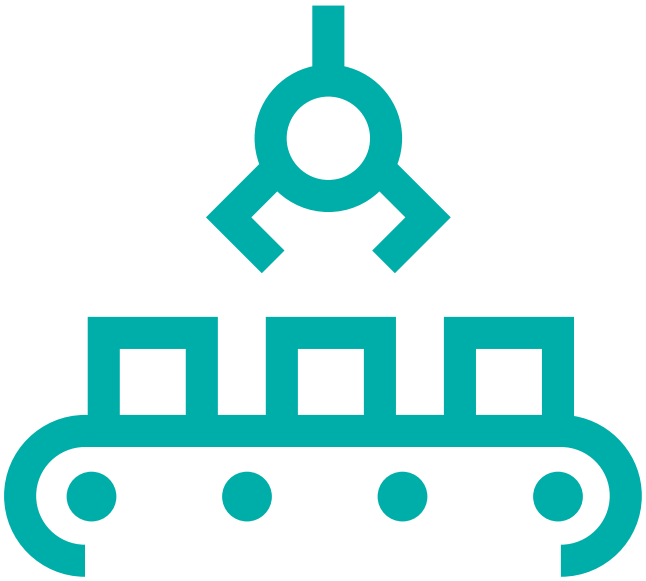
NOCTI

Job Ready Credential Blueprint
co-branded with

America Makes



Additive Manufacturing Essentials (NOCTI-America Makes)

Code: 2567 / Version: 01

Copyright © 2022. All Rights Reserved.

General Assessment Information

Blueprint Contents

General Assessment Information
Written Assessment Information
Specific Competencies Covered in the Test
Sample Written Items

Test Type: The Additive Manufacturing Essentials (NOCTI-America Makes) industry-based credential is a co-branded credential developed by NOCTI and America Makes. It is included in NOCTI's Job Ready assessment battery. These assessments measure technical skills at the occupational level and include items which gauge factual and theoretical knowledge. Job Ready assessments can be used at the secondary and post-secondary levels and are can be delivered in an online or paper/pencil format.

Revision Team: The assessment content is based on input from secondary, post-secondary, and business/industry representatives from the states of Ohio, Pennsylvania, and Texas.

CIP Code

48.0503 - Machine Shop Technology

Learning that works for America CTE™

Career Cluster
Manufacturing

o*net™ in*it

17-2112.03 - Manufacturing Engineers

Association for Career and Technical Education ACTE®

The Association for Career and Technical Education (ACTE), the leading professional organization for career and technical educators, commends all students who participate in career and technical education programs and choose to validate their educational attainment through rigorous technical assessments. In taking this assessment you demonstrate to your school, your parents and guardians, your future employers and yourself that you understand the concepts and knowledge needed to succeed in the workplace. Good Luck!

America Makes

America Makes is the nation's leading public-private partnership for additive manufacturing technology and education. America Makes members from industry, academia, government, workforce and economic development organizations, work together to accelerate the adoption of AM and the nation's global manufacturing competitiveness. Founded in 2012 as the Department of Defense's national manufacturing innovation institute for additive manufacturing and first of the Manufacturing USA network, America Makes is based in Youngstown, Ohio and is managed by the not-for-profit National Center for Defense Manufacturing and Machining (NCDMM).

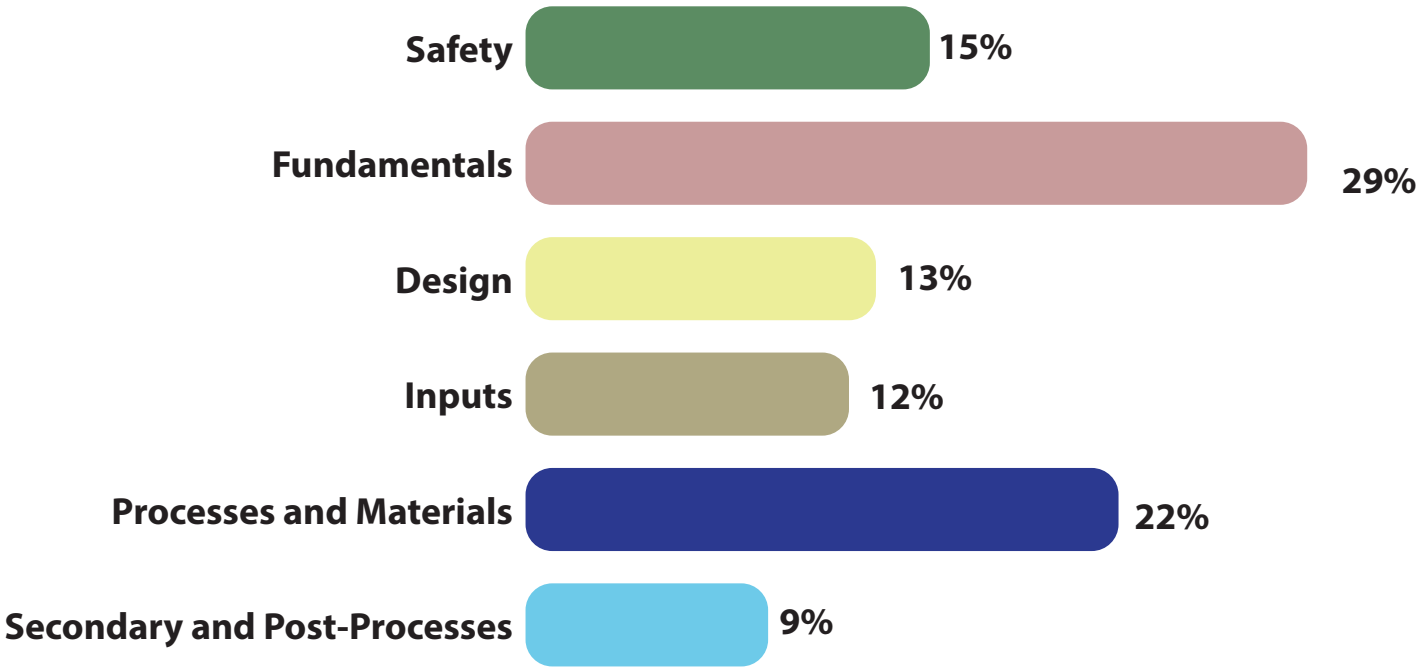
Individuals meeting the established benchmark will earn a joint certification from NOCTI and America Makes.

Written Assessment

NOCTI written assessments consist of questions to measure an individual's factual theoretical knowledge.

Administration Time: 2 hours
Number of Questions: 115
Number of Sessions: This assessment may be administered in one, two, or three sessions.

Areas Covered



Specific Standards and Competencies Included in this Assessment

Safety

- Demonstrate understanding of hazards associated with Additive Manufacturing processing
- Explain Personal Protective Equipment (PPE) required with Additive Manufacturing
- Demonstrate knowledge of hazard communication and labeling in Additive Manufacturing
- Discuss maintenance and lockout/tagout procedures

Fundamentals

- Explain applications of Additive Manufacturing and identify industries using AM parts
- Explain Additive Manufacturing processes using ASTM standards
- Demonstrate knowledge of key Additive Manufacturing terminology using ASTM standards
- Compare advantages and disadvantages of Additive Manufacturing and traditional manufacturing
- Demonstrate knowledge of foundations of quality

Design

- Discuss Additive Manufacturing design strengths and weaknesses
- Demonstrate understanding of Additive Manufacturing design considerations
- Demonstrate knowledge of design strategy and reverse engineering

(Continued on the following page)

Specific Standards and Competencies (continued)

Inputs

- Identify digital input sources and characteristics
- Explain creation of build files
- Identify hardware input sources

Processes and Materials

- Describe the Additive Manufacturing processes using ASTM definitions
- Describe the seven technologies of Additive Manufacturing (Binder Jetting, Directed Energy
- Deposit, Material Extrusion, Material Jetting, Powder Bed Fusion, Sheet Lamination, Vat Polymerization)
- Identify the advantages of materials with the various technologies
- Describe material properties considerations

Secondary and Post-Processes

- Explain secondary processing in Additive Manufacturing
- Discuss critical material considerations in post-processing for polymers
- Define Additive Manufacturing post-processes

Sample Questions

The vapor emitted during an Additive Manufacturing Material Extrusion (MEX) process is better known as

A. volatile organic compound
B. ultrafine particles
C. nanoparticles
D. spatter emissions

The process in which a liquid bonding agent is deposited to join powder materials is called

A. casting
B. electron beam melting
C. binder jetting
D. stereolithography

When reverse engineering, which features are generally hard to scan?

A. large holes
B. protruding features
C. external skins
D. internal features

Which of the following Additive Manufacturing methods can repair or add features to pre-existing objects?

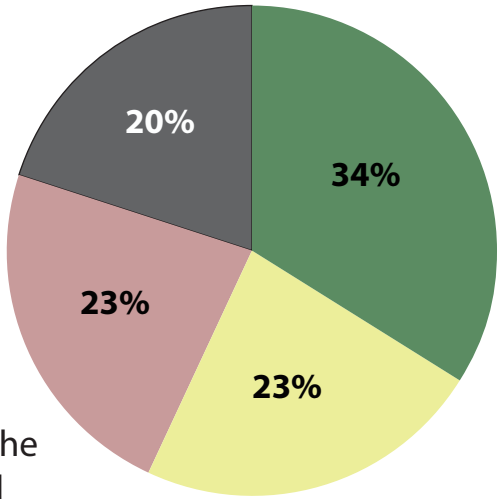
A. Ultrasonic Additive Manufacturing
B. Directed Energy Deposition
C. Selective Laser Melting
D. Material Extrusion

Breaking off the material used for printing that is not part of the final component is called

A. support removal
B. residual stress removal
C. surface finishing
D. Hot Isostatic Pressing (HIP)

Performance Assessment

NOCTI performance assessments allow individuals to demonstrate their acquired skills by completing actual jobs using the tools, materials, machines, and equipment related to the technical area.



Administration Time: 2 hours and 5 minutes
Number of Jobs: 4

Areas Covered:

34% Slicer Software Set-Up
Participant will use a provided file for a 3D object and will create the slicer file for the 3D printer. The preview file for the layer-by-layer build will be viewed. The participant will add support structure and adhesion as directed. The object will not be printed. The G-Code file will be saved to the media storage device and used for the 3D Printer Hardware Set-Up job.

23% Printer Hardware Set-Up
Participant will load the prepared G-Code file to the 3D printer and demonstrate the steps to preparing to print, including preparing the build plate, nozzle, and loading filament. The object will not be printed. Finished object removal is simulated, and the participant will describe post-printing preventive maintenance activities for the 3D printer.

23% Create a 3D Solid Model Drawing
Using CAD software, the participant will draw a solid model with rounded corners, holes, a slot, and a pocket, and calculate the volume of the part. The drawing will be printed and saved to media storage device.

20% Troubleshoot 3D Printing Projects
Participant will view photos of failed 3D printed projects and record a description of the object, identify what went wrong, and suggest a way to correct the failure, completing the chart legibly.

Sample Job

Create a 3D Solid Model Drawing

Maximum Time: 45 minutes

Participant Activity: Using CAD software, the participant will create a 3D solid model drawing of the part shown in the picture with rounded corners, holes, a slot, and a pocket, and calculate the volume of the part. The drawing will be printed and saved to a USB or equivalent storage media, with the file name provided.