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INDEX JUNIOR TECHNICIAN DEVELOPMENT PROGRAM
COURSE SYLLABUS

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OVERVIEW

The INDEX Junior Technician Development Program (JTDP) equips participants with the foundational knowledge and skills they need for a successful career in the machine tool industry. INDEX designed this program as an optimal career transition for people who lack direct experience with machine tools, but possess technical aptitude and a mix of education and general work history that meets the program prerequisites. As part of our iXacademy platform for internal and external training, the JTDP incorporates a blend of traditional and hands-on instruction to create a maximally engaging experience.

Throughout the program, Junior Technicians gain a solid understanding of INDEX CNC machine maintenance, repair, and geometry. The training follows a standardized curriculum, with each topic divided into individual lessons focusing on specific learning objectives. Using a five-phase system that employs a "crawl, walk, run" methodology, the program progressively builds proficiency in the critical skills necessary for Field Service Technicians. Lessons include a mix of lecture-based content to introduce theory and practical hands-on exercises for skill application. Each topic concludes with assessments to evaluate comprehension, and the program culminates in comprehensive written and practical exams to ensure mastery of the material.

By the end of the course, Junior Technicians are proficient in the following areas:

- Explaining the structure and basic operation of INDEX machines for installation, maintenance and alignment of components and assemblies.
- Explaining fundamental electrical theory and performing troubleshooting.
- Explaining basic hydraulic and pneumatic theory, including troubleshooting techniques.
- Interpreting electrical, hydraulic, and mechanical schematics and symbols.
- Diagnosing and troubleshooting ancillary systems and bar feeder operations.
- Conducting full INDEX CNC machine geometry inspections and corrections.

Upon graduation, Junior Technicians are ready to collaborate with INDEX Senior Field Service Technicians, who provide ongoing guidance and mentorship. Graduates also possess the capability to independently diagnose and repair a variety of INDEX CNC machines, marking a significant step in their professional growth at INDEX and their career.

PREREQUISITES

Demonstrated aptitude for one of three areas of concentration:

- **Mechanical Knowledge and Experience**
  Seeking individuals with mechanical knowledge acquired through professional experience or personal projects. This includes, but is not limited to, skills acquired from working on cars, maintaining farm equipment, repairing machinery, or similar hands-on activities that demonstrate an aptitude for mechanical systems and troubleshooting.

- **Electrical Knowledge and Experience**
  Seeking individuals with electrical knowledge gained through professional experience or personal projects. This can include hands-on activities such as wiring a house, working on vehicles, maintaining electrical systems on a farm, troubleshooting circuits, or similar tasks that demonstrate practical understanding and skills in electrical systems and components.

- **Programming of CNC Machine Tools**
  Seeking individuals with experience programming CNC machine tools, whether gained professionally or through personal projects. This includes tasks such as setting up and running CNC routers, operating 3D printers, or creating basic machining programs. Practical experience in understanding machine operations, toolpath creation, and troubleshooting CNC equipment is highly valued.

APPLICABLE MACHINE TYPES

All INDEX machines

PHASE 1: Field Service Essentials: Travel & Administration

Field Service Technicians encounter several unique challenges that may be entirely new experiences. These challenges are often specific to the demands of working in the field, requiring adaptability, problem-solving skills, and the ability to manage various responsibilities. During this initial phase, Junior Technicians are introduced to the "field" environment, which includes extensive travel to different locations. This phase also focuses on familiarizing Junior Technicians with the administrative requirements and logistical tasks essential for every Field Service Technician's role, such as reporting, documentation, and effective communication with customers and team members.

At this stage, Junior Technicians are not expected to acquire machine-specific knowledge. Instead, the emphasis is on building a strong foundation in the operational and procedural aspects of the role. This phase is designed to last between 30 and 60 days, depending on the start date. However, it is essential to note that all Junior Technicians, regardless of their start date, must complete the Phase 1 assessment as part of the program. The assessment ensures that all participants have met the foundational learning objectives necessary to graduate.

This initial phase lays the groundwork for a successful career as a Field Service Technician, preparing Junior Technicians for the challenges and opportunities they encounter as they progress through the program and beyond.

Learning Objectives

Module 1: Field Service Administration
By the end of module 1, Junior Technicians are able to:

- Explain the purpose and function of a service report and complete it accurately
- Properly document time worked, ensuring compliance with company policies and accurate record-keeping.
- Book travel, including selecting the appropriate travel arrangements and following company guidelines.
- Submit Expense Reports, ensuring proper documentation and adherence to company reimbursement policies.

Module 2: Field Service On-the-Job Training (OJT)
By the end of module 2, Junior Technicians are able to:

- Effectively manage the demands of extensive travel, demonstrating the ability to navigate logistical challenges and maintain professionalism in various work environments.
- Apply classroom learning to real-world field scenarios, gaining practical experience in the role under supervision and mentorship.

Assessments

- Complete a written exam demonstrating a thorough understanding of field service administration responsibilities and processes.

PHASE 2: Foundations of CNC Systems & Teamwork

Also known as the "Foundation" phase, Phase 2 is designed to introduce Junior Technicians to the fundamental principles of CNC machines, including their mechanical, electrical, hydraulic, pneumatic, and geometric systems. This phase provides a comprehensive learning experience through a combination of online instruction, classroom learning, and hands-on training. Phase 2 establishes a strong foundation that prepares Junior Technicians for more advanced tasks and responsibilities in the field.

Throughout Phase 2, Junior Technicians learn both individually and in group settings, allowing for a balanced approach to skill development. Emphasis is placed on teamwork and collaborative learning, as Junior Technicians are encouraged to support one another, much like Field Service Technicians must do in real-world scenarios. This focus on team-based learning not only enhances the educational experience but also simulates the collaborative environment they encounter in the field, where communication and teamwork are essential for success.

By engaging in this collaborative learning environment, Junior Technicians begin to understand the interconnectedness of various systems within a CNC machine and gain the confidence to troubleshoot, repair, and optimize these systems effectively. The goal of Phase 2 is to ensure that Junior Technicians

are well-equipped with both the theoretical knowledge and practical skills needed to perform at a high level as they continue their training and transition into more advanced phases.

Learning Objectives

Module 1: Introduction to CNC machining

By the end of module 1, Junior Technicians are able to:

- Identify the basic components of a CNC machine.
- Explain the order of operations for manufacturing parts on a CNC machine.
- Apply the Cartesian coordinate system to machine operations.
- Describe the principles and functions of motion control systems.

Module 2: Mechanical

By the end of module 2, Junior Technicians are able to:

- Apply mechanical safety practices to mitigate dangers during machine tool operations.
- Explain the principles of force, torque, work, power, rotation and tensions as they relate to machine tools.
- Demonstrate proper techniques for using hand tools in machine repair.
- Identify mechanical components and describe their functions within a CNC machine.
- Perform basic alignment proecures for mechanical motion components in CNC machines.

Module 3: Geometry

By the end of module 3, Junior Technicians are able to:

- Explain the Cascade of Accuracies and its significance in machine performance.
- Describe the precision standards that INDEX machines are designed to maintain.
- Demonstrate proper use of indicators and test tooling for accurate measurements.
- Analyze geometry data to identify potential adjustment or corrections needed for optimal performance.

Module 4: Electrical

By the end of module 4, Junior Technicians are able to:

- Apply electrical safety practices and hazard mitigation techniques to ensure a safe work environment.
- Explain fundamental electrical principles, including AC/DC theory, Ohm's Law and Kirchhoff's Law, and describe their relevance to machine tools.
- Utilize electrical test instruments and INDEX electrical schematics to identify components and trace power and logic signals.
- Demonstrate the ability to replace and adjust key electrical components, such as axis and spindle drives, and axis encoders.
- Explain the basics of IT networking principles and their applications in machine tool technology.
- Explain and apply industrial communication protocols, including PROFINET and PROIBUS.

Module 5: Siemens
By the end of module 5, Junior Technicians are able to:

- Explain the overall structure and components of the Siemens system, including its functionality and connections.
- Demonstrate the ability to connect the system and verify its proper operation.
- Utilize diagnostic tools, LED indicators, and pushbutton tests to identify and troubleshoot system issues effectively.
- Perform data transfer operations, including saving, restoring and managing system data securely.
- Analyze diagnostic information from PLCs, alarms, NC parameters, PROFIBUS, and drives to identify and resolve operational challenges.

Module 6: Hydraulic/Pneumatic
By the end of module 6, Junior Technicians are able to:

- Identify fluid and gas power hazards and apply appropriate safety practices.
- Explain Pascal's Law and its application to pressure-to-motion conversion.
- Describe the functions and operations of hydraulic and pneumatic devices.
- Identify and differentiate hydraulic and pneumatic components.
- Utilize schematics effectively for troubleshooting and repairing hydraulic and pneumatic systems.

Assessments

- Upon completion of each module, complete a written and practical exam demonstrating a full understanding of its subject matter.
- Complete a comprehensive written and practical exam demonstrating the ability to apply foundational principles.

PHASE 3: Expanding Knowledge Beyond the Foundations

Building on the foundational principles of INDEX machines established in previous phases, this stage of training is designed to broaden the Junior Technician's skill set by introducing them to basic programming and the essential ancillary equipment associated with CNC lathes. In this phase, Junior Technicians not only enhance their understanding of machine operations but also gain hands-on experience with critical components such as bar feeders, chillers, and coolant systems.

Through a combination of theoretical learning and practical application, this phase covers ancillary equipment and programming. Junior Technicians learn about the components and functions of the coolant system, different types of coolants used at INDEX, and how to connect and operate bar feeders. This includes the skills needed to maintain and repair essential systems like chillers and coolant systems. Junior Technicians also build off their foundational knowledge of the Siemens control system to develop programming skills. They learn the basic operation of the Siemens Solution Line control and delve deeper into the essential building blocks for programming a CNC machine tool. They gain

proficiency in writing G and M codes to perform complex multi-axis movements and other fundamental machine functions.

By the end of this phase, Junior Technicians are equipped with both the technical and programming knowledge necessary to operate and maintain a variety of INDEX machines, as well as troubleshoot and repair key ancillary systems.

Learning Objectives

Module 1: Ancillary equipment
By the end of module 1, Junior Technicians are able to:

- Describe the components and functions of a coolant system.
- Explain the differences between oil-based and water-based coolants used at INDEX.
- Connect and operate bar feeders.
- Maintain and repair chiller systems
- Maintain and repair coolant systems.

Module 2: Programming
By the end of module 2, Junior Technicians are able to:

- Perform most functions on Siemens Solution Line controls.
- Explain the foundational principles for programming INDEX machines.
- Explain the basics of writing G and M codes on INDEX machines to perform basic and complex multi-axis movements.
- Explain how to use pre-programmed cycles to perform geometry and other vital alignments on INDEX machines.

Assessments

- Complete a written exam demonstrating a thorough understanding of ancillary equipment maintenance and programming basics.
- Complete a practical exam demonstrating the ability to apply skills in ancillary equipment maintenance and basic programming on INDEX machines.

PHASE 4: Machine Maintenance and Field OJT

This phase, known as the "sprint" phase, marks the culmination of formal training at INDEX USA. Here, Junior Technicians apply all of the knowledge they've gained so far to focus on the mechanical and electrical maintenance of a specific machine series, based on the current needs of INDEX. The phase begins with a brief period in the classroom and on the floor to deepen their understanding of machine maintenance and repair. Following this, Junior Technicians transition to On-the-Job Training (OJT) in the field, working alongside Senior Field Service Technicians to tackle real-world challenges that

test their skills and solidify their learning.

In this phase, any Junior Technician struggling with certain concepts or tasks has access to remediation, working closely with the instructor for clarification. By the end of the phase, Junior Technicians gain critical experience in troubleshooting, maintenance, and field service activities, and are evaluated through both written and practical assessments to ensure their readiness for the field.

Learning Objectives

Module 1: INDEX machine specific maintenance
By the end of module 1, Junior Technicians are able to:

- Apply advanced maintenance and repair skills to INDEX machines, including mechanical and geometric aspects.
- Demonstrate the ability to troubleshoot and resolve issues specific to INDEX machines effectively.
- Apply knowledge of geometry principles to optimize the operation of INDEX machines.
- Exhibit proficiency in diagnosing and addressing common mechanical and technical problems on INDEX machines.

Module 2: Field service OJT
By the end of module 2, Junior Technicians are able to:

- Demonstrate the ability to critically think through issues in a dynamic environment.
- Demonstrate effective customer interaction skills while consistently adhering to INDEX BEST standards.
- Exhibit comprehensive knowledge of fundamental field service activities.

Assessments

- Complete a final comprehensive written exam demonstrating a complete understanding of all phases of instruction.
- Complete a final comprehensive practical exam in which all acquired skills are applied to successfully complete tasks.

PHASE 5: Capstone

This final, exciting phase offers Junior Technicians a unique and invaluable opportunity to visit INDEX's manufacturing facilities in Germany and/or Slovakia, where they experience firsthand how an INDEX machine is built from the ground up. This capstone experience is designed to challenge Junior Technicians to apply everything they've learned throughout the program by actively participating in the machine assembly process. They work alongside experts, gaining critical insights into the construction and engineering of cutting-edge CNC machines.

During this immersive experience, Junior Technicians are expected to demonstrate their expertise in all aspects of a Field Service Technician's role, ensuring they can seamlessly integrate their technical skills with operational excellence. Furthermore, this phase emphasizes the importance of building strong professional relationships with their trainers and mentors in Germany. These connections are vital after graduation, as Junior Technicians rely on these resources to navigate real-world challenges and continue their growth in the field. This is the ultimate opportunity to solidify their knowledge and skills before launching into their careers as highly skilled Field Service Technicians.