODED ALIGNMENT:

**Florida Department of Education  
College Standards for Engineering Technology Core  
Aligned with NIMS Duties and Standards for Machining Skills-Level I**

The NIMS Duties and Standards for the ET Core are from Machining Skills-Level I (see pages1-3).  
Acronyms refer to terms and numbered items from NIMS Framework for Machining Skills-Level I and Level II.

Level I DA = Duty Area

Level I DT = Duty Title

Example:

1. Job Planning and Management (DA)
  - 1.1 Job Process Planning (DT)

Level I KSAO = Knowledge, Skills, Abilities, and Other Characteristics

Standards and Benchmarks	NIMS Duties and Standards for Machining Skills-Level I
01.0 Demonstrate knowledge of industrial processes and materials properties--The student will be able to:	<i>DA 1: Job Planning and Management</i> <i>DA 2: Job Execution</i> <i>DA 3: Quality Control and Inspection</i> <i>DA 4: Process Adjustment and Control</i> <i>DA 5: General Maintenance</i> <i>DA 6: Industrial Safety and Environmental Protection</i> <i>KSAO 1: Written and Oral Communication</i> <i>KSAO 3: Decision Making and Problem Solving</i> <i>KSAO 6: Measurement</i> <i>KSAO 7: Metalworking Theory</i>
01.01 Demonstrate knowledge of current manufacturing processes.	DT 1.1: Job Process Planning DT 6.1: Machine Operations and Material Handling KSAO 7.1: Cutting Theory KSAO 7.2: Tooling KSAO 7.3: Material Properties KSAO 1.3: Speaking KSAO 7.4: Machine Tools
01.02 Demonstrate knowledge of the use of current manufacturing machines, operating systems and mechanisms.	DT 1.1: Job Process Planning DT 6.1: Machine Operations and Material Handling KSAO 1.3: Speaking KSAO 7.1: Cutting Theory KSAO 7.2: Tooling KSAO 7.3: Material Properties KSAO 7.4: Machine Tools

# References

[http://flate.pbworks.com/w/file/fetch/52854478/earning\\_credentials\\_FINAL.pdf](http://flate.pbworks.com/w/file/fetch/52854478/earning_credentials_FINAL.pdf)

[www.nsf.gov](http://www.nsf.gov)

<http://postsecondary.gatesfoundation.org/wp-content/uploads/2016/02/AnsweringtheCall.pdf>

[https://www.whitehouse.gov/sites/default/files/docs/skills\\_report.pdf](https://www.whitehouse.gov/sites/default/files/docs/skills_report.pdf)

[www.msscusa.org](http://www.msscusa.org)

[www.fl-ate.org](http://www.fl-ate.org)

[www.nims.org](http://www.nims.org)

[www.aws.rg](http://www.aws.rg)

[www.fldoe.org](http://www.fldoe.org)

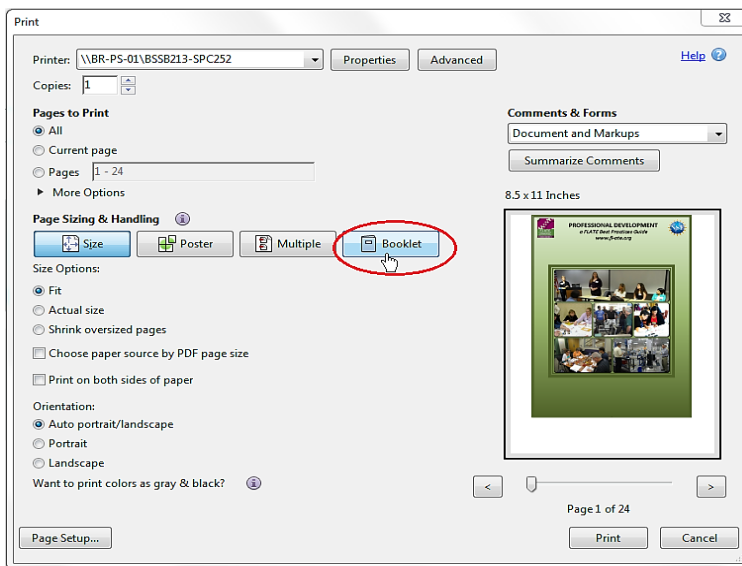
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**Step 1** – select **Booklet** under Page Sizing and Handling (*please make sure you are using a printer that prints double sided documents*).

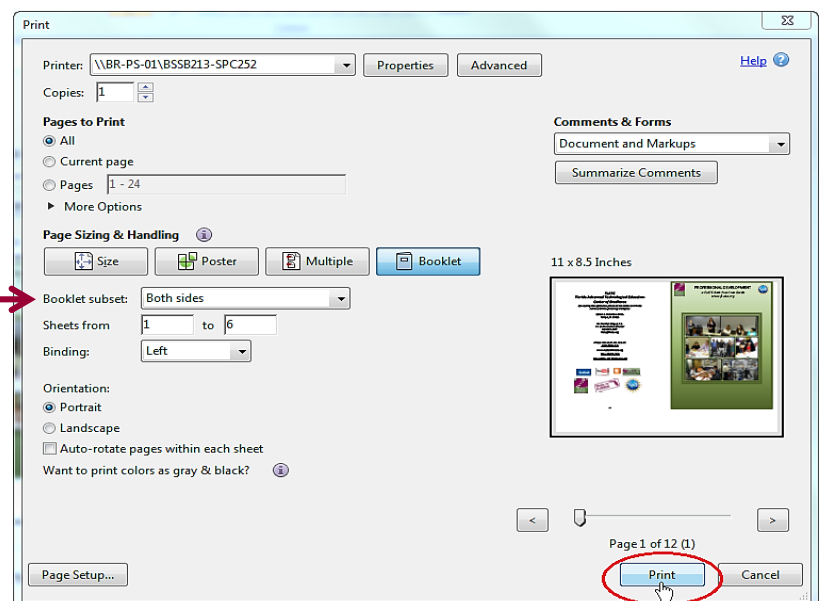
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**Step 3** – select **Print**



Select Booklet

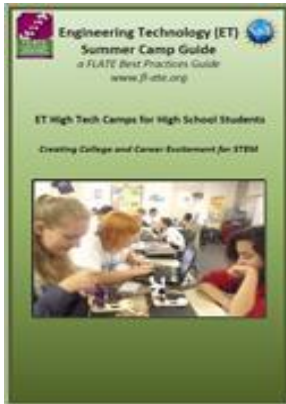
Before selecting Print, make sure that the Booklet subset is for Both Sides.



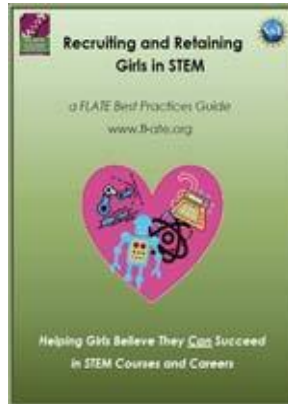


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All FLATE Best Practice Guides are available as online resources or for download at [fl-ate.org/best-practices](http://fl-ate.org/best-practices)



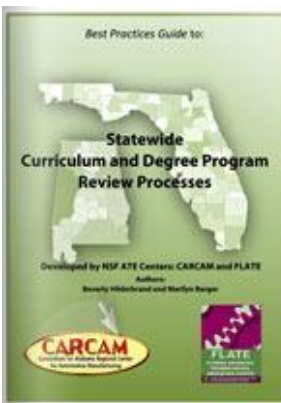
*ET High-Tech Camps for High School Students*



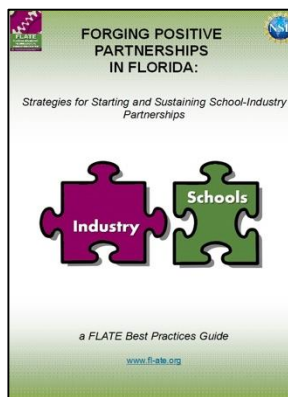
*Recruiting & Retaining Girls in STEM*



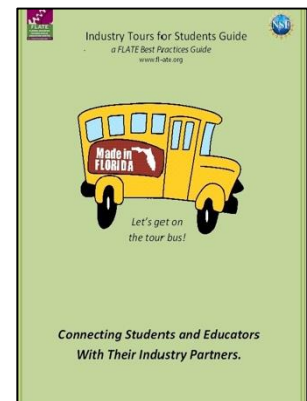
*Professional Development*



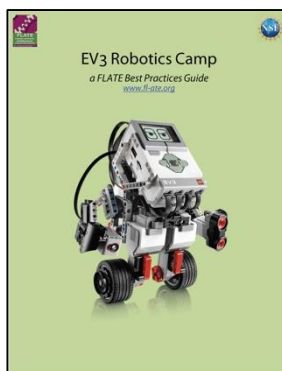
*Curriculum Review Processes*



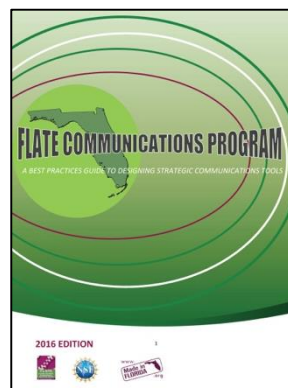
*Forging Positive Partnerships in Florida*



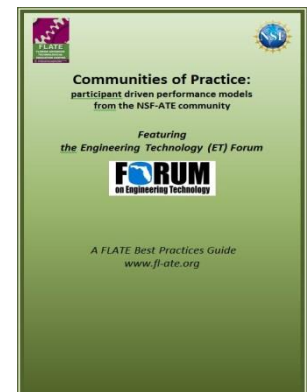
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*Robotics Camp Best Practice Guide*



*FLATE Communication Programs*



*Communities of Best Practice Guide*

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[www.madeinflorida.org](http://www.madeinflorida.org)

[www.flate.pbwiki.com](http://www.flate.pbwiki.com)

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