

# Technology of Robotic Design (2024)

## Demonstrating Personal Qualities and Abilities

- 1 Demonstrate creativity and innovation. 1
- 2 Demonstrate critical thinking and problem solving. 2
- 3 Demonstrate initiative and self-direction. 3
- 4 Demonstrate integrity. 4
- 5 Demonstrate work ethic. 5

## Demonstrating Interpersonal Skills

- 6 Demonstrate conflict-resolution skills. 6
- 7 Demonstrate listening and speaking skills. 7
- 8 Demonstrate respect for diversity. 8
- 9 Demonstrate customer service skills. 9
- 10 Collaborate with team members. 10

## Demonstrating Professional Competencies

- 11 Demonstrate big-picture thinking. 11
- 12 Demonstrate career- and life-management skills. 12
- 13 Demonstrate continuous learning and adaptability. 13
- 14 Manage time and resources. 14
- 15 Demonstrate information-literacy skills. 15
- 16 Demonstrate an understanding of information security. 16
- 17 Maintain working knowledge of current information-technology (IT) systems. 17
- 18 Demonstrate proficiency with technologies, tools, and machines common to a specific occupation. 18
- 19 Apply mathematical skills to job-specific tasks. 19

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**20 Demonstrate professionalism. 20**

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**21 Demonstrate reading and writing skills. 21**

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**22 Demonstrate workplace safety. 22**

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**Examining All Aspects of  
an Industry**

**23 Examine aspects of planning within an industry/organization. 23**

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**24 Examine aspects of management within an industry/organization. 24**

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**25 Examine aspects of financial responsibility within an industry/organization. 25**

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**26 Examine technical and production skills required of workers within an  
industry/organization. 26**

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**27 Examine principles of technology that underlie an industry/organization. 27**

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**28 Examine labor issues related to an industry/organization. 28**

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**29 Examine community issues related to an industry/organization. 29**

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**30 Examine health, safety, and environmental issues related to an  
industry/organization. 30**

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**Addressing Elements of  
Student Life**

**31 Identify the purposes and goals of the student organization. 31**

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**32 Explain the benefits and responsibilities of membership in the student  
organization as a student and in professional/civic organizations as an adult. 32**

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**33 Demonstrate leadership skills through participation in student organization  
activities, such as meetings, programs, and projects. 33**

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**34 Identify Internet safety issues and procedures for complying with acceptable use  
standards. 34**

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**Exploring Work-Based  
Learning**

**35 Identify the types of work-based learning (WBL) opportunities. 35**

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**36 Reflect on lessons learned during the WBL experience. 36**

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**37 Explore career opportunities related to the WBL experience. 37**

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**38 Participate in a WBL experience, when appropriate. 38**

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**Exploring Control  
Systems and Robotic  
Systems**

**39 Define robotics, automation, and control systems. 39**

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**40 Investigate careers in robotics. 40**

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**41 Research the development and future of robotics. 41**

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- 42 Explain the universal systems model.** 42

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  - 43 Identify open and closed loops in control systems.** 43

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  - 44 Demonstrate precision measurement equipment and techniques.** 44

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  - 45 Describe components or processes that typically require precision measurement.** 45

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  - 46 Apply direct and indirect measurement systems and coordinate systems.** 46

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  - 47 Simulate control and automation systems.** 47
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### Exploring Electrical Concepts

- 48 Describe the difference between alternating current (AC) and direct current (DC).** 48

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  - 49 Describe the concepts of voltage, current, and resistance in electricity.** 49

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  - 50 Identify safety precautions and information for electricity (AC and DC).** 50

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  - 51 Explain the primary functions of electronic systems components.** 51

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  - 52 Identify sensors.** 52

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  - 53 Simulate electronic circuits.** 53

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  - 54 Demonstrate soldering technique.** 54

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  - 55 Create circuits.** 55

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  - 56 Measure circuit values with a multimeter.** 56

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  - 57 Design a circuit for a given purpose.** 57
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### Exploring Mechanical and Fluid Concepts

- 58 Identify the primary concepts and components of mechanical systems.** 58

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  - 59 Explain primary concepts and components of a fluid power system.** 59

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  - 60 Design a mechanical system.** 60

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  - 61 Demonstrate a mechanical system.** 61
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### Exploring the Components of Robotic Systems

- 62 Identify components of robotic systems.** 62

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  - 63 Demonstrate how sensors are used to control robotic technology.** 63

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  - 64 Research robotic hardware used in various industries.** 64

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  - 65 Compare open and proprietary hardware components.** 65
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## Explaining Control Systems

**66** Compare analog electronics and digital electronics for control systems. 66

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**67** Describe the operation of basic logic circuits. 67

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**68** Identify the primary types of data transmission hardware. 68

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## Exploring Microprocessor/Microcontroller System Basics

**69** Describe the function of an operating system. 69

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**70** Describe the essential components of a computing system. 70

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**71** Describe software applications within robotic systems. 71

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**72** Describe how computers are used to control automated systems. 72

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**73** Describe robotic systems interfaces. 73

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**74** Describe the purpose of a microcontroller/logic controller. 74

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## Programming Control Systems

**75** Design code for a given purpose. 75

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**76** Implement basic programming procedures. 76

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**77** Select the most appropriate programming language or platform for an application. 77

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**78** Describe the fundamentals of CNC. 78

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**79** Program a robotic system. 79

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**80** Ensure the security of programs. 80

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## Creating a Robotic System

**81** Design a robot. 81

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**82** Use additive manufacturing. 82

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**83** Build a robot. 83

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**84** Reengineer the design of an existing robotic system. 84