EFSP Auxiliary ESL Curriculum

Semiconductor English

Instructor guide for advanced ESL learners working in semiconductor

Audience: semiconductor process engineers, yield engineers, product engineers, equipment engineers, fab supervisors, quality teams, test and packaging teams, foundry coordinators, supply planners, applications engineers, and technical program managers

Focus: A semiconductor English curriculum for wafer fabrication, lithography, process integration, deposition and etch, metrology, yield learning, cleanroom discipline, equipment uptime, packaging, reliability qualification, foundry communication, and customer pressure.

Designed for advanced ESL learners who already use professional English and need industry-specific terminology, realistic meetings, role-play pressure, careful pushback, and polished workplace outputs.

Teaching stance: this is language and workplace-communication training, not legal, medical, financial, safety, or regulatory advice. Instructors should connect every scenario to the learner's current company policies, local rules, and approved procedures.

Purpose and Course Logic

A semiconductor English curriculum for wafer fabrication, lithography, process integration, deposition and etch, metrology, yield learning, cleanroom discipline, equipment uptime, packaging, reliability qualification, foundry communication, and customer pressure.

Core language challenge

Advanced learners do not only need vocabulary. They need the ability to ask which standard applies, who owns the decision, what evidence is sufficient, what risk is being accepted, and how to disagree without sounding vague, defensive, or reckless.

Each module trains a realistic workplace pressure point with role-specific terms, decision language, pushback practice, and a written output learners can adapt to their own work.

Course objectives

- Use semiconductor terminology accurately in meetings, written updates, handoffs, escalations, reviews, and client or stakeholder conversations.
- Turn vague requests into specific questions about evidence, owner, deadline, constraint, risk, and decision rights.
- Push back on unsafe, unsupported, noncompliant, unrealistic, or poorly scoped proposals while preserving professional trust.
- Handle realistic dialogues from the field, including conflict, uncertainty, documentation gaps, customer or stakeholder pressure, and cross-functional disagreement.
- Produce concise workplace outputs: briefing notes, escalation updates, meeting scripts, risk memos, decision records, and follow-up messages.

Instructor Module Plans

Module 1. Wafer Fabrication Flow and Process Integration (90 minutes)

Explain the fab process as a controlled sequence of dependencies, not a simple production line.

Learners should be able to

- Use these terms accurately: wafer, fab, process flow, node.
- Explain the workplace tension: Process flow, route control, layer dependency, and integration risk must be confirmed before movement.
- Respond professionally when a stakeholder says: Release the lot to protect the customer schedule.
- Draft a usable lot-disposition recommendation with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A program manager asks why one wafer lot cannot skip a hold and move directly to the next module.

Release the lot to protect the customer schedule.

Process flow, route control, layer dependency, and integration risk must be confirmed before movement.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.
2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.

3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a lot-disposition recommendation.

Module 2. Lithography, Reticles, and Critical Dimensions (90 minutes)

Discuss patterning risk with enough precision for engineers and enough clarity for non-specialists.

Learners should be able to

- Use these terms accurately: lithography, photoresist, reticle, critical dimension.
- Explain the workplace tension: Reticle status, photoresist behavior, exposure conditions, metrology repeatability, and control limits need review.
- Respond professionally when a stakeholder says: Tell them the lithography module is under control.
- Draft a usable lithography risk update with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A customer asks whether a critical-dimension trend is only a measurement artifact.

Tell them the lithography module is under control.

Reticle status, photoresist behavior, exposure conditions, metrology repeatability, and control limits need review.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.
2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.
3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a lithography risk update.

Module 3. Deposition, Etch, CMP, and Process Windows (90 minutes)

Connect process module changes to downstream device performance.

Learners should be able to

- Use these terms accurately: deposition, etch, CMP, process window.
- Explain the workplace tension: Deposition uniformity, etch selectivity, CMP margin, and the qualified process window must be protected.
- Respond professionally when a stakeholder says: Approve the recipe because cycle time improves.
- Draft a usable process-window tradeoff memo with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A team wants to widen an etch recipe to improve throughput.

Approve the recipe because cycle time improves.

Deposition uniformity, etch selectivity, CMP margin, and the qualified process window must be protected.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.

2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.
3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a process-window tradeoff memo.

Module 4. Metrology, SPC, and Yield Learning (90 minutes)

Use data language that separates signal, noise, and urgent excursion.

Learners should be able to

- Use these terms accurately: metrology, SPC, yield, excursion.
- Explain the workplace tension: SPC trends, sampling change, tool history, defect signatures, and product mix must be separated.
- Respond professionally when a stakeholder says: Call it a bad lot and move on.
- Draft a usable yield-learning brief with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A dashboard shows yield loss after a new metrology sampling plan.

Call it a bad lot and move on.

SPC trends, sampling change, tool history, defect signatures, and product mix must be separated.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.
2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.
3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a yield-learning brief.

Module 5. Defect Density and Cleanroom Contamination (90 minutes)

Escalate contamination risk without creating blame or panic.

Learners should be able to

- Use these terms accurately: defect density, particle, cleanroom, contamination control.
- Explain the workplace tension: Defect density, cleanroom protocol, contamination source, containment, and affected-lot traceability require action.
- Respond professionally when a stakeholder says: Restart production and watch the next few lots.
- Draft a usable contamination containment note with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A particle excursion appears after maintenance in a critical bay.

Restart production and watch the next few lots.

Defect density, cleanroom protocol, contamination source, containment, and affected-lot traceability require action.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.
2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.
3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a contamination containment note.

Module 6. Equipment Uptime, Recipes, and Tool Matching (90 minutes)

Discuss equipment pressure without sacrificing process control.

Learners should be able to

- Use these terms accurately: tool uptime, preventive maintenance, recipe, tool matching.
- Explain the workplace tension: Tool uptime, preventive maintenance status, recipe qualification, tool matching evidence, and bottleneck risk must be balanced.
- Respond professionally when a stakeholder says: Move all lots to the second tool immediately.
- Draft a usable tool-qualification escalation with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A high-demand tool is repeatedly down and a second tool is almost matched.

Move all lots to the second tool immediately.

Tool uptime, preventive maintenance status, recipe qualification, tool matching evidence, and bottleneck risk must be balanced.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.
2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.
3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a tool-qualification escalation.

Module 7. Packaging, Test, and Reliability Qualification (90 minutes)

Explain post-fab risk using test and reliability language.

Learners should be able to

- Use these terms accurately: package, binning, burn-in, qualification.
- Explain the workplace tension: Package interaction, binning criteria, burn-in results, qualification status, and customer-use conditions are not interchangeable.
- Respond professionally when a stakeholder says: Ship the units because electrical test passed.
- Draft a usable qualification readiness update with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A product team wants to ship early units before reliability stress testing is complete.

Ship the units because electrical test passed.

Package interaction, binning criteria, burn-in results, qualification status, and customer-use conditions are not interchangeable.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.
2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.
3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a qualification readiness update.

Module 8. Foundry, Tape-Out, PDK, and Capacity Communication (90 minutes)

Handle customer and executive pressure around constrained foundry schedules.

Learners should be able to

- Use these terms accurately: foundry, tape-out, PDK, capacity allocation.
- Explain the workplace tension: Foundry allocation, PDK readiness, mask schedule, change freeze, and capacity allocation need documented assumptions.
- Respond professionally when a stakeholder says: Promise the date to protect the relationship.
- Draft a usable foundry customer update with facts, caveats, owner, and next step.

Customized scenario

Workplace pressure

A customer asks for a guaranteed tape-out and wafer-start date despite capacity constraints.

Promise the date to protect the relationship.

Foundry allocation, PDK readiness, mask schedule, change freeze, and capacity allocation need documented assumptions.

Classroom sequence

1. Terminology drill: define each term, then use it in one sentence from the learner's own role.
2. Risk map: identify the stakeholder, the decision, the evidence gap, the operating constraint, and the cost of being wrong.
3. Pushback ladder: move from clarifying question to evidence-based objection to consequence to decision request.
4. Output lab: draft and revise a foundry customer update.

Nomenclature and Jargon

These are classroom working definitions. Learners should adapt wording to their organization's policies, systems, and local regulatory environment.

Wafer Fabrication Flow and Process Integration

Term	Working meaning
wafer	Thin semiconductor substrate, usually silicon, on which integrated circuits are fabricated.
fab	Semiconductor fabrication facility where wafers are processed through manufacturing steps.
process flow	Ordered sequence of semiconductor manufacturing steps, layers, inspections, holds, and decision points.
node	Technology generation or process family, often associated with feature size, performance, density, and design rules.

Lithography, Reticles, and Critical Dimensions

Term	Working meaning
lithography	Patterning process that transfers circuit features to a wafer using light, masks, and photoresist.
photoresist	Light-sensitive material used in lithography to define patterns on a wafer.
reticle	Photomask used in lithography to project circuit patterns onto a wafer.
critical dimension	A measured feature size on a wafer that must stay within specification for device performance and yield.

Deposition, Etch, CMP, and Process Windows

Term	Working meaning
deposition	Process of adding material layers to a wafer by physical, chemical, epitaxial, or atomic-layer methods.
etch	Process that removes selected material from a wafer using wet chemistry or plasma-based methods.
CMP	Chemical mechanical planarization; a process that smooths wafer surfaces for later manufacturing steps.
process window	Range of process conditions under which results meet specification with acceptable margin.

Metrology, SPC, and Yield Learning

Term	Working meaning
metrology	Measurement discipline used to verify process, dimension, film, defect, and device characteristics.
SPC	Statistical process control; use of control charts and limits to monitor process stability.
yield	Share of wafers, die, units, or lots that meet requirements after manufacturing, test, or qualification.
excursion	Manufacturing event or trend outside expected control limits, specifications, or normal process behavior.

Defect Density and Cleanroom Contamination

Term	Working meaning
defect density	Number or rate of defects on a wafer, die, layer, lot, or process area.
particle	Small contaminant that can create defects, yield loss, reliability risk, or process instability.
cleanroom	Controlled manufacturing environment designed to limit particles, humidity, electrostatic risk, and contamination.
contamination control	Practices used to prevent particles, residues, metals, organics, moisture, or handling errors from affecting wafers or devices.

Equipment Uptime, Recipes, and Tool Matching

Term	Working meaning
tool uptime	Percentage of time equipment is available and qualified for production use.
preventive maintenance	Planned equipment service performed to reduce unplanned downtime, drift, contamination, safety risk, or tool instability.
recipe	Controlled equipment parameters used to run a process step on a wafer, lot, or tool.
tool matching	Effort to make similar manufacturing tools produce equivalent results within defined limits.

Packaging, Test, and Reliability Qualification

Term	Working meaning
package	Protective and electrical interface that connects a semiconductor die to a board or system.
binning	Sorting tested semiconductor units into performance, power, speed, or quality categories.
burn-in	Stress testing used to screen for early-life failures before product release or shipment.
qualification	Evidence-based approval that a process, product, tool, package, supplier, or change meets defined requirements.

Foundry, Tape-Out, PDK, and Capacity Communication

Term	Working meaning
foundry	Semiconductor manufacturer that fabricates chips for external customers or design companies.
tape-out	Final release of a chip design to the foundry for mask generation and fabrication.
PDK	Process design kit; foundry-provided design rules, models, and files used to design chips for a process.
capacity allocation	Decision process for assigning limited foundry, tool, test, or assembly capacity across products or customers.

Industry-Specific Meeting Moves

Situation	Useful language
Wafer Fabrication Flow and Process Integration	Before we commit, I want to confirm wafer, fab, the owner, and the evidence behind the decision. If process flow, route control, layer dependency, and integration risk must be confirmed before movement., I recommend we document the risk and agree on the next step.
Lithography, Reticles, and Critical Dimensions	Before we commit, I want to confirm lithography, photoresist, the owner, and the evidence behind the decision. If reticle status, photoresist behavior, exposure conditions, metrology repeatability, and control limits need review., I recommend we document the risk and agree on the next step.
Deposition, Etch, CMP, and Process Windows	Before we commit, I want to confirm deposition, etch, the owner, and the evidence behind the decision. If deposition uniformity, etch selectivity, cmp margin, and the qualified process window must be protected., I recommend we document the risk and agree on the next step.
Metrology, SPC, and Yield Learning	Before we commit, I want to confirm metrology, SPC, the owner, and the evidence behind the decision. If spc trends, sampling change, tool history, defect signatures, and product mix must be separated., I recommend we document the risk and agree on the next step.
Defect Density and Cleanroom Contamination	Before we commit, I want to confirm defect density, particle, the owner, and the evidence behind the decision. If defect density, cleanroom protocol, contamination source, containment, and affected-lot traceability require action., I recommend we document the risk and agree on the next step.

Situation	Useful language
Equipment Uptime, Recipes, and Tool Matching	Before we commit, I want to confirm tool uptime, preventive maintenance, the owner, and the evidence behind the decision. If tool uptime, preventive maintenance status, recipe qualification, tool matching evidence, and bottleneck risk must be balanced., I recommend we document the risk and agree on the next step.
Packaging, Test, and Reliability Qualification	Before we commit, I want to confirm package, binning, the owner, and the evidence behind the decision. If package interaction, binning criteria, burn-in results, qualification status, and customer-use conditions are not interchangeable., I recommend we document the risk and agree on the next step.
Foundry, Tape-Out, PDK, and Capacity Communication	Before we commit, I want to confirm foundry, tape-out, the owner, and the evidence behind the decision. If foundry allocation, pdk readiness, mask schedule, change freeze, and capacity allocation need documented assumptions., I recommend we document the risk and agree on the next step.

High-pressure pushback frames

- I understand the urgency. The risk is that we move faster than the evidence or process supports.
- I am not blocking the goal. I am naming the condition we need before the decision is safe and credible.
- If we accept this risk, we should name the owner, document the assumption, and define the trigger for escalation.
- That may be possible, but not under the current scope, timeline, or approval path.
- Let's separate what we know, what we assume, and what still needs confirmation.

Assessment and Coaching

Performance rubric

Skill	Developing	Proficient	Strong
Terminology	Recognizes terms but uses them loosely.	Uses field terms accurately in context.	Defines terms, connects them to evidence, and explains decision impact.
Pushback	Disagrees vaguely or avoids disagreement.	Names concern with evidence and next step.	Balances urgency, relationship, risk, owner, and decision rights.
Scenario judgment	Focuses on one stakeholder's preference.	Identifies constraint, risk, and process.	Guides the group toward a documented, realistic decision.
Written output	Writes general summaries.	Produces clear notes with facts and owner.	Creates concise, decision-ready workplace communication.

Source orientation

- Company process-control plans, fab SOPs, and manufacturing quality procedures.
- SEMI, JEDEC, AEC-Q, and customer qualification expectations where applicable.
- Foundry documentation, PDK release notes, customer quality agreements, and approved communication procedures.
- The learner's own company policies, SOPs, contracts, systems, templates, and approved communication standards.