

# Flexible Manufacturing System (FMS) Training Program

Bridging the Gap Between Classroom and Industry 4.0

Intelitek's Flexible Manufacturing System (FMS) training solutions are designed to help teach proficiency in relevant skills and introduce technical and engineering classrooms to the industrial automation and industry applications needed in modern manufacturing plants.

Intelitek FMS is:

- Industry 4.0 focused training
- A multi-faceted training solutions incorporating a variety of skills and toolsets to qualify students for industry
  - Fundamentals of manufacturing
  - Machining for subtractive manufacturing
  - Robotics & materials handling
  - Machine vision & quality control
  - Storage and materials handling
  - Mfg. integration with mobility systems, integrated manufacturing, MRP
- An integrated program including curriculum that encompasses design, hands-on experience, project-based learning, and theory to deliver job ready graduates for industry
- A flexible solution with mix and match training modules, skillsets and hardware to create a comprehensive manufacturing program

The training integrates and can be complemented with automation, and mechatronics training as well as industry certifications.

**Flexible solution for educating and training students in the principles and technologies of advanced manufacturing**



TECH LEARNING  
CREATIVE THINKING  
CAREER SKILLS

intelitek 



# Flexible & Integrated Manufacturing Training

TECH LEARNING  
CREATIVE THINKING  
CAREER SKILLS

intelitek

Integrated Manufacturing is the cornerstone of modern manufacturing process and can comprise of several key components: Build around a production machine, an FMS can include robotic arms, automated storage and retrieval systems (ASRS), materials handling and assembly apparatus, quality control elements, automation control, and design and operating software.

To educate students about how to design and operate an FMS system and to bring them to a level they are job ready, intelitek offers skill and task based curriculum integrated with education enhanced software and this broad range of hardware options.

## FMS Components

### 1 Machining

Education optimized industrial CNC routing, milling, lathes and plasma cutting machines are used to learn operation and advanced programming for manufacturing.

### 2 Industrial Robotics

Safe industrial robotic arms enable students to learn robotic operation, robotic programming and advanced system integration.

### 3 Automation and Sensors

Adding industrial components to automate, control and manage the manufacturing process like vision sensors, motion and touch sensors, Programmable Logic Controllers (PLCs), and more, expand the scope of the students system understanding.

### 4 Integration Accessories

Accessories and automation components are integrated in the manufacturing cells to enhance the functionality. By adding conveyors, slide-bases, storage, feeders, safety lights, lock out / tag out switches and inspection and assembly stations, the cell can be expanded and automated using PLCs and ERP s/w.

### 5 PLCs

Using a PLC (Programmable Logic Controller), students learn to control and monitor the flow of the workcell. Integrating the machine, robot, accessories and sensors just like a real factory floor environment.

### 6 Design and Programming S/W

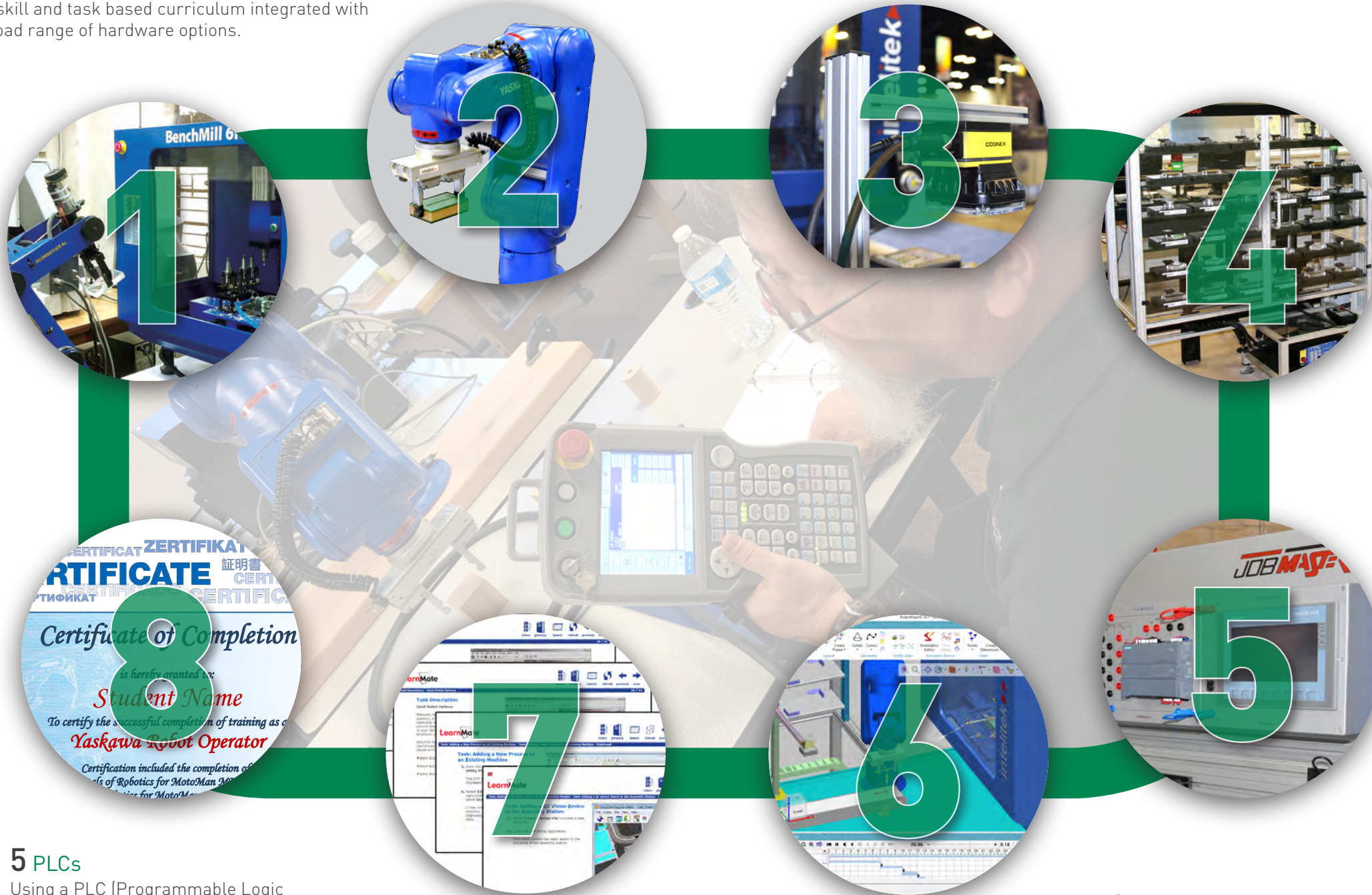
Intelitek and industry s/w applications are used to design, build, simulate and operate the manufacturing cell. Students learn to use and integrate multiple software and hardware components.

### 7 Curriculum & Projects

Self-paced and instructor led training modules delivered online are integrated with the hardware and applications and aligned to industry standards and competencies. Intelitek courseware has been developed based on industry input over more than 35 years.

### 8 Certification

Graduates of programs can obtain industry certifications from leading vendors that are testaments to their job readiness and recognized by employers worldwide.



## Skills Learned

- Computers and Electronics
- CNC Machine Operator / CNC Machine programmer
- Robotics Operator / Robotics Programmer
- Manufacturing Processes and Definitions
- Simulation and Control Software
- Part Definitions and Parts Tracking
- Inventory Control
- Equipment/Product Testing
- Material Handling
- Mechanical Maintenance
- Production Control
- Production Planning
- Production Scheduling
- Work Flow Management
- Operation Monitoring
- Critical Thinking
- Troubleshooting
- Time Management
- Operations Analysis
- Integrated Production
- Location Planning
- Quality Control
- Multi-Level Assembly
- Resource Planning



# How Intelitek Manufacturing Training Solutions Benefit Students

Advanced Manufacturing Systems help businesses to create better products, become more efficient, and increase revenue as time goes on. Teaching these skillsets to students early on will serve to prepare them for their transition into industry.

## Complete Training Solution

Intelitek training systems provide students hands-on experience with industrial level equipment and applications within a lab environment. The modularity and flexibility of the training allows it to be configured into an educational program that best suits a school's needs and budget. Training solutions from Intelitek are supplied as turnkey solutions, together with professional development, installation.

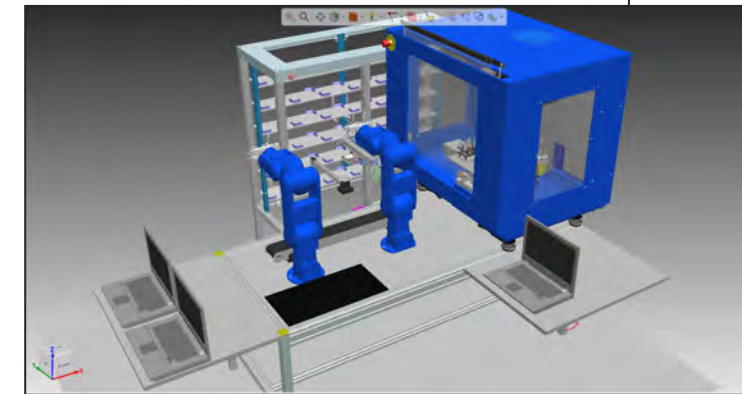
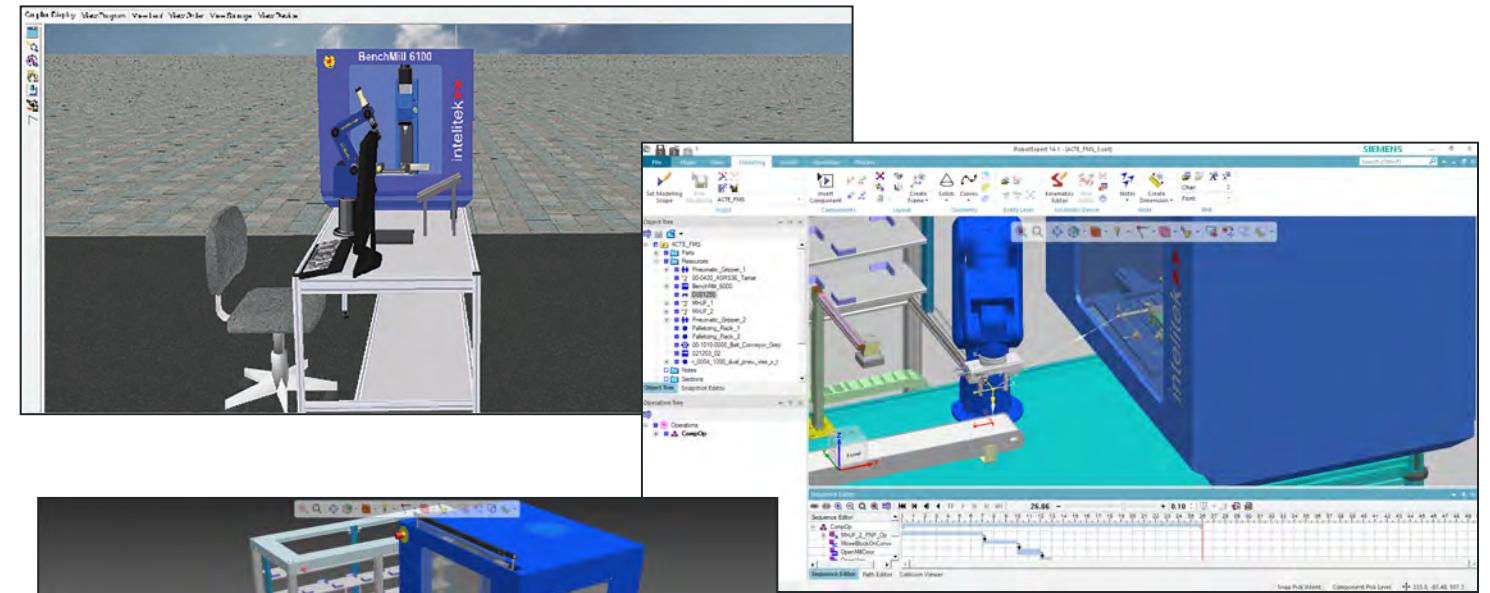
## Supports Your Curriculum

Intelitek Training integrates with stand-alone disciplines like Mechanical Engineering, Electrical Engineering, and Manufacturing Engineering as well as cross-disciplinary programs like mechatronics, informatics and industrial engineering. Industrial level hardware combined with configuration and simulation software and interactive E-learning content makes Intelitek training unique.

## Industry Aligned Training

Intelitek delivers a complete training package optimized for education and aligned with industry. The program is based on decades of collaboration with industry and education partners and the self-guided or instructor led curriculum align with industry defined competency requirements. The components in the Intelitek solutions are equipped with educational yet fully industry ready hardware components. As they learn, students use simulation software to trial machining, robotics and integrated flexible manufacturing cells to gain proficiency in the management and integration of automated manufacturing processes.

TECH LEARNING  
CREATIVE THINKING  
CAREER SKILLS



Simulation, design, optimization and programming software is integrated into the training program

## Program Examples:

### Manufacturing System Integration Level I

**Robotics Automation Technology\*** includes basic robotics expanded with materials handling, sensor technology, and PLC programming offering an integrated PBL approach to flexible manufacturing.

| Components:                     | Related Curriculum                   |
|---------------------------------|--------------------------------------|
| ■ ScorBot ER-4U Robotic Arm     | ■ Fundamentals of Robotics           |
| ■ Conveyor                      | ■ Materials Handling                 |
| ■ Vision sensors                | ■ Machine Vision and Quality Control |
| ■ Motion and proximity sensors  | ■ PLC programming                    |
| ■ Parts feeders/Storage         |                                      |
| ■ PLC controller                |                                      |
| ■ Safety and control components |                                      |



### Manufacturing System Integration Level II

This **basic flexible manufacturing configuration** combines subtractive manufacturing, robotics and materials handling simulating a fully functional manufacturing cell. Built around a robot arm and milling machine, this solution combines with various mobility options for an advanced PBL learning solution.

| Components:                                 | Related Curriculum         |
|---|----------------------------|
| ■ ScorBot ER-4U or MotoMan MHJF Robotic Arm | ■ Fundamentals of Robotics |
| ■ BenchMill 6100 CNC Milling Machine        | ■ CNC Milling Fundamentals |
| ■ Automatic Tool Changer                    |                            |
| ■ Gravity Parts Feeder                      |                            |

### Manufacturing System Integration Level III

This is an **expanded flexible manufacturing cell setup** that includes a mobility system (Linear Slide Base) and two machines (CNC Mill and CNC Lathe). Configuration supports advanced curriculum as well as work projects that can be completed using the configuration.

| Components:                                 | Related Curriculum                |
|---|-----------------------------------|
| ■ ScorBot ER-4U or MotoMan MHJF Robotic Arm | ■ Robotics Fundamentals           |
| ■ BenchMill 6100 CNC Machine                | ■ Advanced Robotics               |
| ■ Automatic Tool Changer                    | ■ CNC Milling Fundamentals        |
| ■ Gravity Parts Feeder                      | ■ CNC Turning Fundamentals        |
| ■ CNC BenchTurn 7100                        | ■ Intro to Advanced Manufacturing |
| ■ Workbench                                 |                                   |
| ■ Linear Slide Base                         |                                   |
| ■ Pneumatic Feeder                          |                                   |
| ■ Engraving Package                         |                                   |

### Manufacturing System Integration Level IV

Using the hardware platform of the Level II or Level III package, the level IV options add **advanced integration and multi-cell integration** options. Here students can build a more sophisticated manufacturing cell or even create a multi-stage manufacturing process.

| Components:                                      | Related Curriculum                   |
|--|--------------------------------------|
| ■ Level II or Level III manufacturing cells plus | ■ Fundamentals of Robotics           |
| ■ Vision sensors                                 | ■ Advanced Robotics                  |
| ■ Motion and proximity sensors                   | ■ CNC Milling Fundamentals           |
| ■ Parts feeders                                  | ■ CNC Turning Fundamentals           |
| ■ Automated Storage                              | ■ Intro to Advanced Manufacturing    |
| ■ PLC controller                                 | ■ Materials Handling                 |
| ■ Safety and control components                  | ■ Machine Vision and Quality Control |
|  | ■ PLC programming                    |



# Flexible Manufacturing System Elements

Manufacturing workcells or machine tending stations found in automated advanced manufacturing typically involve a robotic arm that interacts with CNC machines, assembly stations and/or quality control stations and perform part manipulation tasks. Cells are expanded with mobility components like conveyors or a linear slidebase to create a larger work area and more flexibility of motion.

Intelitek Advanced Manufacturing Training include these components and can be flexibly constructed from some of the following:

## CNC Machining

- BenchMill 6x00 CNC Milling Center
- BenchTurn 7x00 CNC Turning Center
- BenchRouter 1x00 CNC Router
- ProMill 8x00 CNC Milling Center
- ProTurn 9x00 CNC Turning Center
- ProRouter 2x00 CNC Router
- Plasma Cutter Pro
- CNCBase CNC Programming Software
- CNCMotion CNC Simulation Software
- SpectraCAD CAD Design and Simulation Software
- SpectraCAM CAM Simulation Software

The Intelitek CNC Machines and software are versatile PC-based machining centers designed for classroom use that enable educators to deliver robust instruction in computer numerical control and advanced manufacturing training for students.

The classroom optimized machines includes safety features for learners while delivering industry compatible operation and programming.

The CNC systems requires no assembly, arriving at your facility ready to run on an Ethernet port on a standard PC, and fit comfortably into any classroom, without sacrificing features.



TECH LEARNING  
CREATIVE THINKING  
CAREER SKILLS

intelitek

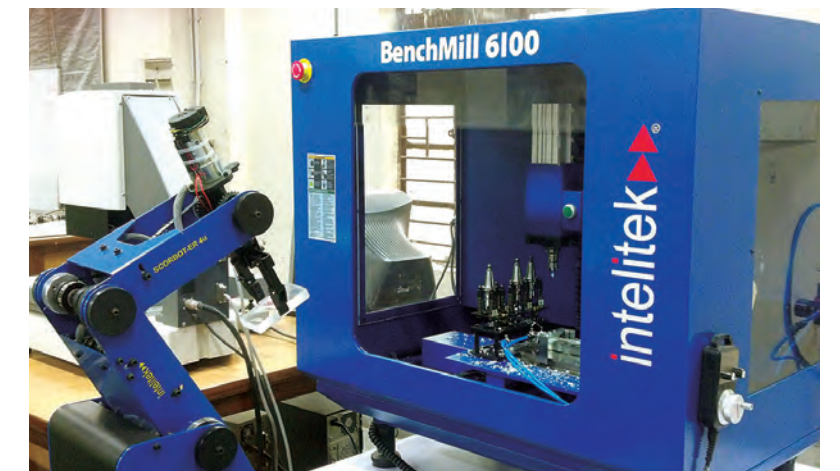
## Multi-Axis Materials Handling Robotic Arms

- ER-4U 5 Axis Robot
- MotoMan MHJF 6 Axis Robot
- MotoMan GP8 6 Axis Industrial Robot
- RoboCell Programming and Simulation Software

The Intelitek and Yaskawa robotic arms are versatile and reliable robotic systems for educational use.

The arms can be mounted on a tabletop, pedestal, or linear slidebase. The robot's speed and repeatability make them highly suited for both stand alone operations and integrated use in automated workcell and FMS applications such as CNC machine tending, assembly, quality control and robotic welding.

The robots offers superior performance in small part applications such as assembly, dispensing, packaging, material handling, and machine tending.



## Accessories and Add-Ons

There is a wide variety of add ons and accessories used to build manufacturing cells and for projects in the classroom. The integration of these accessories is what adapts simple machining or robotics into an FMS. Building these systems is the valuable hands on learning students will take with them to industry.

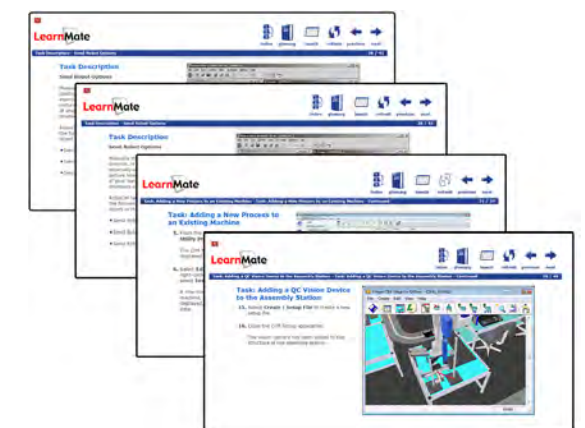
Accessories include:

- Tables for machines and robots
- Conveyor belts
- Parts feeders – gravity or pneumatic
- Linear Slide Bases for robots
- Linear positioning tables and XY tables
- Pneumatic vices and tool changers (ATCs)
- ASRS (automated storage and retrieval systems)
- Sensors (motion/proximity/etc.)
- PLCs (Siemens or Allen Bradley)
- Vision sensors from Cognex

## FMS Related Manufacturing Training Curriculum from Intelitek

Intelitek training courses include introductory courseware for manufacturing, provide students with an overall understanding of how CNC machining and robots work in an industrial environment, and comprehensive FMS and CIM courseware. Courses include:

- CNC Milling
- CNC Routing
- CNC Turning
- Fundamentals of Robotics
- Advanced Robotics
- Robotics and Materials Handling
- Machine Vision and Quality Control
- PLC programming
- Introduction to Advanced Manufacturing
- Introduction to Lean Manufacturing
- Flexible Manufacturing Systems (FMS)
- Computer Integrated Manufacturing



## Intelitek Certification

Industry grade certification is a plus on any student's resume. Intelitek has partnered with leading manufacturers in industry to develop certifications for graduates of training programs that are relevant and revered by employers.

For employers, Industry Certifications provide validation and confidence when picking candidates.

### **Yaskawa MotoMan Robotics Certification**

Students who complete the robotics curriculum and training with the Yaskawa MotoMan robot can take a certification test and become Yaskawa Robot Operator or Yaskawa Robot Programmer Certified.

### **Cognex Machine Vision Certification**

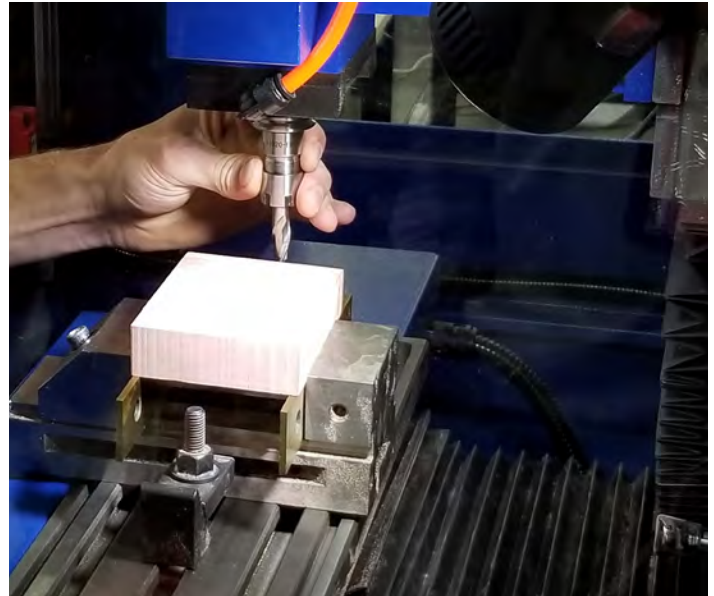
Intelitek has developed a machine vision and quality control training program and certification with Cognex. By completing the training and hands on labs with the Cognex vision sensor, students can receive the Machine Vision with Cognex Certification.

### **Siemens Robot Expert Certification**

Intelitek integrates with and offers training for the Siemens PLM RobotExpert design software for advanced 21st century industrial manufacturing. The Manufacturing Processes with RobotExpert training concludes with the Certification test to earn the Certified RobotExpert Designer Certification.

### **Production Technician Certifications**

A variety of industry certifications for technicians in manufacturing, designed to assess and certify the skills of front-line manufacturing production workers, are available. Intelitek FMS serves as a comprehensive certification prep program enhanced by the integration of manufacturing elements to expand the theory with hands-on experience.



## Project Based Learning (PBL)

Project based learning, also called Learning by Doing, is used extensively in Intelitek learning programs where students learn by designing, creating and building a product or process. Through project based learning, students learn to implement the theory, operate the equipment and validate the results of the topics they have been studying in class. This is real work experience and on-the-job hours that will help them integrate into the workplace after completing their training.

Projects enable students to work in groups in an immersive instructional experience with the common goal of developing solutions to relevant scenarios. Students develop communication, time-management and leadership skills while also learning core engineering principles

### **Project Examples Available for FMS Workcells:**

Intelitek sponsor the manufacturing technology and industrial robotic technology competitions for the annual SkillUSA competitions. The projects used in past competitions are made available for teachers to use in the classroom.

Examples of Machining Projects:

- Four-Cavity Mold
- Brass Cannon
- Planetary Gearbox
- CO2 Car
- Chess Set
- Golf Putter
- Precision Measuring Device
- Yo-Yo



Contact Us:

**intelitek** 

Toll Free: 800-221-2763  
Phone: 603-413-2600

Email: [info@intelitek.com](mailto:info@intelitek.com)  
[www.intelitek.com](http://www.intelitek.com)