BLACKBIRD FOR TRAINING

# Integrated Generative AI for Printing Specialists

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Cairo (Egypt)

UK Traininig
PARTNER



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## Introduction

In the era of digital transformation, artificial intelligence is no longer a technological luxury but has become a fundamental pillar across most production sectors, particularly in the printing and publishing industry. The printing industry today faces increasing challenges; from rising raw material costs, to the urgent need to reduce waste, continuously improve quality, and respond swiftly to complex machine failures that could halt entire production lines.

This is where Generative AI Gen AI emerges as a revolutionary solution that goes beyond automating routine tasks. It extends to generating creative solutions, analyzing massive amounts of data in seconds, and providing precise recommendations that enhance the efficiency of printing specialists, transforming them into proactive rather than reactive professionals.

The course "Integrated Generative AI for Printing Specialists" has been designed to serve as a practical bridge between theoretical knowledge and direct application. The content focuses on utilizing Google's advanced Gemini model as a primary tool to address everyday printing challenges. This course is not merely an overview of AI capabilities; it is an interactive training journey that gives participants the confidence and ability to employ this technology safely, responsibly, and effectively within a professional work environment.

## Course Objectives

This course aims to empower printing specialists with an integrated set of cognitive and applied skills, summarized in the following objectives:

1. Building a Solid Theoretical Foundation: Understanding the fundamental difference between traditional AI which relies on predefined rules and programming and Generative AI capable of creating new content, texts, images, and unprecedented analyses, while exploring how to apply this in the printing context.
2. Mastering the Gemini Tool: Recognizing the capabilities of the multimodal Gemini model text, image, video, audio, and understanding how these capabilities translate into practical solutions across different printing stages; from pre-press to production and post-production.
3. Mastering Prompt Engineering: Learning how to construct effective and specific prompts that enable participants to extract the best results from Gemini, rather than receiving generic or inaccurate responses.
4. Specialized Applications in Quality and Production: Utilizing AI in automated quality control, detecting subtle printing defects, suggesting adjustments to machine settings such as temperature, speed, and ink distribution to minimize waste and achieve the highest possible quality.
5. Fault Analysis and Predictive Maintenance: Transforming Gemini into a virtual technical consultant that helps analyze error messages, suggest troubleshooting steps, and provide preventive maintenance recommendations based on recurring fault patterns.



6. Compliance and Digital Security: Ensuring the use of these tools according to the highest cybersecurity standards and data protection policies, while adhering to SPH Media's internal policies to avoid risks related to information confidentiality or leakage of sensitive machine or product data.

## Course Outlines

Level: Foundational + Applied
Duration: 2 Days 8 Training Hours
Target Audience: Printing Specialist

### Day 1: Why Attend This Course? Wins & Losses!

The first day revolves around answering the question "Why?" and why mastering Generative AI now is an investment in the future rather than merely an option. Participants will clearly see the "Wins" they will gain in terms of time savings, improved decision-making, and reduced errors, versus the "Losses" they or their organization might incur if they ignore this technology or use it incorrectly.

#### 1.1 Course Opening and Introduction

Topics Covered:

- Welcoming participants and ice-breaking activities
- Reviewing course objectives and expected outcomes What will I gain by the end of the two days?
- Defining Generative AI in simple language and identifying its current position in the global printing market
- Overview of the course structure and methodology
- Setting expectations and ground rules for participatio

#### 1.2 In-Depth Introduction to AI and Generative AI

Topics Covered:

- Definition of Artificial Intelligence: Understanding what AI is and its evolution in the industrial sector
- Traditional AI vs. Generative AI: Explaining the difference between traditional AI such as expert systems following If-Then rules and Generative AI capable of creativity and inference
- How Generative AI Works: Basic working mechanisms of Large Language Models LLMs, how they learn from data, and how they generate new outputs
- The Transformer Architecture: Brief explanation of the technology behind modern AI models
- Training Data and Model Capabilities: Understanding how AI models are trained and what determines their knowledge boundaries
- Hallucination in AI: Understanding that AI can generate incorrect information and how to verify outputs
- Real-World Examples from Printing: How Gen AI can improve color distribution or suggest alternative paper types based on product specifications
- AI Limitations: What AI cannot do and where human expertise remains e[illegible]



### 1.3 Introduction to Gemini and Its Capabilities

Topics Covered:

- What is Gemini? Overview of Google's advanced multimodal AI model
- Gemini vs. Other Models: How Gemini differs from ChatGPT, Claude, or other AI models
- Multimodal Capabilities:
    - Analyzing images defect photos, control panels, printed samples
    - Understanding complex texts operation manuals, maintenance guides, technical specifications
    - Processing audio and video inputs where applicable
- Gemini Versions: Understanding the different versions Ultra, Pro, Nano and their appropriate use cases
- Integration Capabilities: How Gemini can be integrated into existing workflows
- Proposed Use Cases for Gemini in Printing Environment:
    - Translating technical terminology
    - Summarizing production reports
    - Suggesting quick solutions to common problems
    - Generating maintenance checklists
    - Creating documentation and reports
- Access and Interface: How to access Gemini and navigate its interface

### 1.4 Safe and Responsible Use of AI

Topics Covered:

- SPH Media Policies: Understanding organizational policies regarding the use of AI tools
- Data Protection and Privacy:
    - What information can be shared with AI?
    - What sensitive information must not be entered client data, exclusive designs, proprietary machine settings?
    - Understanding data retention policies of AI platforms
- Information Security:
    - Risks of sharing confidential production data
    - Best practices for secure AI usage
    - Handling sensitive visual materials designs, proofs, customer artwork
- Bias in AI: How models can reflect biases in training data and how to detect bias in outputs
- Verification and Fact-Checking: The importance of not blindly relying on AI outputs
- Intellectual Property Considerations: Understanding who owns AI-generated content
- Ethical Usage: Ensuring AI is used to augment human capabilities, not replace ethical judgment
- Incident Reporting: What to do if a security incident occurs involving AI tools

### 1.5 Fundamentals of Effective Prompt Engineering

Topics Covered:



- What is a Prompt? Definition and importance of prompts in AI interactions
- The Five Components of an Ideal Prompt:
    - Role: Defining who the AI should act as e.g., "You are a senior printing press operator"
    - Context: Providing background information relevant to the task
    - Task: Clearly stating what you want the AI to do
    - Format: Specifying how you want the response structured
    - Constraints: Setting boundaries and limitations for the response
- Good vs. Bad Prompts: Live examples of well-crafted versus poorly-crafted prompts in a printing context
- Iterative Prompting Techniques: How to refine prompts progressively to obtain more accurate answers
- Chain of Thought Prompting: Encouraging the AI to show its reasoning process
- Zero-Shot vs. Few-Shot Prompting: When to provide examples and when not to
- Common Prompting Mistakes: What to avoid when writing prompts
- Prompt Templates: Creating reusable templates for common printing tasks

**1.6 Practical Exercises on Prompt Writing**

Topics Covered:

- Exercise 1: Technical Explanation Prompt: Writing a prompt to request an explanation of a specific component in an offset printing machine e.g., "Explain how the dampening system works on a Heidelberg SM 52"
- Exercise 2: Maintenance Scheduling Prompt: Writing a prompt to suggest a weekly maintenance schedule based on operating hours
- Exercise 3: Problem Diagnosis Prompt: Creating a prompt to diagnose a specific printing issue e.g., "What could cause dot gain on a 4-color press?"
- Exercise 4: Process Optimization Prompt: Requesting recommendations to improve a specific process
- Exercise 5: Documentation Prompt: Generating a standard operating procedure SOP from a description of the process
- Group Discussion: Reviewing and evaluating exercise outputs collectively
- Feedback Session: Providing constructive feedback on each other's prompts

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**1.1 Week 1 Summary and Q&A Session**

Topics Covered:

- Review of key knowledge points covered during the day
- Recap of the main "Wins" and how to avoid the "Losses"
- Open floor for discussion regarding Day 1 applications in participants' actual work environments
- Addressing remaining questions and concerns
- Preview of Day 2's applied content
- Homework or preparation tasks for the next day if any



## Day 2: Specialized Applications in Printing

The second day is the applied day par excellence, where participants move from the "how it works" stage to the "how we apply it to solve our real problems" stage. The focus will be on four main pillars that are the backbone of any successful printing operation: Quality, Waste Reduction, Fault Analysis, and Intelligent Decision-Making.

### 2.1 Day 1 Recap and Review

Topics Covered:

- Quick retrieval of key concepts through interactive questions and quizzes
- Addressing any remaining questions about prompt writing
- Sharing experiences from Day 1
- Bridging the gap between theory and practice
- Setting the stage for advanced applications

### 2.2 Advanced Gen AI Applications in Printing Operations

Topics Covered:

- Intelligent Quality Control:
  - How Gemini can analyze photos of final products
  - Detecting microscopic defects misregistration, color variations, spots, hickeys
  - Speed comparison: AI vs. human visual inspection
  - Automated pass/fail decision making
  - Integration with quality management systems
- Defect Analysis and Classification:
  - Using AI to classify defects by type and source
  - Determining whether issues are ink-related, mechanical cylinder problems, or substrate-related
  - Pattern recognition in recurring defects
  - Root cause analysis using AI
  - Building a defect knowledge base
- Machine Settings Optimization:
  - How AI can suggest optimal settings pressure, temperature, speed based on paper type, ink, and desired design
  - Reducing make-ready time through AI recommendations
  - Color matching and calibration assistance
  - Register control optimization
  - Drying and curing parameters
- Waste Reduction:
  - Analyzing production data to identify waste patterns
  - Predicting waste before it occurs
  - Suggesting process adjustments to minimize rejection rates
  - Material usage optimization
  - Cost-benefit analysis of process changes



**2.3 Practical Exercises for Quality and Waste Reduction Applications**

Topics Covered:

- Exercise 1: Defect Analysis: Providing Gemini with data about a printing defect description or image and requesting root cause identification and immediate solution suggestions
- Exercise 2: Waste Reduction Simulation: Simulating a waste reduction scenario where participants write prompts for Gemini to analyze previous production data and suggest process changes to reduce rejection rates by a certain percentage
- Exercise 3: Quality Standards Documentation: Using Gemini to generate comprehensive quality control checklists based on specific product requirements
- Exercise 4: Color Correction Assistance: Prompting Gemini to suggest steps for correcting color variations between proof and production
- Exercise 5: Process Optimization Plan: Creating a step-by-step optimization plan for a specific production bottleneck
- Results Comparison: Comparing AI-generated solutions with traditional approaches

**2.4 Fault Analysis and Maintenance Using Gen AI**

Topics Covered:

- Gemini as a Virtual Maintenance Consultant:
  - How to input error codes and receive detailed explanations
  - Submitting textual or voice descriptions of faults
  - Receiving referenced checklists of troubleshooting steps
  - Accessing repair procedures and parts information
- Predictive Maintenance:
  - Analyzing historical performance data temperatures, vibrations, pressures
  - Identifying early warning signs of potential failures
  - Predicting when machines will need maintenance before breakdown occurs
  - Creating maintenance schedules based on actual machine condition
  - Reducing unplanned downtime through proactive maintenance
- Fault Documentation:
  - Using AI to generate detailed and professional maintenance reports from simple operator inputs
  - Creating standardized reporting templates
  - Building a fault history database for future reference
  - Analyzing fault frequency patterns
- Spare Parts Management:
  - Using AI to identify required spare parts for specific repairs
  - Cross-referencing part numbers and specifications
  - Estimating repair times and costs
- Remote Troubleshooting:
  - How AI can assist in remote diagnostics
  - Step-by-step guidance for operators during emergency situations

**2.5 Comprehensive Applied Workshop Solving a Real Problem**

Topics Covered:

- Workshop Structure:
  - Dividing participants into working groups
  - Assigning a complex printing scenario to each group
- Sample Scenarios:
  - White lines appearing on printed materials
  - Color instability across the print run
  - Frequent paper jams during high-speed operation
  - Ghosting or doubling issues on the printed output
  - Ink drying problems causing smudging
- Workshop Methodology:
  - Using Gemini to analyze the assigned problem
  - Identifying possible causes root cause analysis
  - Developing a comprehensive action plan with solutions
  - Documenting recommendations and presenting findings
  - Justifying proposed solutions with data and logic
- Group Presentations:
  - Each group presents their solution approach
  - Peer feedback and constructive discussion
  - Trainer evaluation and expert insights
- Best Practice Compilation:
  - Collecting the best solutions across groups
  - Creating a reference document for future use

**2.6 Course Summary, Assessment, and Conclusion**

Topics Covered:



- Comprehensive Review:
  - Summary of all key concepts from both days
  - Revisiting the "Wins" and how to sustain them
  - "Losses" to avoid post-training
- Short Quiz:
  - Quick assessment of most important theoretical and applied knowledge acquired
  - Practical scenario-based questions
  - Immediate feedback and explanation of answers
- Course Evaluation Survey:
  - Collecting participants' feedback on content quality, trainer performance, and training materials
  - Suggestions for improvement
  - Identifying additional training needs
- Closing Remarks and Recommendations:
  - Guiding participants on how to continue developing their AI skills after the course
  - Suggested self-learning resources online courses, articles, community forums
  - Practical steps for implementing AI in daily work
- Certificate Distribution:
  - Awarding certificates of completion to participants in recognition of their commitment and effort
  - Celebrating successful completion of the course

## Conclusion

At the conclusion of this course, participants will no longer view Generative AI as a complex tool or a vague futuristic technology, but rather as an intelligent colleague that can be relied upon to alleviate daily burdens, provide deep insights, and accelerate problem-solving processes in unprecedented ways. The practical exercises and applied workshops have demonstrated that integrating Gen AI into the daily workflow of a printing specialist is not only possible but is an inevitable necessity for achieving operational excellence.

Through mastering the use of Gemini, the art of prompt writing, and understanding vital applications in quality control and fault analysis, participants now possess a new set of tools that enhance their position as modern, adaptable printing experts. With a commitment to security and responsibility policies, this expert becomes capable of leading digital transformation within their organization, achieving tangible gains in efficiency, quality, and innovation.

The skills and knowledge gained are immediately applicable and will deliver measurable returns, from reduced downtime and waste, to improved quality and enhanced problem-solving capabilities. Investing in these skills today is the surest guarantee for leading the printing industry tomorrow.

Key Takeaways for Participants:

- Gen AI is a powerful assistant, not a replacement for human expertise
- Prompt engineering is the key to unlocking AI's full potential
- Responsible and secure use of AI protects both individuals and organizations
- Continuous learning and practice are essential for staying ahead

