Advanced Manufacturing
FMS and CIM Solutions
Bridging the Gap Between Classroom and Industry

Modular and flexible solutions for educating and training students in the principles and technologies of advanced manufacturing

Smart Factories and Industry 4.0 embody the transformation at the forefront of modernizing manufacturing processes to keep competitive in this fast changing world. Employers are now looking for workers who are tech literate, process savvy, natural problem solvers and take a role in the ongoing design and improvement of manufacturing systems.

Intelitek FMS and CIMflex solutions are designed to introduce higher levels of learning in vocational and engineering classrooms from middle school through post secondary environments to create skilled workers with the capabilities needed in modern plants.

Intelitek integrated curriculum encompass design, hands-on experience, project based learning and theory to deliver job ready graduates for industry.
FMS and CIM Learning Solutions
Intelitek blended learning solution for advanced manufacturing encompasses a broad set of tools and courses that help develop the skills that are relevant and in high demand in industry.

Training includes:

- **Robotics & Machining** – classroom optimized industrial robots and CNC machines
- **Integrated Manufacturing** – including automation, instrumentation and control systems
- **eLearning** – covering automation, PLCs, sensors, robotics, machines, maintenance and more
- **System Integration** – teaches how to use these complex components in a flexible learning lab
- **LearnMate LMS** – decentralized class and curriculum management

Low Floor, High Ceiling
FMS and CIM from Intelitek is great for beginners and experts. Newbies start with individual trainers or the base FMS turnkey solution, while more advanced students can expand and extend the system and its capabilities with a custom designed CIM solution.

Integrated Simulation
Intelitek’s LearnMate LMS and custom software take the learning experience beyond the classroom. With our integrated simulation that can be used in or outside of the classroom, students enjoy the immediate feedback that allows them to program and verify their designs even when outside the school.

Stand Alone Operation
All the components of the system like the robot arm or the CNC mill operate independently. This allows students to work on different technologies, and later integrate them to work as an automated cell. For the teacher, when combined with the simulation software, this provides efficiency, scaleability and higher output.

Comprehensive Blended Educational Solution
Training includes eLearning content that allows students to study anytime, anywhere and at their own pace. The programming of the system, online simulation tools and hands-on projects are a part of the curriculum delivering maximum teaching efficiency. Teachers can use the LMS to monitor and grade students as they progress.

Flexible Solution
Intelitek FMS and CIM combinations are designed to be flexible in their setup allowing educators to keep students interested and challenged through easy reconfiguration and simple expansion.
Your Challenge, Our Solution

Intelitek Advanced Manufacturing training solutions provide high schools, community colleges, universities and industrial training programs a comprehensive, cost-effective training system. Select the configuration that best meets your educational plan and fits your budget, from basic to comprehensive systems. The hardware and software seamlessly integrates into existing solutions and the open configuration allows you to expand your system at any time to maximize both students’ experiences and organizational investments.

Preconfigured or Custom Packages for Rapid Classroom Integration

- Industry-standard hardware and open architecture software that enable simulation of automated production operations, such as robotic assembly, CNC machining, and quality control.
- An open software environment that enables online tracking of FMS/CIM processes, including ERP capabilities, and 3D simulation of the entire process.
- Classroom-friendly lab equipment that ensures safety and ease of use.
- Intelitek also offer custom designs, installation, professional development and technical support.

Competencies

FMS and CIMflex configurations are designed to teach students a wide range of relevant and in-demand competencies.

Students will learn to:

- Develop state-of-the-art machine operation skills
- Develop, verify and run G&M Code CNC programs
- Develop robotic programs
- Develop manufacturing programs by recording precise robotic positions, accurately machining parts, and synchronizing mill and robot operation
- Have the machines communicate in a true FMS/CIM integration like those found in industry

Skills

- Computers and Electronics
- CNC Machining
- Robotics
- Processes and Definitions
- Simulation and Control S/W
- Part Definitions
- Parts Tracking
- Inventory Control
- Data Entry
- 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

Projects

Using machining, robotics, materials handling and other parts of the FMS/CIM environment, students can build real products. Intelitek offer some sample projects for classes to implement.

- Brass Cannon
- CO2 Car
- Golf Putter
- Precision Measuring Device
- Yo-Yo
- Sterling Engine
- Chess Set
- 4-Cavity Mold
- Planetary Gearbox
- Gears
- Turner’s Cube
- Name Engraving
- Small Guitar
- Cell phone protector
FMS Training Configurations

Compact Flexible Manufacturing Systems from Intelitek encompass hardware, software, simulation and curriculum that can be used to teach the fundamentals of manufacturing including robotics, machining, control, system programming, and materials handling. Coupled with a comprehensive set of curriculum, students will learn design, manufacturing, maintenance and much more about manufacturing.

FMS Base System
The base configuration is a sophisticated starting point for any technical classroom and includes:

- ER4U Robotic Arm and accessories
- BenchMill 6000 CNC Milling machine with a four tool Automatic Tool Changer
- 1.0m Linear Slide Base
- Materials handling kit including a pneumatic feeder
- Curriculum
  - Robotics Fundamentals
  - CNC Milling Fundamentals
  - SpectraCAD engraving
  - SpectraCAM Milling
- LearnMate LMS (100 students/1yr license)

FMS Advanced
An expanded solution that includes a machine vision system typically used for Quality Control in a manufacturing system. In addition, advanced curriculum as well as work projects are included that can be completed using the configuration.

- All the components of the FMS Base System plus
- Viewflex machine vision system that enables automated quality control applications
- Assembly station - components to implement an automated assembly operation
- Additional Curriculum
  - Advanced Robotics
  - Vision and Image Processing for QC
  - Intro to Advanced Mfg
  - Flexible Manufacturing Systems (FMS-I)
- Two (2) work projects for 50 students

FMS Pro
A comprehensive and advanced manufacturing configuration that includes:

- All the components of the Basic and Advanced systems plus
- BenchTurn 7000 CNC Turning machine
- Additional Curriculum
  - CNC Turning Fundamentals
  - SpectraCAM Turning
- Additional two (2) work projects for 50 students
CIMflex Training Configurations

CIMflex is a professional level, robust, education solution for advanced levels of programs. CIMflex includes the OpenCIM Supervisory Control and Data Acquisition system software and the more accurate and robust ER9 Pro robotic arm. In addition to the advanced capabilities, these turnkey solutions include on site instructor training.

CIMflex Basic System
This CIMflex setup encompasses fundamentals of Computer Integrated Manufacturing including robotics, machining, control, system programming, and materials handling. CIMflex Basic is an advanced starting point for all levels.

System includes:
- ER9Pro Robotic Arm and accessories
- BenchMill 6000 CNC Milling machine with a four tool Automatic Tool Changer
- 1.8 meter Linear Slide Base
- Pneumatic feeder and palletized rack
- OpenCIM Software
- Curriculum
  - Robotics Fundamentals
  - Advanced Robotics
  - CNC Milling Fundamentals
  - Materials Handling I
  - SpectraCAD engraving
  - SpectraCAM Milling
  - Intro to Advanced Mfg
  - Flexible Manufacturing Systems (FMS-I)
  - Computer Integrated Manufacturing (CIM-I)
- LearnMate LMS (100 students/1yr license)
- Two (2) work projects for 50 students

CIMflex Advanced System
CIMflex Advanced package takes Computer Integrated Manufacturing training to the next level integrating CNC turning and computer vision. In addition, advanced curriculum as well as work projects are included that can be completed using the configuration.

This provides an advance manufacturing framework that can design and build advanced products.

System includes:
- All the components of the CIMflex basic plus
- PROturn 9000 CNC Turning machine
- Viewflex machine vision system that enables automated quality control applications
- Additional Curriculum
  - Materials Handling II
  - Vision and Image Processing for QC
  - SpectraCAM Turning
  - Computer Integrated Manufacturing (CIM-II)
- Additional two (2) work projects for 50 students
CIMflex Custom

CIMflex Custom is a purpose-built design for your school’s needs. Systems can have several subcomponents or stations best suited to match the industry needs of your region or your faculty’s concentrations. In addition to robotic arms and CNC machining, CIMflex Custom uses several stations, a TCP/IP communication network, and the Intelitek OpenCIM management software.

Stations Overview

1. **Storage Station**
The ASRS automated storage and retrieval system designed for educational use is floor-mounted or on a table top. The system’s dedicated Cartesian robot transfers parts between storage cells and conveyor pallets stopped at the ASRS station.

2. **Machine Tending Station**
Intelitek’s Turning, Milling or Routing CNC machine. The robot, mounted on a linear slide base for mobility and a larger work area, tends the CNC machine and performs part manipulation and/or assembly tasks.

3. **Assembly & Quality Control Station**
The assembly and QC station is equipped with a variety of assembly and quality control devices as well as with local storage devices.

4. **Welding Station**
This automated welding station uses a robot that loads and unloads parts to and from the CIM conveyor in addition to performing arc welding and part manipulation tasks.

5. **Conveyors**
The conveyor frame is constructed of extruded, black anodized aluminum, and its moving belt is a double flexible-chain rail.

6. **PLC Station**
The PLC (Programmable Logic Controller) can control and monitor the flow of pallets on the conveyor with the help of sensors and actuators that are built into the stop stations.

7. **Pallet Tracking Station**
The stop station allows the PLC to control and monitor the flow of pallets on the conveyor with the help of sensors and actuators that are built into the stop stations.

8. **OpenCIM Management Station**
OpenCIM, OpenCIM Offline and OpenFMS software is a computer-integrated systems management solution that contains all the elements found in fully-automated facilities. OpenCIM is designed for the study and practice of CIM/FMS methods and operations including:
- Shop floor management controlling the operation of all the elements of an automated factory
- Enterprise resource planning (ERP)
- Materials Requirements Planning (MRP) for:
  - parts, machines and processes
  - customer, purchase and production orders
- inventory control and tracking
- scheduling and dispatching
- report generation
- Manufacturing execution system (MES)
- 3D solid model graphic display module that dynamically and accurately simulates the CIM/FMS components and processes.
- OpenCIM Web viewer allows users to monitor CIM/FMS cell operations in real-time from remote locations.
Computer-Integrated Manufacturing (CIM-I)

Computer Integrated Manufacturing (CIM) introduces the basic concepts and procedures of production as well as the main components and devices in a CIM cell. Using OpenCIM Software with a fully simulated industrial CIM, students learn about all the aspects of a CIM production cycle, from customer orders, inventory control, to automated manufacturing of materials into finished parts, and quality inspection and final delivery.

Course Outline
- Introduction to CIM
- Introducing OpenCIM Software
- Parts and Production Flow
- Storage Setup
- Production Planning
- Processes and Machine Definition
- Part Definition
- Defining a Product Part
- Producing a New Part
- Timing and Optimization
- Viewing Production Details in the Device View
- Viewing Production Details in the Storage View
- Defining Part Production in the Lathe
- Integrated Production
- Tracking Integrated Production

Computer-Integrated Manufacturing (CIM-II)

CIM 2 builds on the basic concepts covered in CIM 1. Students design, set up and operate CIM cells and learn about mass production, robotic systems, location planning, QC devices, part feeding, assembly, purchase orders, MRP and CIM databases.

Course Outline
- Mass Production and CIM
- Robotic Systems
- Location Planning
- QC Devices
- Feeders
- Adding an Assembly Station
- Assembled Part Production
- Assembled Product Characteristics
- Expanding Assembly Capabilities
- Sub-assemblies and Multi-Level Assembly
- Purchase Orders and MRP
- Multi-Level Assembly Production
- CIM Database: Part I
- CIM Database: Part II
“The crew that Intelitek sent out at installation was the best in the business, top-notch professionals. They painstakingly, carefully explained the system. They promised to stay with us for the life of the system, and they have.”

John Wright, University Dean

“Intelitek’s software and hardware is relevant to the industry we serve. The online component was an asset to have because it gives us much more flexibility in how we deliver the courses. The system is built with a lot of flexibility in it, so if 5 years down the road we figure there is some new technology we could adopt here, we can modify the system to accommodate that.”

Philip J. Przybyszewski, Community College Project Coordinator

About Intelitek
Intelitek transforms education across the globe through comprehensive technology learning solutions. Our innovative tools and technologies empower instructors and inspire students to improve the world around them. We understand the changing needs of your career and technology classrooms and design flexible solutions that meet those needs within the framework of any budget. Our sustainable support and professional development ensure the continued success of your programs. By helping to deliver the skills needed for in-demand careers, we are producing results for students, teachers, nations and economies.