

Windows PowerShell Scripting and Toolmaking

Duration: 5 Days **Course Code: M55039**

Overview:

Learn to create reusable PowerShell scripts, functions, and tools that automate Windows administration tasks and improve IT operational efficiency.

Updated August 2026

Target Audience:

This course is intended for administrators in a Microsoft-centric environment who want to build reusable units of automation, automate business processes, and enable less-technical colleagues to accomplish administrative tasks.

Objectives:

- **After completing this course, students will be able to:**
- Create and execute PowerShell scripts to automate administrative tasks.
- Develop reusable PowerShell functions, modules, and custom tools.
- Work with variables, arrays, loops, and conditional logic in PowerShell scripts.
- Manage files, services, processes, and system resources using PowerShell.
- Query and manipulate data from Windows systems and administrative tools.
- Implement error handling, debugging, and script troubleshooting techniques.
- Build automation solutions for Windows administration and enterprise operations.
- Apply PowerShell best practices for script design, maintenance, and reuse.

Prerequisites:

The course assumes a basic working knowledge of PowerShell as an interactive command-line shell, and teaches students the correct patterns and practices for building reusable, tightly scoped units of automation.

Before attending this course, students must have:

- Basic understanding of Windows administration and management tasks.
- Familiarity with Windows networking, file systems, and administrative tools.
- Experience using the Windows command line or PowerShell console is beneficial.
- Basic scripting or automation knowledge is helpful but not required.
- Fundamental knowledge of Microsoft server or desktop environments is recommended.

Testing and Certification

None

Follow-on-Courses:

- M55318 – Advanced Automated Administration with Windows PowerShell: Build on your scripting skills with advanced PowerShell automation, administration, and tool development techniques.
 - M-AZ040 - Automate Administration with PowerShell (AZ-040)
 - M-AZ800 - Administer Windows Server Hybrid Core Infrastructure (AZ-800)
 - M-AZ801 - Configure Windows Server Hybrid Advanced Services (AZ-801)
 - M-MD102 - Microsoft 365 Endpoint Administrator (MD-102)
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Content:

Module 1: Tool Design

This module explains how to design tools and units of automation that comply with native PowerShell usage patterns.Lessons

- Tools do one thing
- Tools are flexible
- Tools look nativeLab : Designing a Tool
- Design a tool

After completing this module, students will be able to:

- Describe the native shell patterns that a good tool design should exhibit
- Describe the benefits of discovery and experimentation in the console
- Discover and experiment with existing commands in the console
- Build a basic function
- Create a script module
- Run a command from a script module
- Describe the purpose of CmdletBinding and list common parameters
- Parameterize a script's input
- Define parameters as mandatory
- Define parameters as accepting pipeline input
- Describe the purpose of object-based output
- Create and output custom objects from a function
- Describe the native patterns that a good tool design should exhibit
- Redesign a script to meet business requirements and conform to native patterns
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- Describe how to define multiple parameter sets
- Describe other parameter definition options
- Describe the advantages of external help
- Create external help using PlatyPS and Markdown
- Describe the purpose of unit testing
- Describe the purpose of the ETS
- Extend an existing object type

This module explains how to add comment-based help to tools.Lessons

- Where to put your help
- Getting started
- Going further with comment-based help
- Broken helpLab : Designing a Tool
- Comment-based help

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- Publish a tool to a repository
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- Describe the use of XML within PowerShell
- Use XML data within a PowerShell function
- Describe the use of JSON data within PowerShell
- Use JSON data within a PowerShell function
- Describe the use of SQL Server from within PowerShell
- Write and run SQL Server queries
- Design tools that use SQL Server for data storage
- Create PowerShell tools, using native design patterns, from business requirements.

Module 2: Start with a Command

This module explains how to start the scripting process by beginning in the interactive shell console. Lessons

- Why start with a command?
- Discovery and experimentation Lab : Designing a Tool
- Start with a command

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Module 9: Handling Errors

This module explains how to create tools that deal with anticipated errors. Lessons

- Understanding errors and exceptions
- Bad handling
- Two reasons for exception handling
- Handling exceptions in our tool
- Capturing the actual exception
- Handling exceptions for non-commands
- Going further with exception handling
- Deprecated exception handling Lab : Designing a Tool
- Handling errors

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Module 16: Publishing Your Tools

This module explains how to publish tools to public and private repositories. Lessons

- Begin with a manifest
- Publishing to PowerShell Gallery
- Publishing to private repositories Lab : Designing a Tool
- Publishing your tools

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Module 3: Build a Basic Function and Module

This module explains how to build a basic function and module, using commands already experimented with in the shell. Lessons

- Start with a basic function
- Create a script module
- Check prerequisites
- Run the new commandLab : Designing a Tool
- Build a basic function and module

After completing this module, students will be able to:

- Describe the native shell patterns that a good tool design should exhibit
- Describe the benefits of discovery and experimentation in the console

- Create and output custom objects from a function
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Run a command and observe error handling behaviors

- Describe the native patterns for handling errors in a command
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Module 17: Basic Controllers: Automation Scripts and Menus

This module explains how to create controller scripts that put tools to use. Lessons

- Building a menu
- Using UIChoice
- Writing a process controllerLab : Designing a Tool
- Basic controllers

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- Describe the use of SQL Server from within PowerShell
- Write and run SQL Server queries
- Design tools that use SQL Server for data storage
- Create PowerShell tools, using native design

Module 10: Basic Debugging

This module explains how to use native PowerShell script debugging tools.Lessons

- Two kinds of bugs
- The ultimate goal of debugging
- Developing assumptions
- Write-Debug
- Set-PSBreakpoint
- The PowerShell ISELab : Designing a Tool
- Basic debugging

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- Describe the use of SQL Server from within PowerShell

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Module 4: Adding CmdletBinding and Parameterizing	
This module explains how to extend the functionality of a tool, parameterize input values, and use CmdletBinding.Lessons	
- About CmdletBinding and common parameters - Accepting pipeline input - Mandatory-ness - Parameter validation - Parameter aliasesLab : Designing a Tool - Adding CmdletBinding and Parameterizing	
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Module 11: Going Deeper with Parameters	
This module explains how to further define parameter attributes in a PowerShell command.Lessons	
- Parameter positions - Validation - Multiple parameter sets - Value from remaining arguments - Help messages - Aliases - More CmdletBinding	
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- Write and run SQL Server queries - Design tools that use SQL Server for data storage - Create PowerShell tools, using native design patterns, from business requirements.	
Module 18: Proxy Functions	
This module explains how to create and use proxy functions.Lessons	
- A proxy example - Creating the proxy base - Modifying the proxy - Adding or removing parametersLab : Designing a Tool - Proxy functions	
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Define parameter validation Module 5: Emitting Objects as Output This module explains how to create tools that produce custom objects as output.Lessons - Assembling information - Constructing and emitting output - Quick testsLab : Designing a Tool - Emitting objects as output After completing this module, students will be able to: - Describe the native shell patterns that a good tool design should exhibit - Describe the benefits of discovery and experimentation in the console - Discover and experiment with existing commands in the console - Build a basic function - Create a script module - Run a command from a script module - Describe the purpose of CmdletBinding and list common parameters - Parameterize a script's input - Define parameters as mandatory - Define parameters as accepting pipeline input - Describe the purpose of object-based output - Create and output custom objects from a function - Describe the native patterns that a good tool design should exhibit - Redesign a script to meet business	input - Describe the purpose of object-based output - Create and output custom objects from a function - Describe the native patterns that a good tool design should exhibit - Redesign a script to meet business requirements and conform to native patterns - Describe the six output channels in the shell - Write commands that use verbose, warning, and informational output - Describe the purpose and construction of comment-based help - Add comment-based help to a function - Identify causes of broken comment-based help - Describe the native patterns for handling errors in a command - Add error handling to a command - Describe the tools used for debugging in PowerShell - Debug a broken script - Describe the use of positional parameters - Describe additional parameter validation methods - Describe how to define multiple parameter sets - Describe other parameter definition options - Describe the advantages of external help - Create external help using PlatyPS and Markdown - Describe the purpose of unit testing - Describe the purpose of the ETS - Extend an existing object type - Describe the use of Script Analyzer - Perform a basic script analysis - Describe the tool publishing process and requirements - Publish a tool to a repository - Describe the purpose of basic controller scripts - Write a simple controller script - Describe the purpose of proxy functions - Create a simple proxy function - Describe the use of XML within PowerShell - Use XML data within a PowerShell function - Describe the use of JSON data within PowerShell - Use JSON data within a PowerShell function - Describe the use of SQL Server from within PowerShell - Write and run SQL Server queries - Design tools that use SQL Server for data storage - Create PowerShell tools, using native design patterns, from business requirements. Module 19: Working with XML Data This module explains how to work with XML data in PowerShell.Lessons - Simple: CliXML - Importing native XML - ConvertTo-XML - Creating native XML from scratchLab : Designing a Tool - Working with XML After completing this module, students will be able to: - Describe the native shell patterns that a good tool design should exhibit - Describe the benefits of discovery and experimentation in the console - Discover and experiment with existing commands in the console - Build a basic function - Create a script module - Run a command from a script module - Describe the purpose of CmdletBinding and list common parameters - Parameterize a script's input - Define parameters as mandatory - Define parameters as accepting pipeline	- Describe how to define multiple parameter sets - Describe other parameter definition options - Describe the advantages of external help - Create external help using PlatyPS and Markdown - Describe the purpose of unit testing - Describe the purpose of the ETS - Extend an existing object type - Describe the use of Script Analyzer - Perform a basic script analysis - Describe the tool publishing process and requirements - Publish a tool to a repository - Describe the purpose of basic controller scripts - Write a simple controller script - Describe the purpose of proxy functions - Create a simple proxy function - Describe the use of XML within PowerShell - Use XML data within a PowerShell function - Describe the use of JSON data within PowerShell - Use JSON data within a PowerShell function - Describe the use of SQL Server from within PowerShell - Write and run SQL Server queries - Design tools that use SQL Server for data storage - Create PowerShell tools, using native design patterns, from business requirements. Module 19: Working with XML Data This module explains how to work with XML data in PowerShell.Lessons - Simple: CliXML - Importing native XML - ConvertTo-XML - Creating native XML from scratchLab : Designing a Tool - Working with XML After completing this module, students will be able to: - Describe the native shell patterns that a good tool design should exhibit - Describe the benefits of discovery and experimentation in the console - Discover and experiment with existing commands in the console - Build a basic function - Create a script module - Run a command from a script module - Describe the purpose of CmdletBinding and list common parameters - Parameterize a script's input - Define parameters as mandatory - Define parameters as accepting pipeline
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- requirements and conform to native patterns
- Describe the six output channels in the shell
- Write commands that use verbose, warning, and informational output
- Describe the purpose and construction of comment-based help
- Add comment-based help to a function
- Identify causes of broken comment-based help
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- Describe the use of positional parameters
- Describe additional parameter validation methods
- Describe how to define multiple parameter sets
- Describe other parameter definition options
- Describe the advantages of external help
- Create external help using PlatyPS and Markdown
- Describe the purpose of unit testing
- Describe the purpose of the ETS
- Extend an existing object type
- Describe the use of Script Analyzer
- Perform a basic script analysis
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- Describe the use of SQL Server from within PowerShell
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- Create PowerShell tools, using native design patterns, from business requirements.

Module 6: An Interlude: Changing Your Approach

This module explains how to re-think tool design, using concrete examples of how it's often done wrong. Lessons

- Examining a script
- Critiquing a script
- Revising the script

After completing this module, students will be able to:

Module 12: Writing Full Help

This module explains how to create external help for a command. Lessons

- External help
- Using PlatyPS
- Supporting online help
- "About" topics
- Making your help updatableLab : Designing a Tool
- Writing full help

After completing this module, students will be able to:

- Describe the native shell patterns that a good tool design should exhibit
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- Run a command from a script module
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- Parameterize a script's input
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- Create and output custom objects from a function
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- Create PowerShell tools, using native design patterns, from business requirements.

Module 20: Working with JSON Data

- Describe the native shell patterns that a good tool design should exhibit
- Describe the benefits of discovery and experimentation in the console
- Discover and experiment with existing commands in the console
- Build a basic function
- Create a script module
- Run a command from a script module
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- Describe the use of Script Analyzer
- Perform a basic script analysis
- Describe the tool publishing process and requirements
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- Create a simple proxy function
- Describe the use of XML within PowerShell
- Use XML data within a PowerShell function
- Use JSON data within a PowerShell function
- Describe the use of SQL Server from within PowerShell
- Describe the use of JSON data within PowerShell

Markdown

- Describe the purpose of unit testing
- Describe the purpose of the ETS
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- Design tools that use SQL Server for data storage
- Create PowerShell tools, using native design patterns, from business requirements.

Module 13: Unit Testing Your Code

This module explains how to use Pester to perform basic unit testing.Lessons

- Sketching out the test
- Making something to test
- Expanding the test
- Going further with PesterLab : Designing a Tool
- Unit testing your code

After completing this module, students will be able to:

- Describe the native shell patterns that a good tool design should exhibit
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- Create a script module
- Run a command from a script module
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- Define parameters as mandatory
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- Describe the purpose of object-based output
- Create and output custom objects from a

This module explains how to using JSON data in PowerShell.Lessons

- Converting to JSON
- Converting from JSONLab : Designing a Tool
- Working with JSON data

After completing this module, students will be able to:

- Describe the native shell patterns that a good tool design should exhibit
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- Describe other parameter definition options
- Describe the advantages of external help
- Create external help using PlatyPS and Markdown
- Describe the purpose of unit testing
- Describe the purpose of the ETS
- Extend an existing object type
- Describe the use of Script Analyzer

- Write and run SQL Server queries
- Design tools that use SQL Server for data storage
- Create PowerShell tools, using native design patterns, from business requirements.

Module 7: Using Verbose, Warning, and Informational Output

This module explains how to use additional output pipelines for better script behaviors. Lessons

- Knowing the six channels
- Adding verbose and warning output
- Doing more with verbose output
- Informational output Lab : Designing a Tool
- Using Verbose, Warning, and Informational Output

After completing this module, students will be able to:

- Describe the native shell patterns that a good tool design should exhibit
- Describe the benefits of discovery and experimentation in the console
- Discover and experiment with existing commands in the console
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- Create a script module
- Run a command from a script module
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- Use JSON data within a PowerShell function
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- Write and run SQL Server queries
- Design tools that use SQL Server for data storage
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Write basic unit tests for PowerShell functions

Module 14: Extending Output Types

- Perform a basic script analysis
- Describe the tool publishing process and requirements
- Publish a tool to a repository
- Describe the purpose of basic controller scripts
- Write a simple controller script
- Describe the purpose of proxy functions
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- Describe the use of XML within PowerShell
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Module 21: Working with SQL Server Data

This module explains how to use SQL Server from within a PowerShell script. Lessons

- SQL Server terminology and facts
- Connecting to the server and database
- Writing a query
- Running a query
- Invoke-SqlCmd
- Thinking about tool design patterns

After completing this module, students will be able to:

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Run commands with extra output enabled

Module 8: Comment-Based Help

This module explains how to extend objects with additional capabilities. Lessons

- Understanding types
- The Extensible Type System
- Extending an object
- Using Update-TypeData

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- Extend an existing object type

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Module 22: Final Exam

This module provides a chance for students to use everything they have learned in this course within a practical example. Lessons

- Lab problem
- Break down the problem
- Do the design
- Test the commands
- Code the toolLab : Final Exam
- Lab oneLab : Final Exam

- Describe the use of Script Analyzer
- Perform a basic script analysis
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Module 15: Analyzing Your Script

This module explains how to use Script Analyzer to support best practices and prevent common problems. Lessons

- Performing a basic analysis
- Analyzing the analysisLab : Designing a Tool
- Analyzing your script

Lab two

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Further Information:

For More information, or to book your course, please call us on Head Office 01189 123456 / Northern Office 0113 242 5931

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