Objective Summary Sheet

Industry Foundations Training and Certification – Semiconductor

Student/Manager: _____ **Class I.D.:** _____

Instructor: _____ **Class Dates:** _____

Company/FAB: _____

COURSE DESCRIPTION: This course is given with lecture, visual aids, web-based training, and hands-on exercises. Lectures on safety and the system components are also included.

TARGET AUDIENCE: This course is designed for those individuals in the semiconductor industry who require the knowledge and skills to operate and perform maintenance (preventive or corrective) on semiconductor manufacturing equipment.

Use this form to track your completion of the course objectives. Initial each objective as it is completed. Use a METHOD CODE to identify the manner in which the objective was completed. At the end of the course, have your instructor sign at the bottom.

METHOD CODES:

P1 = **completed procedure successfully individually or as a member of a two-person team**
P2 = **completed procedure successfully as a member of a three or four person team**
PW = **completed open book review questions and passed written exam**
D = **demonstrated only**
NA = **not applicable**

Student Initial/Date	Method Code	Module	Performance Objective	Comment	Instructor Initial
		1.0	**Introduction**		
		2.0	**Safety**		
	PW	2.1	Identify the information contained in a Material Safety Data Sheet		
	PW	2.2	List, describe, and identify safety hazards, hazard alert symbols, and personal protective equipment associated with Manufacturing Systems		
	PW	2.3	Locate all emergency machine off buttons and describe how to EMO Manufacturing Systems		
	PW	2.4	Describe and perform Lockout/Tagout procedures for Manufacturing Systems		
	PW	2.5	Describe the electrical hazards associated with Manufacturing Systems		
	PW	2.6	Describe the hazardous chemicals and gases associated with Manufacturing Systems		
	PW	2.7	Describe the hazardous wastes associated with Manufacturing Systems		
	PW	2.8	Describe the mechanical hazards associated with Manufacturing Systems		
	PW	2.9	Safely perform tasks (including LOTO) while working on and around Manufacturing Systems		
		3.0	**Manuals and Documentation**		
	P1	3.1	Given a computer with access to the Applied Materials intranet, locate information related to a specific system in the correct manual: • Site and System Preparation Specification • Safety • Startup • Preventive and Corrective Maintenance • Functional Description		

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			• Operations and Programming • Schematics • Customer Engineering News • Best Known Method • Visual Spare Parts Identifier		
		4.0	**Semiconductor Systems Overview**		
	PW	4.1	State the purpose of each major component for semiconductor equipment		
	PW	4.2	Identify whether the system is used for etch, deposition, implant, process control, chemical mechanical polishing, or rapid thermal process		
	P2	4.3	Locate and identify the major components associated with semiconductor equipment		
		5.0	**Pneumatic Devices**		
	PW	5.1	Identify and define how pneumatic components are used in semiconductor processing equipment		
	PW	5.2	Given a pneumatic schematic, trace the schematic components on a system		
	P2	5.3	Adjust the slit valve open/close sensors		
	P2	5.4	Adjust the air pressure interlock switch trip points		
	P2	5.5	Adjust the pneumatic lift speed		
	P2	5.6	Adjust the CDA pressure regulator		
	P2	5.7	Replace an SMC pneumatic electrovalve		
		6.0	**Electric Power**		
	PW	6.1	Describe the differences between a Delta and a Wye AC circuit		
	PW	6.2	Given a schematic diagram, explain the power distribution and power-on sequence for a semiconductor system		
	PW	6.3	State the purpose of a GFCI circuit		
	PW	6.4	State the low voltage DC power requirements for operating and controlling semiconductor equipment		
	P2	6.5	Locate the power-on, EMO, and GFCI components		
	P2	6.6	Measure the output of the low voltage power supplies on a system		
	P2	6.7	Perform a system EMO and power-on		
	P2	6.8	Test all system EMO switches and GFCI circuits		
		7.0	**Control Systems**		
	PW	7.1	Understand the logic in controlling different devices used in semiconductor processing equipment		
	PW	7.2	Provide an explanation of communication standards between the main computer and different devices		

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	P2	7.3	Access software screens to locate DI, DO, AI, and AO signals		
	P2	7.4	Locate control system components screens on a system		
		7.5	Trace a DeviceNet network		
	P2	7.6	Verify DeviceNet Can_H and Can_L resistivity		
	P2	7.7	Verify DeviceNet 24 V power		
	P2	7.8	Determine the status of DeviceNet communications		
		8.0	**Gas Delivery**		
	PW	8.1	Identify and define how gas delivery components are used in semiconductor processing equipment		
	P2	8.2	Trace a gas delivery from the facilities to the gas panel		
	P2	8.3	Use a gas panel schematic to trace gas flow from the gas sticks to the showerhead		
	P2	8.4	Explain how an MFC controls gas flow		
	P2	8.5	Perform an MFC zero calibration		
	P2	8.6	Perform an MFC flow verify		
	P2	8.7	Perform a VCR MFC replacement		
	P2	8.8	Perform a surface mount MFC replacement		
		9.0	**Vacuum Systems**		
	PW	9.1	Given a conversion chart, convert a pressure reading from one unit to another		
	PW	9.2	Identify vacuum components, including gauges, pumps, seals, and valves		
	P2	9.3	Perform PM tasks for the vacuum components, including gauge calibration, seal replacement, valve rebuild, lubrication, and pump maintenance		
	P2	9.4	Given a vacuum schematic and a semiconductor system, find the vacuum components listed on the schematic		
	P2	9.5	Check the base pressure of a chamber		
	P2	9.6	Complete a chamber rate-of-rise or leak rate test		
	P2	9.7	Inspect the level and condition of the pump oil		
	P2	9.8	Check the return helium line pressure to the cryo-compressor		
	P2	9.9	Regenerate a cryopump		
	P2	9.10	Add helium to the cryo-compressor		
	P2	9.11	Check the cryopump for proper temperatures		
	P2	9.12	Perform a helium leakcheck on a chamber		
	P2	9.13	Find the five main Venturi vacuum ejectors on the Reflexion LK and discuss their uses		

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		10.0	**Wet Clean Protocol**		
	PW	10.1	Understand how to perform particle troubleshooting on semiconductor equipment		
	PW	10.2	State the sources that can lead to high particle counts on a wafer and ways of reducing particles on a system		
	P2	10.3	Perform a wet clean of a non-process chamber using Applied Materials wet clean techniques		
		11.0	**Process Kits**		
	PW	11.1	Identify safety hazards associated with process kit changes		
	PW	11.2	State the basic procedure for performing a process kit change		
	PW	11.3	State the basic procedure for recovering a chamber after a process kit change		
	PW	11.4	Identify the purpose of process kits		
	PW	11.5	Identify the different materials from which process kits can be made		
	P2	11.6	Perform a process kit change		
	P2	11.7	Perform a selected consumables change on the Reflexion LK		
		12.0	**Electrostatic Chucks and Pedestals**		
	PW	12.1	Describe the general purpose and function of pedestals		
	PW	12.2	Describe the general purpose and function of electrostatic chucks		
	PW	12.3	Describe the general purpose and function of vacuum chucks		
	PW	12.4	Describe the general purpose and function of susceptors and other support structures		
	PW	12.5	Define different designs and features of pedestals and electrostatic chucks		
	PW	12.6	Identify safety issues and protective activities required when working with pedestals and electrostatic chucks		
	P2	12.7	Perform an electrostatic chuck cleaning PM		
	P2	12.8	Perform an electrostatic chuck wafer chucking capability test		
	P2	12.9	Perform independent helium cooling gas flow testing and adjustment		
	P2	12.10	Perform process kit removal and installation		
	P2	12.11	Perform electrostatic chuck and pedestal removal and replacement		
	P2	12.12	Perform electrostatic chuck verification checks		

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		13.0	**Thermal Control**		
	PW	13.1	Identify and describe different heaters and how they are used in semiconductor processing equipment		
	PW	13.2	Identify and describe how heaters are controlled		
	PW	13.3	Identify and describe the different methods for temperature monitoring		
	P2	13.4	Program a WATLOW controller		
	P2	13.5	Verify that PID constants are set correctly in software		
	P2	13.6	Replace a SWLL degas lamp		
		14.0	**Fluid Delivery Systems**		
	PW	14.1	Identify and define the components and fluids used for cooling or heating semiconductor manufacturing systems		
	P2	14.2	Remove and replace a deionized water cartridge		
	P2	14.3	Perform PM procedures, including operational checks		
	P2	14.4	Check the fluid level of a heat exchanger or chiller and adjust as necessary		
	P2	14.5	Given a semiconductor system and a fluid delivery schematic, trace the fluid path of a heat exchanger or chilled water system through the system • Heat exchangers/chillers • Flowmeters/sensors • Plumbing schematic symbols • Regulators/pressure control		
		15.0	**Mainframe Robots**		
	PW	15.1	Define robot		
	PW	15.2	Understand the difference between belt drives and magnetic coupled drives		
	PW	15.3	Identify the different robots and their applications for either the mainframe or factory interface		
	P2	15.4	Perform mainframe robot bearing replacement and calibration on an available training system or stand-alone robot (VHP and XP robots)		
	P2	15.5	Calibrate a mainframe robot using system calibration software		
		16.0	**Factory Interface**		
	PW	16.1	Describe the function and location of the factory interface major system components		
	P2	16.2	Perform an FI robot mapping sensor adjustment		
	P2	16.3	Replace the pads on the FI robot blade		
	P2	16.4	Perform ADOe preventive maintenance		
	P2	16.5	Perform 300mm FI calibrations to all stations		

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		17.0	**Wafer Transfer**		
	PW	17.1	Locate the different types of wafer transfer mechanisms, including pneumatic, stepper, and servo motor mechanisms		
	PW	17.2	Understand the difference between a servo motor and stepper motor		
	PW	17.3	Understand the difference between an encoder and a resolver		
	P2	17.4	Perform wafer transfer mechanism maintenance, including cleaning, lubrication, replacement of vacuum seals, calibrations of lift sensors, and slot spacing verification		
	P2	17.5	Locate the loadcup wafer exchanger on the Reflexion LK and discuss its operation		
		18.0	**Plasma Theory**		
	PW	18.1	Define plasma		
	PW	18.2	Give at least three examples of a plasma		
	PW	18.3	List the three requirements for a plasma		
	PW	18.4	Explain the basics of a plasma		
	PW	18.5	Describe the results of a plasma		
	PW	18.6	Describe the effects of RF, magnetic, and electric fields on a plasma		
		19.0	**RF and DC Systems**		
	PW	19.1	Understand the use of RF and high voltage DC supplies for semiconductor manufacturing equipment		
	PW	19.2	Given an RF schematic, trace the RF signal path through semiconductor manufacturing equipment		
	PW	19.3	Locate and define the different ways that RF and DC supplies can be controlled		
	PW	19.4	State the safety hazards associated with RF and DC power		
	P2	19.5	Calibrate an RF generator		
	P2	19.6	Tune an RF system that uses a manually controlled matching network		
	P2	19.7	Replace an RF generator or DC power supply		
		20.0	**Lasers**		
	PW	20.1	Identify and define how lasers are used in semiconductor processing equipment		
	PW	20.2	Describe what a laser is		
	PW	20.3	Describe basic safety practices when working with and around lasers		
	PW	20.4	State the definitions of acronyms used with lasers		
	PW	20.5	Describe the criteria by which lasers are classified		

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	PW	20.6	Explain the differences between the four classes of lasers		
	PW	20.7	Describe the biological effects of lasers on the eyes and skin		
	PW	20.8	Explain the engineering control measures used with lasers		
	PW	20.9	Explain the administrative control measures used with lasers		
	P2	20.10	Locate the ComPLUS laser path and insert a safety filter		
	P2	20.11	Review the proper use of safety glasses with the ComPLUS		
		21.0	**Optical Components and Systems**		
	PW	21.1	Describe and define how optic lenses and sensor systems are used in semiconductor processing equipment		
	PW	21.2	Describe the types of optical components that are used in Applied Materials tools		
	PW	21.3	Describe how LCF and OTF function		
	PW	21.4	Explain what focus is when related to collected images		
	PW	21.5	Describe the concept of DOF when related to optical lenses		
	PW	21.6	Explain typical wafer protrusion sensor systems		
	PW	21.7	Explain how typical wafer mapping systems work		
	PW	21.8	Describe how break-the-beam sensors function and operate		
	PW	21.9	Describe the uses of CCD arrays in Applied Materials tools		
	D	21.10	Focus concept demonstration using the review mode of ComPLUS		
	P2	21.11	Calibrate the wafer protrusion sensor for the ADOe		
	P2	21.12	Calibrate the OTF or LCF sensors		
		22.0	**Software Control**		
	PW	22.1	Describe the different control system architectures used in Applied Materials tools		
	PW	22.2	Describe the different methods of communicating from the main controller of a tool to sub computers and subsystems		
	PW	22.3	Describe the purpose of the main controller software, subsystem software, and diagnostic software (chamber-based software, FI-based software)		
	PW	22.4	Describe the purpose and features of user IDs and user logins		

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	PW	22.5	Describe user interfaces, such as mouse, keyboard, touchscreen, and lightpen		
	PW	22.6	Describe the purpose of system constant files and configurable constants tables		
	PW	22.7	Describe and access technical support capabilities (ExpertConnect, RTA)		
	PW	22.8	Describe the purpose of process recipes		
	P2	22.9	Perform software PM procedures • Recipe backups • SysCon/configuration tables backup • Database backups • Antivirus installation and updates		
	P2	22.10	Perform software CM procedures • Installation of new software revisions • Reimaging of hard drives		
		23.0	**Abatement Systems**		
	PW	23.1	State the reasons that an inline scrubber or abatement system is used in semiconductor processing		
	PW	23.2	Identify the major components of abatement systems		
	PW	23.3	Identify the different abatement technologies for Manufacturing Systems		
	PW	23.4	Understand the safety hazards associated with abatement systems		
	P2	23.5	Locate the major components of an abatement system		

I agree that I have completed the training as indicated above.

STUDENT NAME: _____

STUDENT SIGNATURE: _____

I agree that the student has completed the training as indicated above.

INSTRUCTOR NAME: _____

INSTRUCTOR SIGNATURE: _____