Siemens Centre of Excellence

Essentials of Industry Relevant Innovation, Research & Development

Digitalization also changes the face of industry
On the way to Industry 4.0

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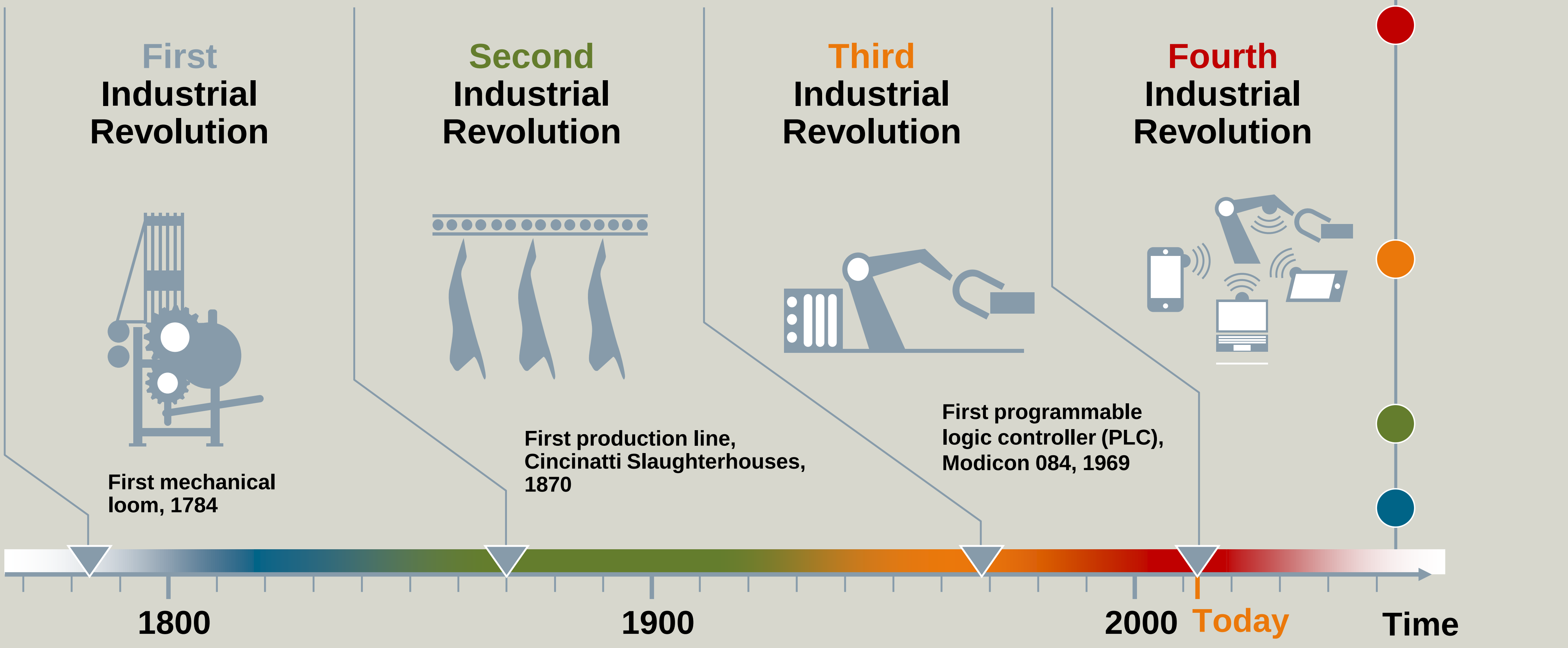
From Industry 1.0 to Industry 4.0

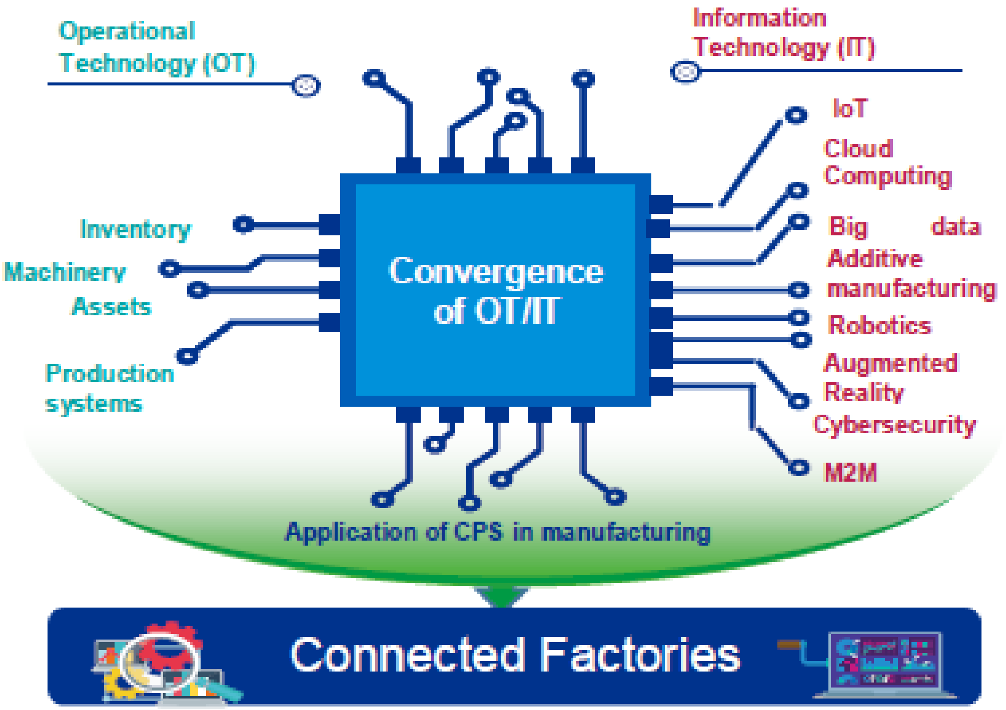


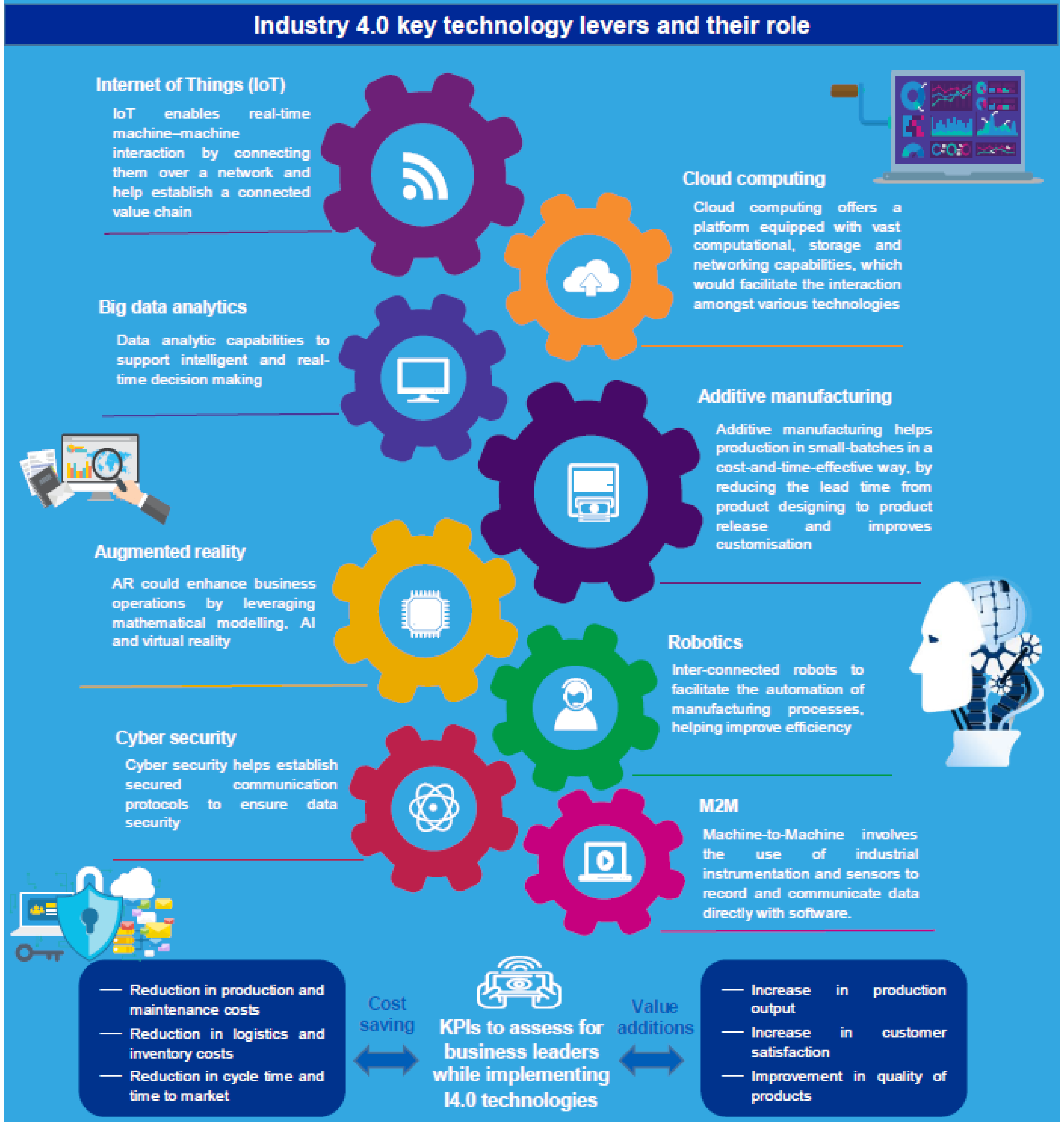
Industry 4.0 Key Technology Levers

Connected Factories

The connected factory - powering digital manufacturing

- With digitalization, information flow within various factory systems can become seamless.
- This interplay of information technology with physical systems and operational technology — popularly known as IT / OT convergence — forms the key element of a 'connected factory'.
- The "connected factory" phenomenon is backed by various I4.0 technology levers such as AR, IoT and big data.





India getting ready for Industry 4.0

Current status of Industry 4.0 in India

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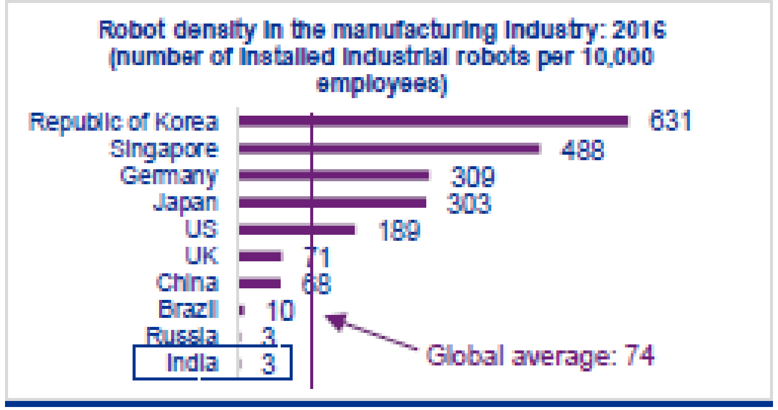
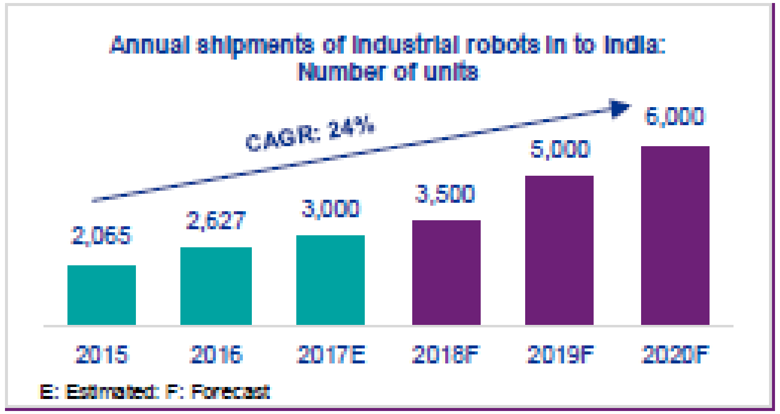
- Globally, the I4.0 market is expected to reach INR 13,90,647 crore by 2023.
- Countries such as the U.S., China, and Japan and European nations such as the U.K., Ireland, Sweden and Austria have all started adopting I4.0.
- In India, the sixth-largest manufacturing country, the manufacturing sector forms an integral part of the country's long-term vision as seen by the government's strong focus on the 'Make in India' campaign.
- The government aims to augment the share of manufacturing in GDP to 25 per cent from the current 17 per cent, by 2022.
- A number of initiatives and policy reforms, such as implementation of the GST and easing FDI policy, has been taken by the government.
- At present, India lags its global peers in I4.0 adoption.
- A significant portion of the Indian manufacturing sector is still in the post-electrification phase with use of technology limited to systems that function independently of each other.
- The integration of physical systems on cyber platforms, the basic premise of I4.0, is still at its infancy.
- The Micro, Small & Medium Enterprises (MSME) segment has very little access to technology due to the high cost barrier.





Progress made by India for enabling Industry 4.0

IoT & Big Data

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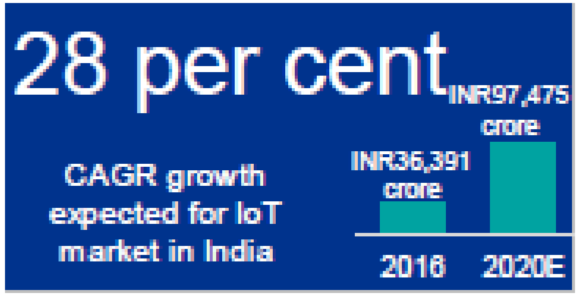
- Going by the progress that India is seeing in the two very critical enabling I4.0 technologies, IoT and big data, the country seems to be developing the right platform to base its ‘smart factories’.
- India is expected to command nearly 20 per cent of the global IoT market by 2020.
- Industrial IoT, or the segment of the IoT market that particularly caters to the manufacturing sector, currently accounts for 60 per cent of the Indian IoT market.
- The big data analytics market in India is currently valued at INR12,997 crore and is expected to grow at a CAGR of 26 percent reaching approximately INR1,03,974 crore by 2025, making India’s share approximately 32 percent in the overall global market.



Sector impact

- In India, digitalization of physical objects in various industries is taking place at a slow pace, while the penetration level varies as per the sector needs.
- Sectors have started experimenting with the idea of connected factory at shop floors and assembly lines.
- To leverage technologies, some of these enterprises are testing / creating small scale solutions for I4.0.
- Capital-intensive industries that require high-skilled labourers, such as the automotive industry, are the ones who are pioneering the adoption.

Opportunities and Risks to consider in I4.0 adoption

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Key challenges

Cost and technical issues

— **Lack of adequate infrastructure – physical and digital:** Despite continuous effort of the government, India still lacks basic infrastructure such as roads and electricity. Additionally, India's telecommunication network still suffers from low data speeds and unstable connection.

— **Cyber security:** According to KPMG in India's Cybercrime Survey Report 2017, 79 per cent of corporations in India have acknowledged cyber security as one of the top-five business risks. Apart from cyber security, the regulatory environment pertaining to data privacy would also need to be strengthened.

— **High cost of digital technologies:** Building the factory of the future having an entirely connected system could require significant capital outlay. Getting access to digital technologies for MSMEs, that forms the base of Indian manufacturing sector, remains a challenge due to the high cost of these technologies.

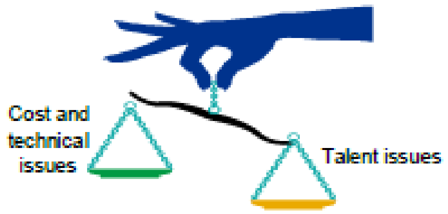
Skill and Talent issues

— **Leadership skill gap - Tradition Leadership versus Leadership 4.0:** India faces a lack of business leaders ready for the Industry 4.0 era, which could hinder the country's attempts for widespread adoption. Although, India Inc. has a strong traditional leadership, there are deficiencies of digital CXOs with a strong vision for Industry 4.0 adoption. The need of the hour is agile leadership and mitigating this challenge should be India's foremost priority. Although, most CXOs acknowledge the need for Industry 4.0, their execution capabilities are still untested.

— **Workforce skill gap:** India's current workforce lacks skill and expertise in new-age technologies such as data analytics, additive manufacturing and IoT. The government, industry and academia needs to collaborate to enable an Industry 4.0-ready workforce.

The right set of talent will be the key to success

The availability of adequate talent – both at a strategic leadership level as well as on the factory floor – can prove to be a significant challenge for India Inc. on its way to I4.0 maturity. Building leaders who can successfully navigate their organisations in the digital age and up-skilling the workforce will require significant planning, investment and collaboration from all stakeholders.



Re-engineering the talent pool for Industry 4.0

Leadership 4.0 — India needs 'digital' leaders

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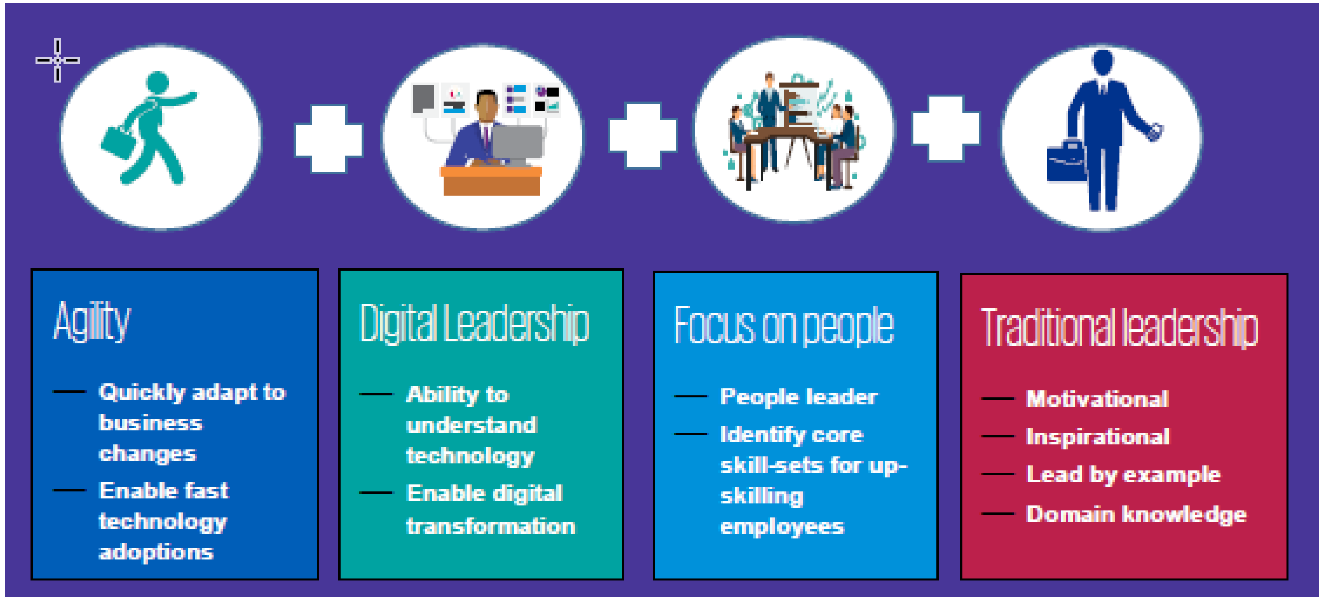

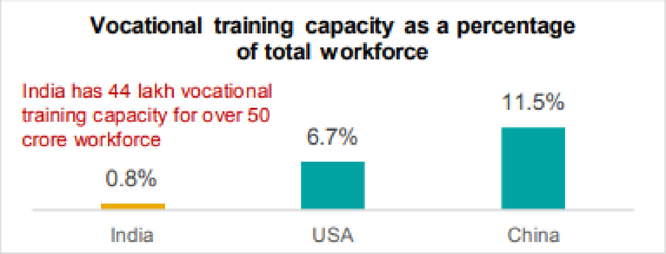

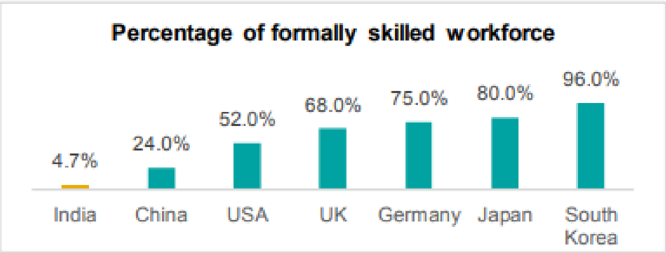

Lack of skills to pose significant challenges for Industry 4.0 adoption in India

Building the next-gen workforce

- A skilled workforce would form the key element for I4.0 adoption. The present-day workforce would need to be re-engineered to fill new roles arising due to I4.0.
- Next-gen worker needs to be digitally strong with a clear understanding of the domain.

Defining 'digital talent'

- Apart from disruptive changes in production, I4.0 transformation reforms day-to-day tasks for employees.
- The main pillars of the talent shift are based on up-skilling ability, better leadership, L&D platforms and cross-function collaborations.

Up-skilling workforce

- India is struggling with low vocational training capacity and low percentage of formally skilled workforce.
- The quality and employability of engineers have also been questioned.
- With the onset of I4.0, the country would need to develop a robust training infrastructure to ensure up-skilling of its existing workforce.

Skills required for the Industry 4.0 era

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Digital knowledge and ability to work with data

- Ability to use automated systems
- Knowledge of new-age technologies such as IoT, AR/VR, machine learning, big data and analytics
- Knowledge of cyber security and data protection
- Statistical knowledge and ability to analyse data generated from machines.

Digital skills and cross-domain expertise are likely to become game changer for success of Industry 4.0 era

Cross-functional expertise and soft skills

- Understanding of cross-functional processes
- Focus on client needs and industry trends
- Expertise in working under ambiguous and changing environments
- Honing soft skills such as collaboration, emotional intelligence, decision making and up-skilling mind-sets.

Role of government, industry and academia in up-skilling India

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Government

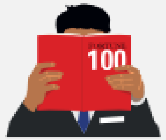
- Take job creation initiatives like 'Make in India' which is expected to create 10 crore jobs by 2022
- Involve the private sector in PPP models to conduct I4.0 relevant training
- Launch mass skilling initiatives like 'Skill India', which aims to skill about 40 crore Indians by 2022
- Create proper infrastructure and develop innovation centres and test labs
- Provide supportive policies and adequate financing for skill development
- Promote practical and industry-oriented training
- Improve the quality of academic institutions and vocational training

Industry

- Create and define new roles for I4.0, which would be mostly managerial in nature
- Provide re-skilling opportunities by identifying a core set of industry-relevant skills and delivering them to employees
- Provide cross-function exposure to employees for them to learn outside their own disciplines
- Establish Leadership 4.0, which fosters a culture of up-skilling through various forums
- Participate actively in PPP initiatives and take up vocational training with the government
- Undertake and invest in R&D for I4.0 technologies

Academia

- Enhance quality of teachers and modernise learning infrastructure
- Align course curricula in tandem with I4.0 requirements, with well-regulated and industry-relevant updated content
- Focus more on practical, result-oriented knowledge, over theoretical content
- Promote a culture of research in upcoming areas like I4.0 and act as the testbeds for innovation and new learning
- Participate actively in the development of MOOCs (Massive Open Online Courses)
- Collaborate with industry players, e.g., a Bengaluru-based reputed academic institution is setting up a 'smart factory' in collaboration with a global aerospace major



Case study of a skill development platform by an MNC

Company: A German manufacturing conglomerate

L&D initiative: The company signed an MoU to set up four I4.0 CoEs across Karnataka in India, looking at diverse sectors like automotive, industrial automation, renewable energy and A&D. It aims to create an integrated skill development platform with benchmarked technical education curriculum, focussing on I4.0, automation, mechatronics and Internet of Things (IOT) infrastructure. The association targets to skill students on appropriate industry processes.

- The key stakeholders — the government, industry and academy institutions — have to come together to re-think the way education system functions and encourage re-skilling in order to make employees competitive.
- The stakeholders need to change the skill map and take remedial actions to accommodate fast-paced technology trends.

The driving workforce accompany the change

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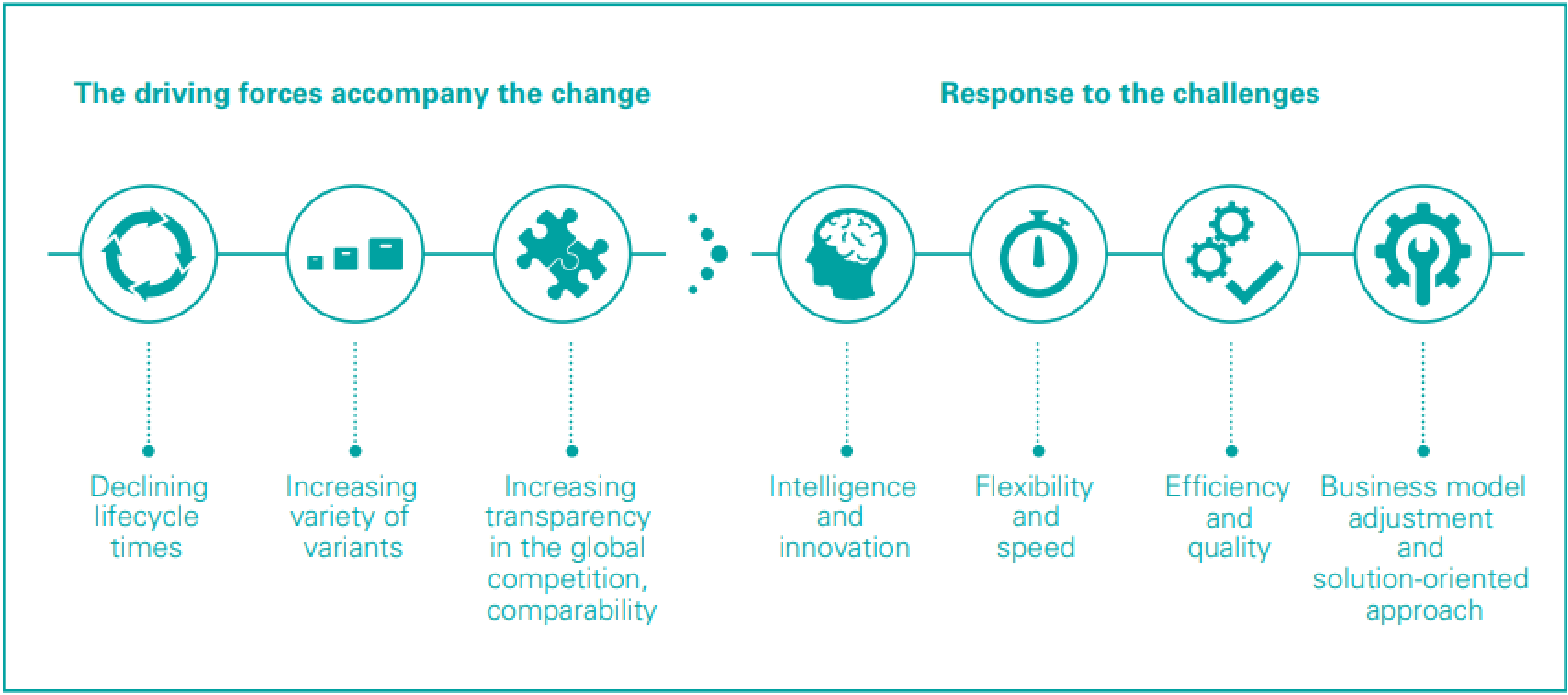

Meeting essential requirements – throughout the manufacturing industry

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Speed

Flexibility

Quality

Efficiency

Security

Siemens is passing through the digital transformation itself and adapting its processes to the new reality

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Example – Electronics facility in Amberg, Germany

Fast
~1 SIMATIC product per second
24 hours between order and arrival at customer

Flexible
>1,200 product variants in Teamcenter

Efficient
Roughly nine-fold increase in shop floor utilization since production start (1990)

High-quality
Fewer than 11dpm, for a quality level of 99.9989%

Goal: Build a self-sustainable, interactive, industry-relevant, cyber-physical learning platform to bridge Technical Skill Gap

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Four key foundation blocks

Open Technology Platform: Scalable, Modular & Independent

- Scalable: Refresh/ New Technology, Newer Courses, Newer Locations
  Modular: In Courses, Delivery Models, Locations, Technology
  Independent: Industry collaboration platform including and beyond Siemens
- Technology from Siemens and other companies

Self learning Interactive modules – DIAS based (Digitally Advanced Interactive System)

- Learn anywhere-anytime using interactive digital content
  - Available in vernacular medium
- Instructor assistance only for practical handholding
- Uniformity and consistency of learning media over pure instructor-led model.
- Incorporation of global practices
- Easy and rapid updates

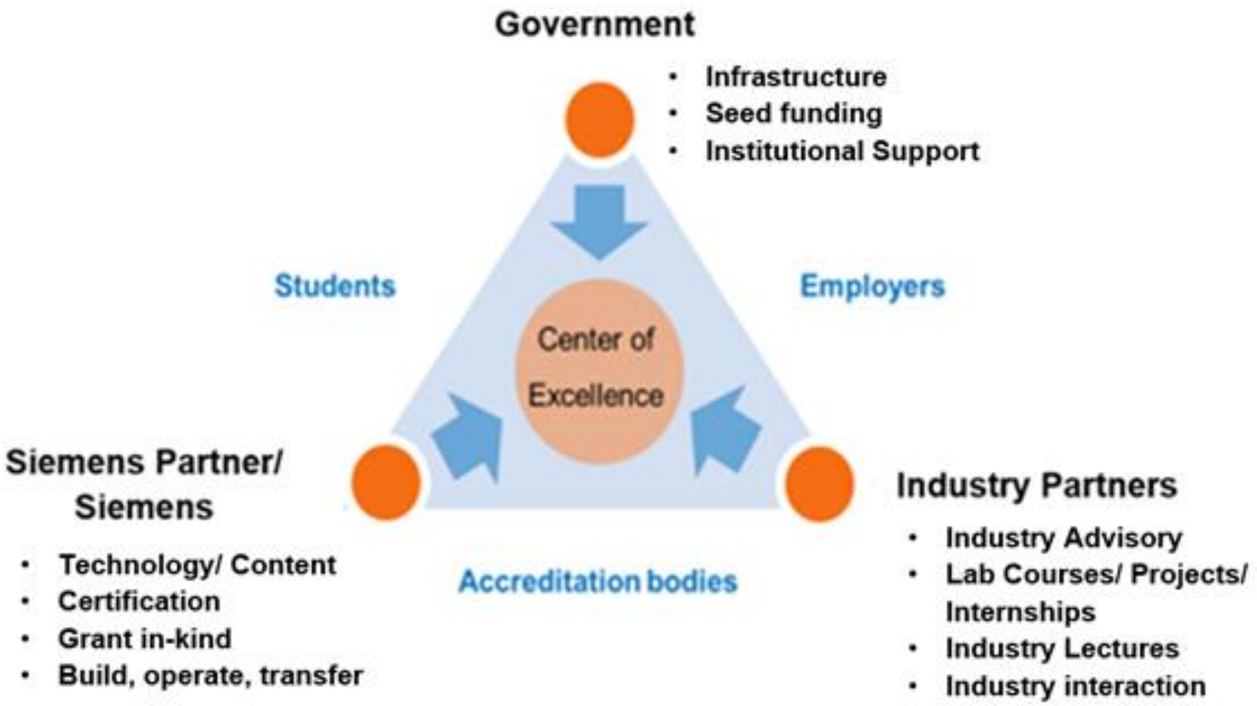
Unique Hub & Spoke Delivery Model

- Large scale deployment and scale-up possibility with minimum time and investment
- Optimum leverage of physical infrastructure
- Foundation for adding other courses, collaborators, partners as per the need.
- The spokes (t-SDI) are connected to the hubs (COE) for learning assistance and advanced lab infrastructure

Industry Relevant, Self Sustaining Platform

- Industry relevant: New technology additions and refreshes as per industry needs.
- Self sustaining: Prime funded, operationally sustainable
- Built – Operate – Transfer of the complete setup to relevant institutions/ bodies post 3 years
  - Additional 1 year of supervisory and subject matter expertise

Scope of the initiative:
Partnership model and Scope of work



The COEs support t-SDIs with latest industry trends, skill upgrade of trainers and knowledge sharing

Creating Enabling Environment
- Centers of Excellence plus Technical Skill Development Institutes
  - 2 years of Operation
  - 1 year of Handholding and Support
- Creation of Board of Governance
- Constituting a joint working group for curriculum review and Industry Interfacing

Skilling Manpower
- Mentoring
- Student Training Program
- Certification Exams
- Computer Based Training Modules as per the list (for self paced learning)

Siemens Centre of Excellence – Overview

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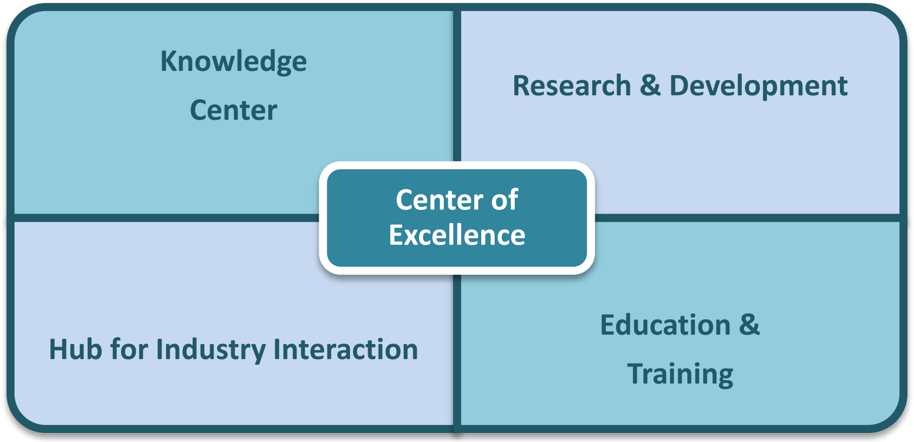
Interdisciplinary Knowledge Center

- Serve as a Technical Knowledge Resource for Industry
- Equipped with State-of-the-Art Tools and Technologies
- Hub for "Technical" Skill Development programs in State in coordination with Universities and Industry
- Catalyze Industry – Academia Partnership

Activities at Center of Excellence



S.no	Lab
1	Product Digitalization Lab
2	Advance Analysis Lab
3	Process Digitalization Lab
4	Smart Factory Lab
5	Internet of Things (IoT) Lab
6	Robotics Lab
7	CNC Controller Lab
8	Automation Lab
9	Mechatronics Lab
10	Process Instrumentation Lab
11	Electrical & Energy Saving Lab
12	Additive Manufacturing Lab

Product Digitalization Lab – Lab 1
NX for Digital Product Development

With the industry's broadest suite of integrated, fully associative CAD-CAE-CAM applications, NX touches the full range of development processes in product design, simulation and manufacturing

NX CAD, CAM, CAE, Nastran

Teamcenter

Advance Analysis Lab – Lab 2
Imagine Lab

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LMS Imagine.Lab Landing Gear	LMS Imagine.Lab Environmental Control Systems	LMS Imagine.Lab Engine Equipment	LMS Imagine.Lab Power & Distribution Networks
Helps designing any landing gear system and its multi-disciplinary nature	Simulate and analyze complex fluid systems	Design fuel systems and controls as well as engine control actuators	Size and optimize complete aircraft power and distribution networks
• Actuation systems • Braking systems • Steering systems • Shock absorber	• Bleed air • Anti-icing • Ventilation circuit • Oxygen and life system	• Fuel systems • Lubrication • Heat exchangers • Thrust reversers • Accessory gearbox	• Hydraulic systems • Pneumatic systems • Electrical systems • Electrical wire harness • Electrical aircraft

Advance Analysis Lab – Lab 2
Virtual Lab

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LMS Virtual.Lab Motion Durability	LMS Virtual.Lab Acoustics Noise & Vibration	LMS Virtual.Lab Correlation & Updating	LMS Virtual.Lab Optimization
Scalable modeling, sizing & analysis of mechanical systems	Simulation & analysis of system vibro-acoustics	De-risk physical structural dynamic testing via virtual testing	Multi-disciplinary sensitivity analysis and optimization
• Controls • Actuation systems • Flexible structures • Kinematic and dynamic Functional & performance specifications for safety, reliability and stability	• Accurately predicts aircraft interior and exterior noise & vibration • Address structural and airborne transmission paths • Reduce noise of structures, engines, power equipment, ECS • Optimize passenger comfort	• Increase productivity by combining test-based and virtual component models into system-level models. • Correlate noise & vibration data sets: Test – FEM, Test-Test, FEM-FEM • Update FE models with test data systematically	• Reach optimal design with multiple performance targets. • Easily identify key variables that influence the functional multi-attribute performance of a mechanical system

Advance Analysis Lab – Lab 2
Test Lab

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LMS Test.Lab Structures & GVT Structural Dynamics Testing	LMS Test.Lab Acoustics & General Dynamic Data-Acquisition	LMS Test.Lab Rotating & Turbine Testing	LMS Test.Lab Vibration Control & Environmental Testing
Small-scale and large-scale modal tests in hours rather than days	Data acquisition and analysis for noise, vibration and other dynamic phenomena	All-digital, advanced solution for complex turbine testing processes	Advanced and complete environmental testing solution range
• Complete GVT testing for aeroelastic certification • Identify root causes of vibration problems and engineer the best solution	• Cabin comfort • Interior acoustics • Fly-over noise • Advanced aircraft noise & vibration	• Data acquisition • Data storage & management • On-line monitoring alarming • Analysis and reporting • Updating	• Basic component vibration qualification testing • Advanced 3D multi-shaker vibration control • Closed loop shaker control and real-time monitoring of shakedown tests • Safe operation

Process Digitalization Lab – Lab 3
Planning Capabilities

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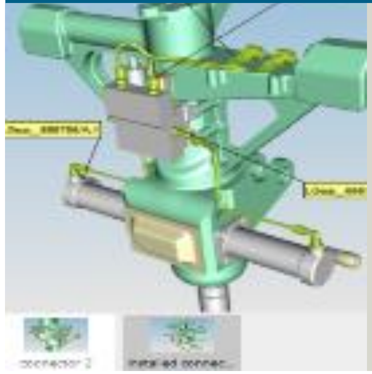
Process

- BOM Management
- Manufacturing process planning
- Advanced assembly planning
- Global production planning
- Change management

Work Instructions

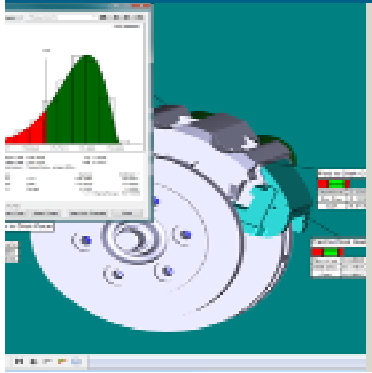


- Process steps, visuals, text and documents
- Up-to-date information
- Web-based retrieval and mobile device support
- MES integration

Layouts

- Plant/facility design
- Workstation/Line design
- Layout data management
- Material handling, logistics, and indirect
  labor optimization

Dimensional Quality



- Define dimensional targets based on embedded PMI
- Upfront variation and manufacturability analysis
- Requirements traceability

Process Digitalization Lab – Lab 3
Simulation Capabilities

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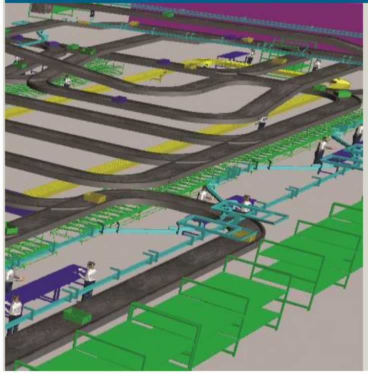
Assembly

- Assembly feasibility studies
- Automatic assembly path planning
- 3D kinematic simulation
- Sequencing of operations

Robotics

- Robotic placement and path planning
- Native language programming
- Realistic robot simulation
- Cycle time optimization

Logistics



- Material flow simulation
- Throughput assessment
- Energy usage simulation and analysis
- Genetic algorithms for experimentation and optimization

Human

- Advanced anthropometric scaling
- Advanced posture prediction
- Comprehensive ergonomic analysis
- Lifelike, 3D visualization and virtual reality

Process Digitalization Lab – Lab 3
Production Capabilities

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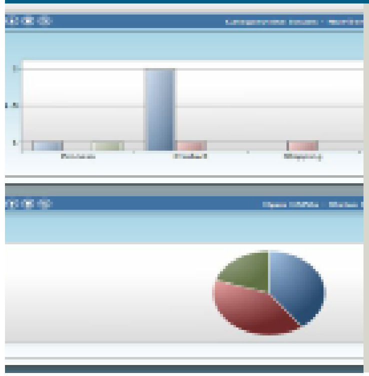
Issue Tracking



- Enterprise visibility
- Standardized procedures
- Proven change and workflow control
- Automated correlation of issues with deliverables

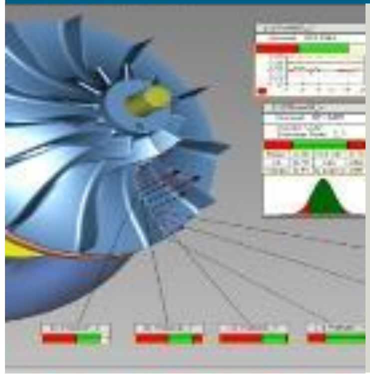
Virtual Commissioning

- Multi-discipline coordination
- Hardware in the loop
- Managed source of information
- Optimized use of equipment investments

Shop Floor

- Automated generation of work plan
- Rule-based validation
- Visual work instructions
- Validated execution
- Master/Order configuration

Build Quality



- Trending with sophisticated analytics
- Product and process integration
- Advanced historical reporting
- One UI for all measurement results

Enabling the Widest Array of Digital Solutions for EV development
Systems approach is required for these complex vehicles

Harness Design & Manufacture
NX + Capital

PCB Design & Manufacturing
Mentor

Thermal Analysis:
Mentor + Simcenter

Functional Behavior Capture
PHM

Vehicle EE Architecture Optimization & Network Design
Mentor

Performance & NVH Optimization
Simcenter (HEEDS)

Inverter reliability
Mentor Graphics

System of Systems Modeling
Simcenter + Mentor

Logical → Functional → Physical Model
Mentor Capital

Integrated Product and Software Engineering
Polarion

Powertrain Architecture Design Exploration
Simcenter

Power Consumption
Mentor

Electrical System Synthesis
Mentor

IIoT
Mindsphere

NX CAD (Vehicle Design) + **Simcenter** (1D & 3D Simulation, testing) + **Polarion** (ALM) + **Mentor** (EE Systems, PCB & WH Engineering) + **Teamcenter** (Systems Engineering, Data Management)

Smart Factory Lab – Lab 4

Smart Factory Lab – Lab 4

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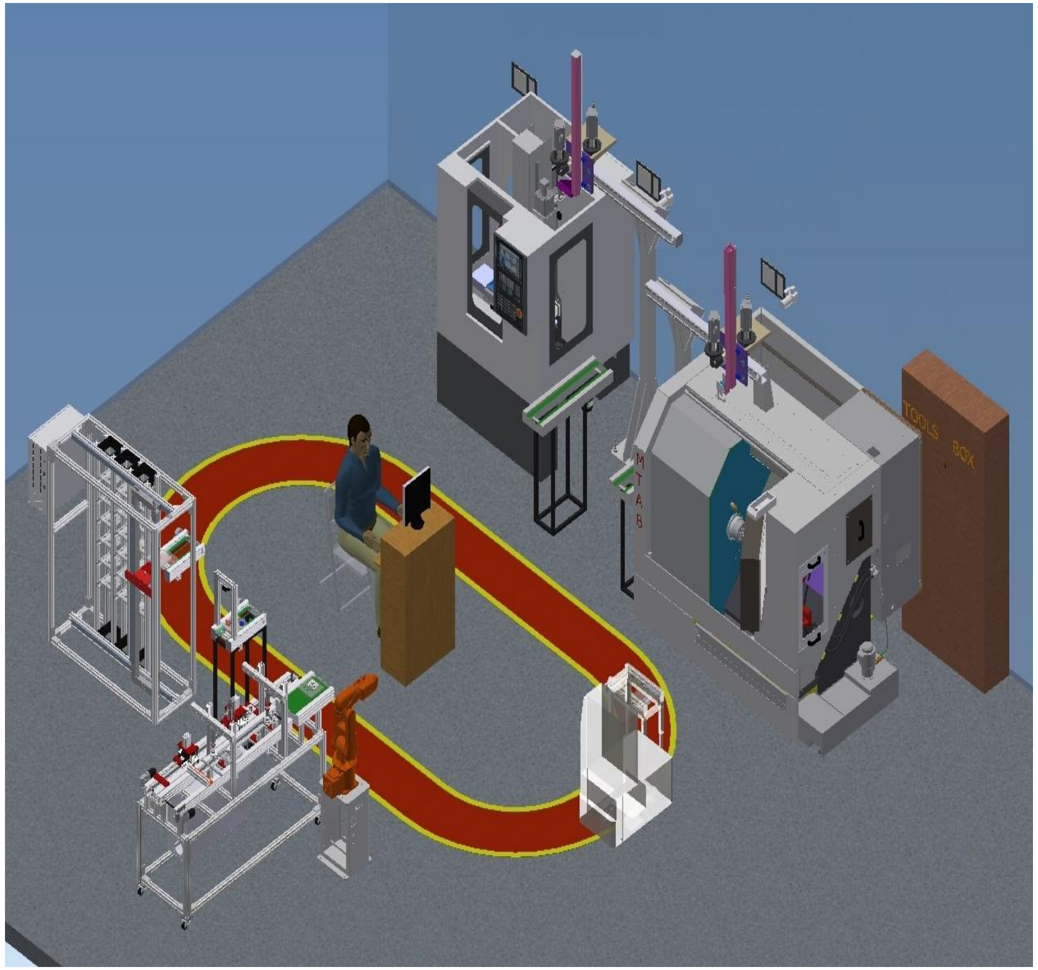
CAD / CAE: Design, Analysis
CAM: Manufacturing with CNC Lathe, VMC
MCD / ROB Expert: Automation thru :

- Material Handling & Storage
- Material Transfer Systems
- Automated Robotics Assembly
- AGV

QMS: Quality Management Systems

- Inspection (Visual)
- RFID Technology for part tracking

TIA - PLC: Master controller
Teamcenter: For Data Mgmt & control
Tecnomatix: Design, Simulate, Control
MindSphere: IoT Platform: to track the system & process



Smart Factory Lab – Lab 4

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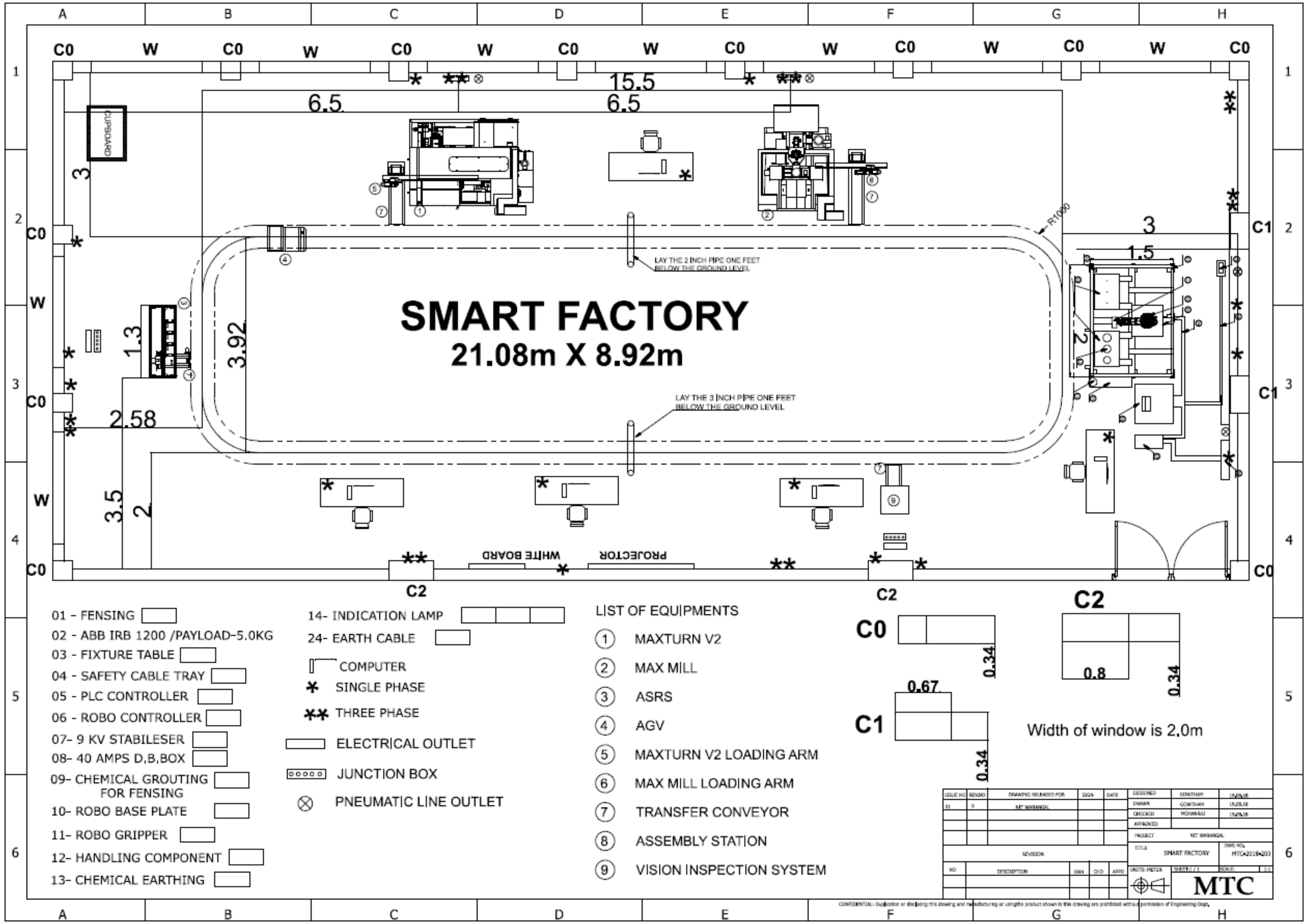
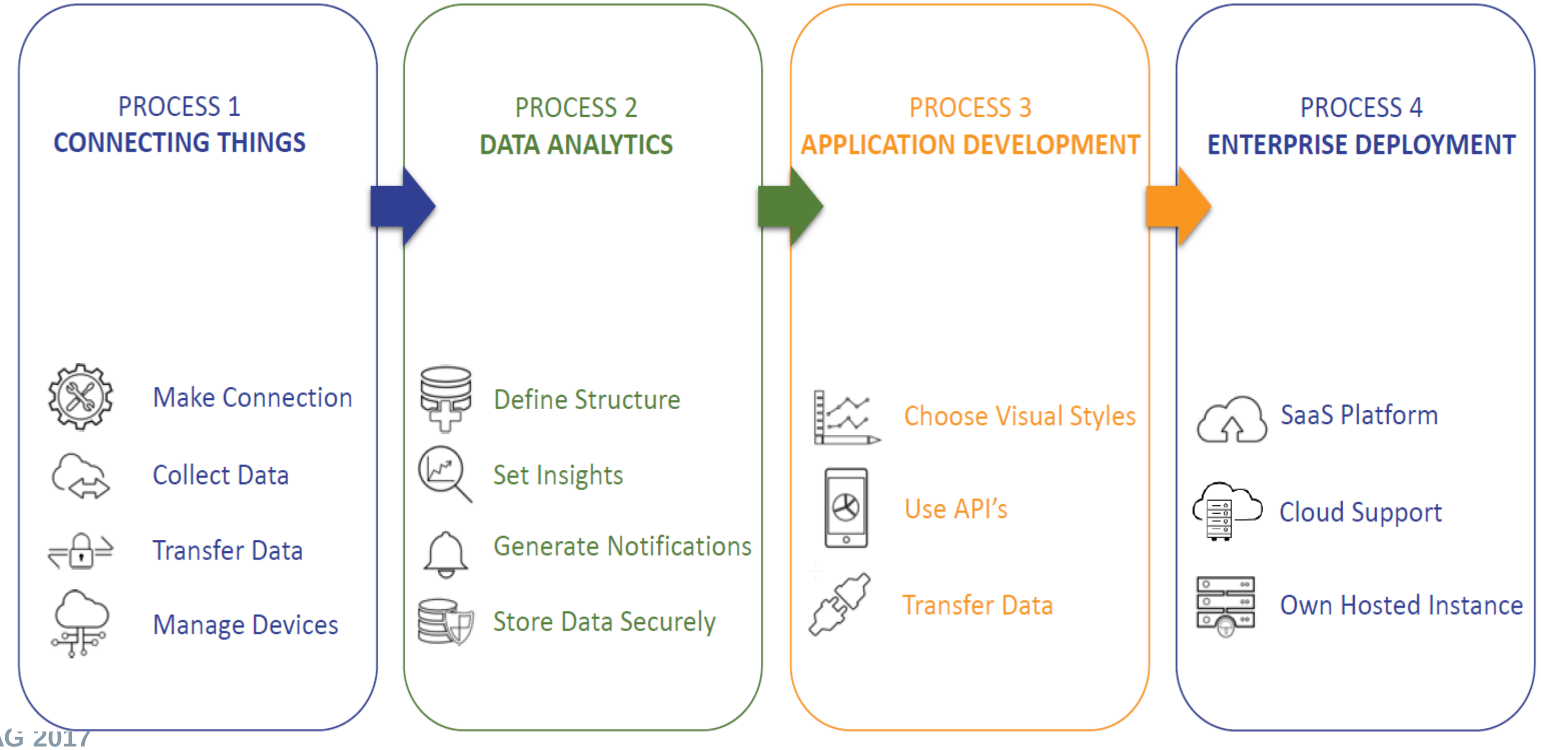


Internet of Things Lab – Lab 5

The IOT Lab uses Experiential Learning Program Modules for getting participants an implementers view of building an Industrial IOT solution end-to-end using MindSphere.

The Experiential Learning Program consists of four (4) processes as illustrated below:



Robotic Manufacturing Lab – Lab 6
Robotic Pulse MIG Welding Cell

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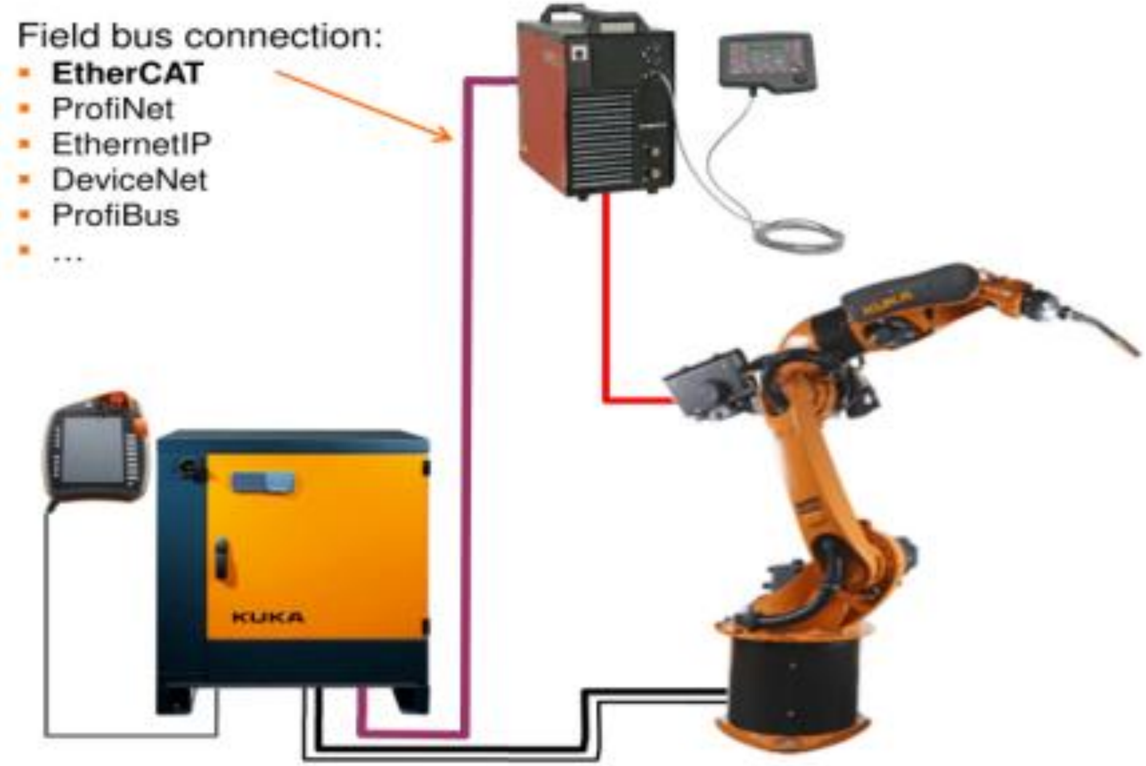

Equipment Specification	
1	Robot – KUKA/ ABB Robot
2	Robot Controller – KUKA/ ABB Robot Controller
3	Welding Machine – Fronius/ Lincoln/ Kemppi/ Miller
4	Robotic Torch
5	Wire Feeder
6	Wire Spool
7	Stationery Work bench
8	Voltage Stabilizer with Isolation Transformer
9	Mixed gas with Cylinder and regulator
10	Torch Cleaning and Wire Cutter Station

Robotic Manufacturing Lab – Lab 6
Robotic Spot Welding Cell – Spot Welding Application

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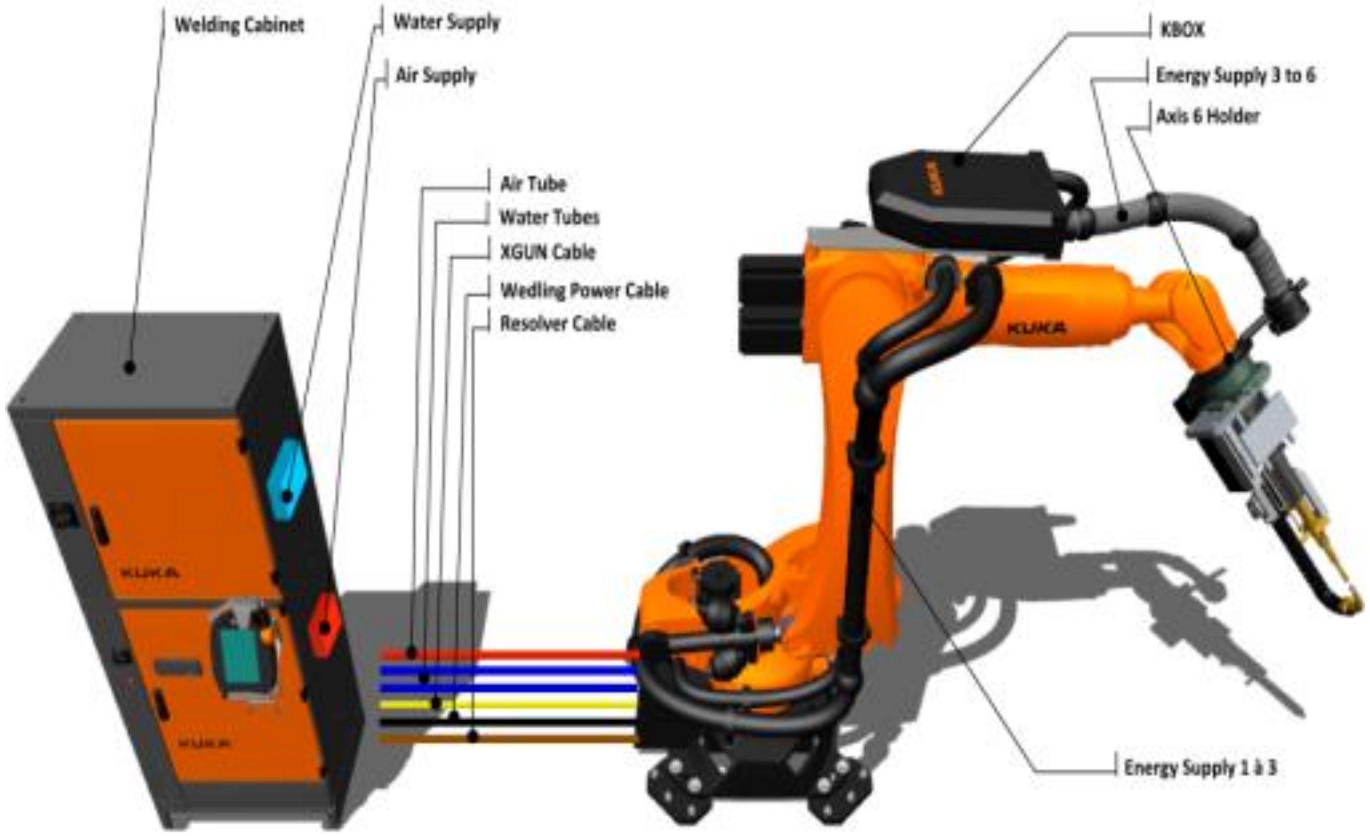

Equipment Specification	
1	Robot – KUKA/ ABB Robot
2	Robot Controller – KUKA/ ABB Robot Controller
3	Spot welding gun and standard accessories
4	Tip Dresser Station
5	Air Compressor
6	Voltage Stabilizer with Isolation Transformer
7	Water circulation system

Machine Controller Lab – Lab 7

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DIFFERENT CONTROLLERS:

1. SINUMERIC 808D Turning / Milling
2. SINUMERIC 840D SL

SINUMERIC 808D

SINUMERIC 840D SL

Automation Lab – Lab 8

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- **INDUSTRIAL PLC** (Programmable Logical Controller)

- **INDUSTRIAL HMI** (Human Machine Interface)

- **INDUSTRIAL SCADA**
(Supervisory Control & Distributed Acquisition)

- **PLC NETWORKING** (Profibus, Profinet, etc.)

SIMATIC S7-1500 TRAINING KIT

SIMATIC S7-1200 TRAINING KIT

Mechatronics Lab – Lab 9

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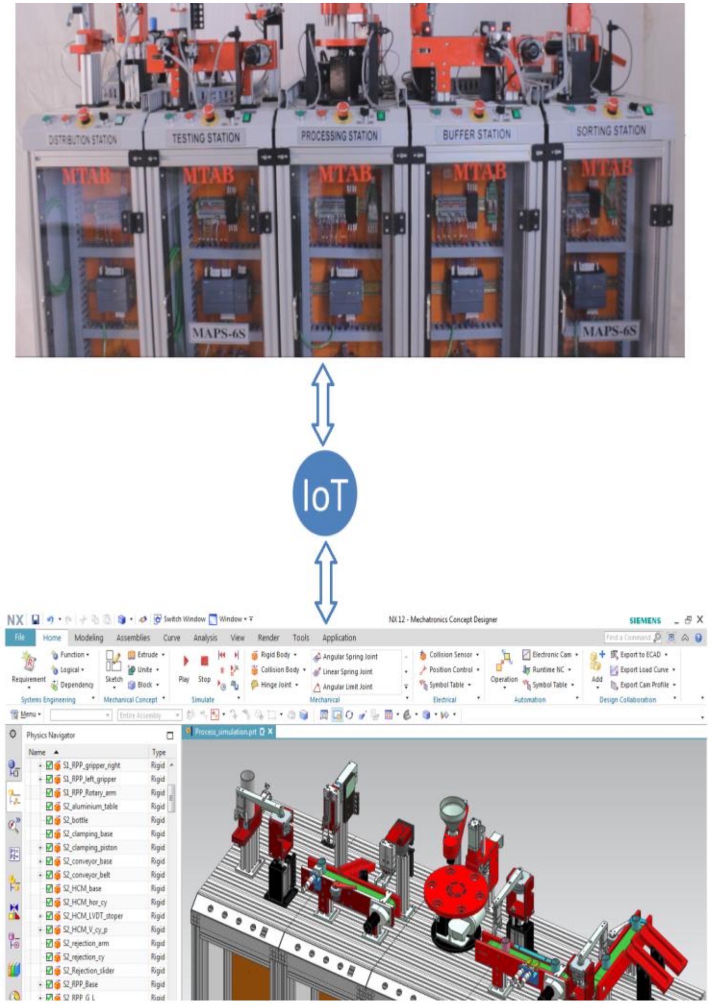
1. Level-1/2 Courses: 30 Working days each (SPE-Berlin certified)
2. Crash Course: 12 days (SITRAIN-India certified)



Process Instrumentation Lab – Lab 10

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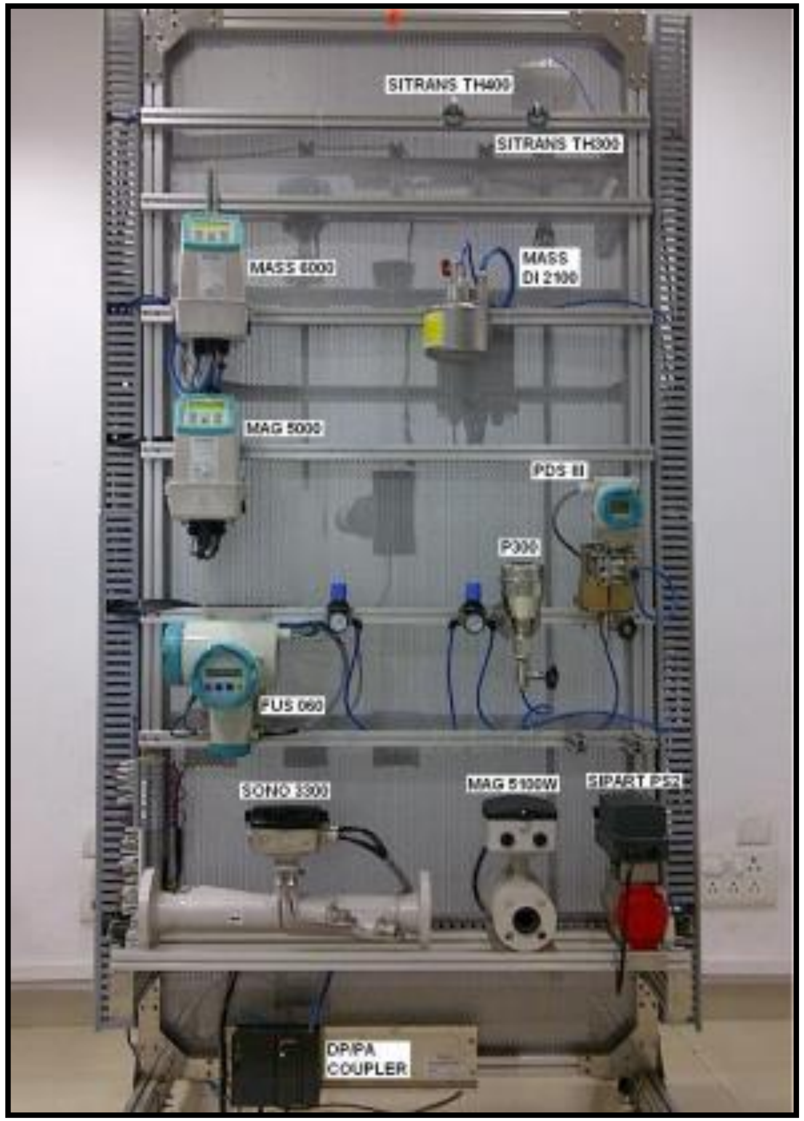
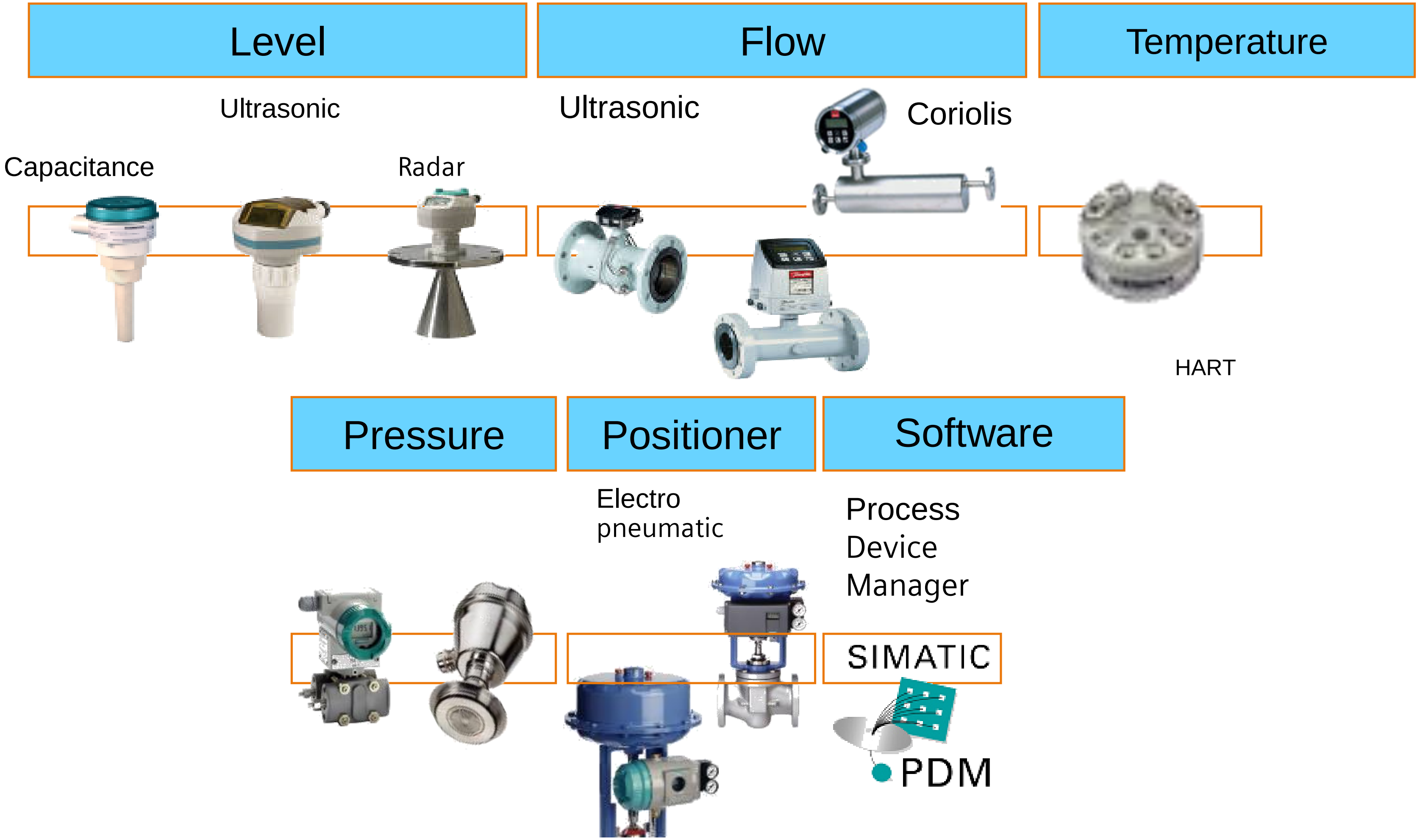
- **PROCESS INSTRUMENTATION**
  - Temperature
  - Flow
  - Level
  - Pressure
  - Sensors/Measurements & Communications

- **ADVANCE AUTOMATION COURSE - DCS (Distributed Control Systems)**

SIMATIC PCS-7 CONTROLLER (S7-400 PLC BASED HARDWARE)



Process Instrumentation Lab – Lab 10



Electrical Lab – Lab 11
AC/DC DRIVES

- **INDUSTRIAL AC-DC DRIVES** (Power Electronics & Controls)
- **SINAMIC G-120** (AC Drives Product & Maintenance)
- **SINAMICS DC 6RA80** (DC Drives Product/ Maintenance)
- **DRIVE - PLC NETWORKING** (PROFIBUS, PROFINET, etc.)

SINAMIC G-120 TRG KIT

SINAMIC DC TRG KIT

AC/DC DRIVES TRAINING EQUIPMENTS
Trainings conducted

SIEMENS
Ingenuity for life

COURSE CONTENTS:

BASIC – AC/DC DRIVES

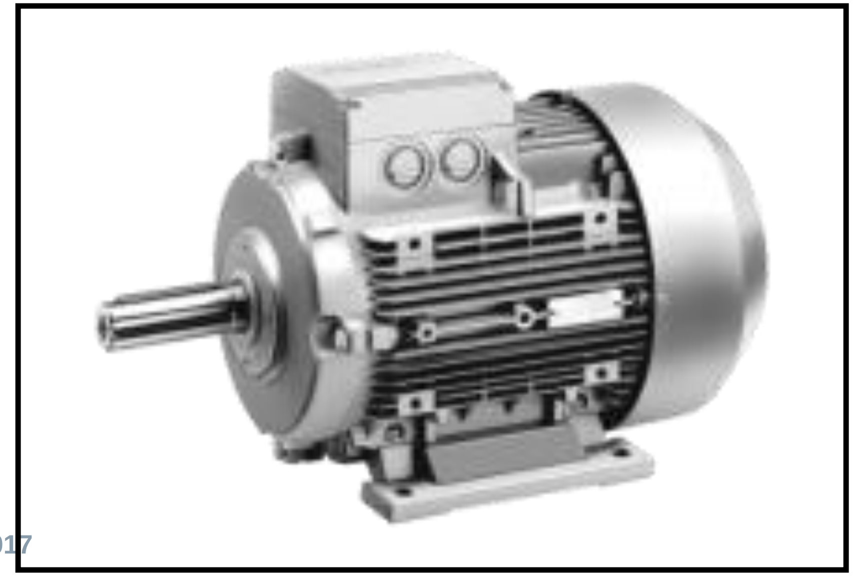
- Brief Basic Power Electronics (including Thyristors, Power-Transistors & IGBTs).
- DC Motor Basics (construction, principle of operation, T-N Characteristic etc).
- DC Drives Basics (Block diagram, 1Q-4Q principle of operation, T-N Curves etc)
- Selections, Calculations & applications of typical DC drives.
- Siemens DC Drives (6RA80) - Ratings, Specs, features, options & applications.
- Commissioning of DCM 6RA80 using BOP & Starter commissioning Software.
- AC Motor Basics (construction, principle of operation, T-N Characteristic etc).
- AC Drives Basics (Block diagram, 1Q-4Q principle of operation, T-N Curves etc)
- Selections, Calculations & applications of typical AC drives.
- AC Drives (Sinamics S & G)-Ratings, Specs, features, options & applications.
- MEDIUM VOLTAGE (MV Drives & Motors):
- MV Motor types & Fundamentals (including starting methods, options/features)
- MV Motor offers from Germany (separately for Induction & Synchronous Motor)
- MV Converter Basics & types.
- Siemens MV Converters (Sinamics GM, Simovert-S and Perfect Harmony)
- Selection, configuration & Applications of MV Drive systems
- Short briefing on MV Transformers along with their options & protections
- Hands on practice on DC and AC drive

TWO SET OF SINAMICS 6RA80
2 X DC DRIVES & 2 X DC MOTORS
(Batch of 6 to 8 x Students per DRIVE)

FIVE SETS OF SINAMICS G-120
5 X AC DRIVES & 5 X AC MOTORS
(Batch of 3 to 4 x Students per DRIVE)

Electrical Lab – Lab 11
SWITCHGEAR-MOTORS

- **INDUSTRIAL SWITCHGEAR** (Products & Maintenance)
- **POWER DISTRIBUTION** (ACB, PAC & Maintenance)
- **POWER QUALITY & MEASUREMENT**
- **INDUSTRIAL COURSE ON INDUCTION MOTOR** (Service/Maintenance)



SWITCHGEAR & MOTORS TRG. EQUIPMENTS
Trainings conducted

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COURSE CONTENTS

Basic Power System & Protection:

- Basic Of power distribution
- Philosophy of Generation, distribution in LV, MV & HV
- Types of network
- Faults & Fault level calculations
- Basic Of protection
- Types of Fault
- Abbreviations O/L,S/C & E/F
- Power products Range overview

Low Voltage Siemens offerings in Power Distribution

- 3WT / 3WL
- 3VT / 3VA
- 3KL
- 3NA3
- Overview of Pac meter

Control products with latest Indian & International Standards an overview, And basic Control Products used in Industry today

- Contactor- New technology, Compactness DOL,RDOL & S-D assy – Hands on of Star-delta assembly
- Overload Relay, Microprocessor Relay- Why new versions of relays
- Motor protection circuit breaker- why MPCB needs to be used
- MCB
- RCCB
- Pushbutton & Indication Lamps

Motor:

- Product spectrum of Siemens motor.
- Comparison of normal & inverter driven motor.
- Comparison of normal and energy efficient motor.
- Various reasons of high starting current of an induction motor & their effects on supply system.
- Starters- DOL & star delta etc.
- Soft starter – brief overview

Energy Studies Lab – Lab 11

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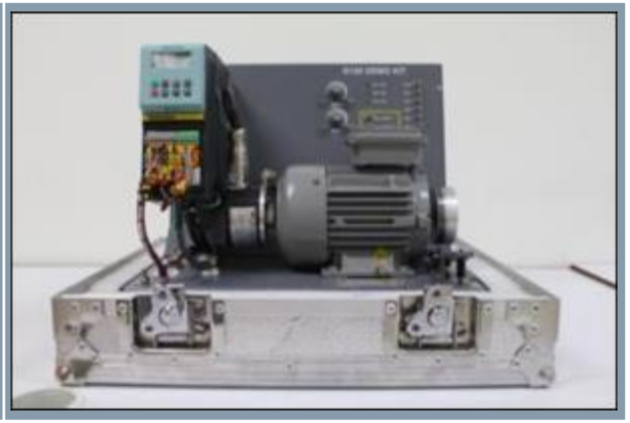

PAC Meter	**Simocode Kit**	**G120 Drive**

- IE3 Series motors- High efficiency motors to serve variety of industrial applications with savings in energy cost
- VFD Control- Variable voltage variable frequency drive - programmed to achieve the energy savings in closed loop control.
- SIMOCODE- Intelligent motor controller to control motor operations to save energy
- PAC Meter- Intelligent meter programmed for high- Low tariff switching, limit monitoring & logical control of the field devices

Additive Manufacturing Lab – Lab 12

SIEMENS
Ingenuity for life

Produce fast, effective prototypes for concept development, as well as highly accurate and robust parts for design validation and functional performance.

Combination of powerful FDM technology with design-to-print software for the most versatile and intelligent solution available.


Global Academic Partner Program
Helping future engineers realize innovation through STEM.
Siemens PLM Software

Evolution of Industry 4.0