LAPT

LONDON ACADEMY OF PROFESSIONAL TRAINING

CERTIFICATE

ISO 11357 — Plastics Differential Scanning Calorimetry

ISO Certification Programme

LAPT — London Academy of Professional Training

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Reference MTL-NMM-11357 • ISO Materials

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6	30	180	430	60%	Lifetime
SUBJECTS	CHAPTERS	CLASSES	TOTAL MARKS	PASS MARK	VALIDITY

AT A GLANCE

REFERENCE	**MTL-NMM-11357**
AWARD	**Certificate**
ASSESSMENT	**430 marks — 258 to pass (60%)**
PREREQUISITES	**None**
VALIDITY	**Lifetime**
AWARDING BODY	**LAPT — London Academy of Professional Training**

CURRICULUM

1 Advanced Thermal Analysis Techniques

5 chapters · 30 classes · **65 marks**

• 1 Fundamentals of Differential Scanning Calorimetry (DSC) in Plastics Analysis — 6 classes

- 1.1 Explain the Principles of Differential Scanning Calorimetry in Plastics
- 1.2 Identify Key Components and Equipment Used in DSC
- 1.3 Analyze the Thermal Properties of Plastics with DSC Techniques
- 1.4 Evaluate Thermal Transition Processes in Plastics via DSC
- 1.5 Interpret DSC Curves and Data for Plastics Characterization
- 1.6 Apply DSC Results to Optimize Plastic Material Selection

• 2 Thermal Properties of Non-Metallic Materials — 6 classes

- 2.1 Analyze the Fundamentals of Thermal Properties in Non-Metallic Materials
- 2.2 Explore Differential Scanning Calorimetry Fundamentals
- 2.3 Examine the Role of Heat Capacity in Non-Metallic Materials
- 2.4 Evaluate Glass Transition and Melting Temperature Determination
- 2.5 Investigate Practical Applications of Thermal Analysis Techniques
- 2.6 Apply ISO 11357 Standards in Evaluating Thermal Properties

• 3 Instrumentation and Calibration of DSC Equipment — 6 classes

- 3.1 Identify Key Components of DSC Equipment
- 3.2 Explain the Principles of Differential Scanning Calorimetry
- 3.3 Outline Standard Calibration Procedures for DSC
- 3.4 Demonstrate Equipment Setup for Accurate Measurements
- 3.5 Analyze Calibration Results and Adjust Parameters
- 3.6 Evaluate Real-World Applications of DSC Calibration

• 4 Data Interpretation and Thermal Analysis Results — 6 classes

- 4.1 Analyze Differential Scanning Calorimetry (DSC) Curves
- 4.2 Interpret Phase Transition Data from Thermal Analysis
- 4.3 Evaluate Glass Transition Temperature (Tg) Results
- 4.4 Assess Melting and Crystallization Points in Materials
- 4.5 Correlate Thermal Properties with Materials Performance
- 4.6 Apply Statistical Methods to Thermal Analysis Results

• 5 Applications of DSC in Quality Control and Materials Development — 6 classes

- 5.1 Explore the Fundamentals of Differential Scanning Calorimetry (DSC)
- 5.2 Identify Key Parameters Measured by DSC in Quality Control
- 5.3 Analyze Thermal Properties of Materials Using DSC Techniques
- 5.4 Examine the Role of DSC in Identifying Material Composition
- 5.5 Implement DSC Methods for Quality Assurance in Plastics
- 5.6 Apply DSC Data to Optimize Material Development Processes

2 Data Interpretation and Statistical Analysis

5 chapters · 30 classes **65 marks**

• 1 Fundamentals of Data Interpretation in Differential Scanning Calorimetry — 6 classes

- 1.1 Define Key Terminology in Differential Scanning Calorimetry
- 1.2 Explain the Principle of Differential Scanning Calorimetry
- 1.3 Identify Common Data Outputs from DSC Experiments
- 1.4 Interpret Basic Thermograms and Their Significance
- 1.5 Analyze Case Studies Using DSC Data Interpretation
- 1.6 Apply Statistical Methods to Evaluate DSC Results

• 2 Understanding Thermal Profiles and Their Statistical Significance — 6 classes

- 2.1 Analyze Thermal Profiles Using Differential Scanning Calorimetry
- 2.2 Interpret Data Outputs from Thermal Analysis Techniques
- 2.3 Identify Key Thermal Transitions in Materials
- 2.4 Assess Statistical Techniques for Analyzing Thermal Data
- 2.5 Apply Statistical Significance to Thermal Profile Comparisons
- 2.6 Evaluate Real-World Applications of Thermal Profile Analysis

• 3 Data Visualization Techniques for DSC Results — 6 classes

- 3.1 Analyze DSC Data for Thermal Events Interpretation
- 3.2 Construct Graphs to Visualize DSC Output Trends
- 3.3 Utilize Color-Coding to Differentiate DSC Data Sets
- 3.4 Implement Histograms for Frequency Distribution of DSC Results
- 3.5 Interpret Statistical Graphs to Assess DSC Result Significance
- 3.6 Synthesize Visualizations to Present Comprehensive DSC Findings

• 4 Advanced Statistical Methods for Data Analysis in DSC — 6 classes

- 4.1 Define and Explain Differential Scanning Calorimetry (DSC) Principles
- 4.2 Identify Key Statistical Methods Used in DSC Data Analysis
- 4.3 Apply Descriptive Statistics to Interpret DSC Data Sets
- 4.4 Utilize Inferential Statistics for Hypothesis Testing in DSC
- 4.5 Analyze and Interpret Complex Data Patterns in DSC Outputs
- 4.6 Develop a Comprehensive Data Analysis Report from DSC Findings

• 5 Interpreting Variability and Uncertainty in DSC Measurements — 6 classes

- 5.1 Define Variability in DSC Measurements
- 5.2 Identify Sources of Uncertainty in Thermal Analysis
- 5.3 Analyze Statistical Distributions of DSC Data
- 5.4 Calculate Mean and Standard Deviation in DSC Results
- 5.5 Interpret Confidence Intervals in Thermal Measurement
- 5.6 Apply Statistical Methods to Validate DSC Findings

3 Fundamentals of Differential Scanning Calorimetry

5 chapters · 30 classes **85 marks**

• 1 Introduction to Differential Scanning Calorimetry and Its Applications in Plastics — 6 classes

- 1.1 Understand the Principles of Differential Scanning Calorimetry
- 1.2 Identify the Key Components of a DSC Instrument
- 1.3 Explore the Thermodynamic Concepts Relevant to DSC
- 1.4 Analyze Temperature-Related Properties of Plastics Using DSC
- 1.5 Compare DSC with Other Thermal Analysis Techniques
- 1.6 Apply DSC Results to Predict Plastic Behavior in Real-World Applications

• 2 Understanding the Thermal Properties of Polymers — 6 classes

- 2.1 Define Key Thermal Properties of Polymers
- 2.2 Explain the Principles of Differential Scanning Calorimetry
- 2.3 Analyze the Measurement Process in DSC
- 2.4 Identify Common Applications of DSC in Polymer Analysis
- 2.5 Interpret DSC Graphs and Data for Polymer Evaluation
- 2.6 Evaluate the Impact of Thermal Properties on Polymer Selection

• 3 Instrumentation and Operation of DSC Instruments — 6 classes

- 3.1 Identify Key Components of DSC Instruments
- 3.2 Explain the Functionality of Thermal Sensors in DSC
- 3.3 Describe Calibration Procedures for DSC Instruments
- 3.4 Outline the Steps for Sample Preparation in DSC Analysis
- 3.5 Demonstrate the Operating Principles of DSC Measurement
- 3.6 Analyze Data Output from DSC Experiments

• 4 Data Analysis and Interpretation in Differential Scanning Calorimetry — 6 classes

- 4.1 Identify Key DSC Data Types and Their Significance
- 4.2 Analyze DSC Thermograms for Thermal Events
- 4.3 Interpret Enthalpy and Heat Capacity Changes in DSC Results
- 4.4 Compare Differential Scanning Calorimetry Results Across Materials
- 4.5 Apply Statistical Methods to Enhance Data Analysis in DSC
- 4.6 Evaluate Practical Applications of DSC Data in Material Selection

• 5 Applications of DSC in Material Development and Quality Control — 6 classes

- 5.1 Explore the Fundamentals of Differential Scanning Calorimetry
- 5.2 Identify Key Applications of DSC in Material Development
- 5.3 Analyze the Role of DSC in Quality Control Processes
- 5.4 Compare DSC with Other Thermal Analysis Techniques
- 5.5 Evaluate Material Properties Using DSC Data
- 5.6 Implement Best Practices for DSC in Laboratory Settings

4 Leadership and Team Management in Materials Science

5 chapters · 30 classes **45 marks**

• 1 Foundational Principles of Leadership in Materials Science — 6 classes

- 1.1 Define Leadership in the Context of Materials Science
- 1.2 Identify Key Leadership Theories Relevant to Team Management
- 1.3 Analyze the Roles of a Leader in a Materials Science Team
- 1.4 Explore Effective Communication Strategies for Leaders
- 1.5 Evaluate Team Dynamics and Leadership Styles in Materials Projects
- 1.6 Implement Leadership Strategies to Enhance Team Performance in Calorimetry

• 2 Effective Communication and Team Dynamics in Scientific Environments — 6 classes

- 2.1 Foster Active Listening Skills in Team Meetings
- 2.2 Develop Clear Communication Strategies for Scientific Concepts
- 2.3 Build Trust and Respect within Diverse Teams
- 2.4 Facilitate Dynamic Team Discussions to Enhance Collaboration
- 2.5 Implement Conflict Resolution Techniques in Scientific Settings
- 2.6 Evaluate Team Performance through Effective Feedback Mechanisms

• 3 Decision-Making Strategies for Materials Science Leaders — 6 classes

- 3.1 Identify Key Decision-Making Frameworks in Materials Science
- 3.2 Analyze the Impact of Data-Driven Decisions on Project Outcomes
- 3.3 Evaluate Leadership Styles and Their Effectiveness in Team Decision-Making
- 3.4 Implement Collaborative Techniques for Enhanced Team Problem-Solving
- 3.5 Utilize Scenario Planning to Anticipate Challenges in Materials Innovation
- 3.6 Develop Action Plans for Effective Decision-Making in Material Selection Processes

• 4 Conflict Resolution and Management Techniques in Technical Teams — 6 classes

- 4.1 Identify Common Sources of Conflict in Technical Teams
- 4.2 Analyze the Impact of Conflict on Team Dynamics
- 4.3 Explore Effective Communication Strategies for Conflict Resolution
- 4.4 Apply Problem-Solving Techniques to Resolve Team Conflicts
- 4.5 Develop a Conflict Resolution Action Plan for Technical Scenarios
- 4.6 Assess the Outcomes of Conflict Resolution Strategies in Team Management

• 5 Leading Change: Innovation and Adaptation in Materials Science — 6 classes

- 5.1 Identify Key Drivers of Change in Materials Science
- 5.2 Analyze Case Studies of Successful Innovation in Plastics
- 5.3 Develop Strategies for Overcoming Resistance to Change
- 5.4 Implement Effective Communication Techniques for Team Buy-in
- 5.5 Evaluate the Role of Leadership in Fostering a Culture of Adaptation
- 5.6 Create an Action Plan for Leading Change in Your Organization

5 Practical Applications of DSC in the Industry

5 chapters · 30 classes **85 marks**

• 1 Fundamentals of Differential Scanning Calorimetry (DSC) Principles — 6 classes

- 1.1 Explain the Basic Principles of Differential Scanning Calorimetry
- 1.2 Identify the Key Components of DSC Equipment
- 1.3 Describe the Thermal Characteristics Measured by DSC
- 1.4 Analyze Thermal Transition Events in Materials Using DSC
- 1.5 Compare DSC with Other Thermal Analysis Techniques
- 1.6 Apply DSC Data to Real-World Industry Scenarios

• 2 Instrumentation and Calibration for Accurate DSC Measurement — 6 classes

- 2.1 Understand the Principles of Differential Scanning Calorimetry (DSC)
- 2.2 Identify Key Components of DSC Instruments
- 2.3 Explore Calibration Techniques for Accurate DSC Measurements
- 2.4 Analyze Factors Affecting DSC Instrument Performance
- 2.5 Implement Standard Operating Procedures for DSC Calibration
- 2.6 Assess Calibration Results and Troubleshoot DSC Instrument Issues

• 3 Thermal Properties of Polymers and Their Relevance in DSC — 6 classes

- 3.1 Identify Key Thermal Properties of Polymers in DSC
- 3.2 Explain the Principles of Differential Scanning Calorimetry
- 3.3 Analyze the Effect of Temperature on Polymer Behavior
- 3.4 Demonstrate the Role of DSC in Material Characterization
- 3.5 Evaluate the Impact of Additives on Polymer Thermal Properties
- 3.6 Apply DSC Data to Optimize Polymer Processing Techniques

• 4 Interpreting DSC Data: Analysis and Reporting Techniques — 6 classes

- 4.1 Understand Key Parameters in DSC Data
- 4.2 Analyze Heating and Cooling Curves in DSC
- 4.3 Identify Thermal Transitions and Their Significance
- 4.4 Evaluate DSC Graphs for Material Characterization
- 4.5 Correlate DSC Results with Material Properties
- 4.6 Report Findings and Interpret Results for Stakeholders

• 5 Case Studies: Practical Applications of DSC in Material Development — 6 classes

- 5.1 Analyze Case Studies of DSC Applications in Plastics
- 5.2 Evaluate the Impact of DSC on Material Selection
- 5.3 Demonstrate DSC Techniques for Thermal Characterization
- 5.4 Compare DSC Results Across Different Material Formulations
- 5.5 Explore Industry-Specific Applications of DSC in Product Development
- 5.6 Present Findings from DSC Case Studies to Drive Innovation

6 Research and Development in Non-Metallic Materials

5 chapters · 30 classes **85 marks**

• 1 Introduction to Non-Metallic Materials and Their Properties — 6 classes

- 1.1 Explore the Key Characteristics of Non-Metallic Materials
- 1.2 Identify Types of Non-Metallic Materials Used in Industry
- 1.3 Analyze the Mechanical Properties of Non-Metallic Materials
- 1.4 Investigate Thermal Properties and Their Measurement Techniques
- 1.5 Examine the Applications of Non-Metallic Materials in Engineering
- 1.6 Apply Knowledge of Non-Metallic Materials to Real-World Scenarios

• 2 Principles of Differential Scanning Calorimetry (DSC) — 6 classes

- 2.1 Define and Explain Differential Scanning Calorimetry (DSC)
- 2.2 Describe the Key Components of a DSC Instrument
- 2.3 Illustrate the Basic Principles of Thermal Analysis in DSC
- 2.4 Analyze Thermograms and Identify Key Thermal Events
- 2.5 Compare DSC with Other Thermal Analysis Techniques
- 2.6 Apply DSC Techniques to Characterize Non-Metallic Materials

• 3 Analyzing Thermal Data: Techniques and Applications — 6 classes

- 3.1 Identify Key Concepts of Differential Scanning Calorimetry
- 3.2 Describe the Equipment and Setup for Thermal Analysis
- 3.3 Analyze Basic Thermal Data Outputs from DSC Experiments
- 3.4 Interpret the Significance of Thermal Transition Points
- 3.5 Compare Thermal Properties of Different Non-Metallic Materials
- 3.6 Apply Thermal Analysis Results to Material Selection Criteria

• 4 Material Selection for R&D Projects Using DSC Insights — 6 classes

- 4.1 Identify Key Metrics from DSC Data for Material Selection
- 4.2 Analyze Thermal Properties of Non-Metallic Materials Using DSC
- 4.3 Compare the Thermal Behavior of Selected Polymers Through DSC
- 4.4 Evaluate Material Compatibility for R&D Projects Using DSC Findings
- 4.5 Develop a Material Selection Criteria Based on DSC Analysis
- 4.6 Apply DSC Insights to Real-World R&D Project Scenarios

• 5 Case Studies: Innovations Driven by DSC in Non-Metallic Material R&D — 6 classes

- 5.1 Analyze Key Innovations in DSC Applications for Non-Metallic Materials
- 5.2 Evaluate Case Studies Highlighting DSC-Driven Material Enhancements
- 5.3 Identify Challenges Faced During DSC Implementation in R&D
- 5.4 Explore Success Stories of DSC in Polymer Development
- 5.5 Apply DSC Techniques to Improve Material Properties in Case Studies
- 5.6 Discuss Future Trends in Non-Metallic Material R&D Using DSC Insights