



TATA TECHNOLOGIES

RCOEM

Shri Ramdeobaba College of Engineering and Management, Nagpur



Shri Ramdeobaba College of Engineering and Management
Center for Invention Innovation Incubation & Training
RCOEM-TATA-CIIT, Nagpur



Innovation Design and Incubation Center of Excellence

Integrated Advance Manufacturing Center of Excellence
Machine Learning and IoT Center of Excellence



Shri Ramdeobaba College of Engineering and Management, Nagpur

RCOEM TECHNOLOGY BUSINESS INCUBATORS FOUNDATION

RCOEM - TATA TECHNOLOGIES - CIIT

**CENTER FOR INVENTION, INNOVATION,
INCUBATION AND TRAINING**

About TATA Technologies

Tata Technologies makes product development dreams a reality by designing, engineering, and validating the products of tomorrow for the world's leading manufacturers. With more than 9400 professionals serving clients worldwide, Tata Technologies is the manufacturing industry's premier partner for advanced engineering, research and development, product lifecycle management consultancy and software and connected enterprise IT solutions. Tata Technologies 17 global delivery centers spread across India, US, UK, Sweden, Romania, Singapore, China, Japan and Thailand help cater the Automotive, Aerospace and Industrial Heavy Machinery industries.



About RCOEM CIIT Center

RCOEM in association with Tata Technologies Ltd., has set-up the bench mark of excellence in Engineering & Technology education in Nagpur. CIIT is at par with the world class technologies. The major objective of CIIT is, hand-holding of young engineers to develop into professionals catering to industry centric technical skills. ITI, Diploma, Degree, Postgraduate, Ph.D. research scholar and Industry persons can visit, connect and avail the facilities at CIIT. The facility is open to all the aspirants in region for technical associations and upgradations.

CIIT comprises of 3 centers of Excellences:

- **Innovation Design and Incubation,**
- **Integrated Advanced Manufacturing,**
- **Machine Learning and IoT.**

CIIT provides practical exposure on following machines:

- Arc-welding Robot
- Pick-n-place Robot
- CNC-VMC machines
- Manufacturing Execution system
- 3-D printing & 3-D scanning
- Machine learning & IoT

CIIT has 10 professional Softwares like,

- MSC Nastran
- MSC Patran
- Adams machinery studio
- 3-D Experience (Catia V6)
- Delmia ● ScFLOW ● Marc ● Easy5
- FEAST ● i-Get-it (e-Learning Platform)

Benchmarks@RCOEM-TATA-CIIIT in last 1 year

- Product/Mold design, 3-D Printing, machine fabrication consultancy project
- About 10 IPRs applied
- Concrete testing tool manufactured
- Tycathon project 3-D printed with required precision
- More than 15 Training programs completed
- Design of Battery Swapping Switch
- Mobility Robot development.

Courses at CIIT provide technical competency, value additions and improved chances of employability. The training modules available at CIIT also provides the opportunity to become entrepreneurs.

COURSES OFFERED AT CIIT

S.N.	Name of Certificate Course	Batch Size	Duration	Eligibility
1	3-D Scanning & Reverse Engineering	10	40 Hrs.	ITI/Diploma/BE/ME or Pursuing similar technical course
2	3-D Printing & Additive Manufacturing	10		
3	CNC Programming & VMC Operations	10		
4	Industrial Robot operator (Yaskawa Arc welding)	10		
5	Solid modeling Catia V6	15		
6	Mechatronics & Internet of Things (IoT) Engineering	10		
7	Manufacturing Execution System Engineering / operator	10		
8	Finite Element Analysis (MSC Nastran)	10		

ADVANCED COURSES OFFERED at RCOEM-TATA-CIIIT

Diploma Courses (6+ months)	Certificate Courses (upto 3 months)
<ul style="list-style-type: none"> ● Product Design and Validation Design Thinking for Start Ups, Catia V6 and PLM, Virtual Verification and Analysis, Product Design and Development ● Integrated Advanced Manufacturing Additive Manufacturing, Digital Manufacturing, Industrial Robotics, Advanced Manufacturing ● Manufacturing Execution System & IoT Design Thinking, Manufacturing Execution System, Industrial Robotics, IoT ● Advanced Product Design Engineering & Manufacturing Design Thinking for Start Ups, Catia V6 and PLM, Virtual Verification and Analysis, Product Design and Development, Additive Manufacturing, Digital Manufacturing, Industrial Robotics, Advanced Manufacturing, Manufacturing Execution System, IoT 	<ul style="list-style-type: none"> ● Catia V6 and PLM ● Virtual Verification and Analysis ● Product Design and Development ● Additive Manufacturing ● Digital Manufacturing ● Industrial Robotics ● Advanced Manufacturing ● Manufacturing Execution System ● Internet of Things (IOT) ● Industrial Automation ● Miniature Industrial Production System (MIPS)

COURSE CONTENTS

CIIT-01: 3-D Scanning & Reverse Engineering

- Introduction to Reverse Engineering
- Geometry Acquisition Hardware & Software
- 3D Scanner and Data Processing
- Inspection Software
- Hands-on on Reverse Engineering Software
- live Scan technology **EinScan- 3D Scanner**
- real-time data capture with 3D scanner
- Scanning / Inspection software. **EinScan- 3D**
- 3D Scanning (Laser and White / Blue Light)
- Scanned Data to 3D Model, clean up tools
- Convert raw 3D scan data into high quality models
- 3D Inspection & Drag and drop Report generation

CIIT-02: 3-D Printing & Additive Manufacturing

- Intro to Product Design Development
- Introduction to 3D Printing Technology
- Geometric/solid modeling
- Facet generation and File types Obj, Stl, Prt etc
- Slicing softwares, Cura
- Part orientations and Slicing considerations
- Slicing parameter settings
- 3-D Printing materials PLA, ABS, TPU, Wood,
- 3-D Printing Tolerances
- G code files and FDM 3-D printing
- Ultimaker FFF-3-D printing
- Post processing

CIIT-03: CNC Programming & VMC Operations

- Introduction to Various Manufacturing Processes
- Introduction to Advance Manufacturing Processes
- CNC Programming and Milling operations
- CNC Programming and Turning operations
- G-Codes & M-Codes for Milling & Turning
- CNC Programming for Drilling operations
- Fancu Interface and operating panel
- ATC operations & Work-offset
- Operating facemill & endmill cutters
- Subprogram and canned cycle
- Manufacturing simulation

CIIT-04: Industrial Robot operator (Yaskawa Arc welding)

- Basics of Industrial Robotics
- Various application in industries
- Safety for Robot
- Product Description and Specifications: ROBOTS
- Robot Transport and Installation
- Operation of ROBOT: ROBOT Programming
- Basic & logical command used in program
- Robot practical Welding program
- Maintenance of Robots in Industry

CIIT-05: Solid modeling Catia V6

- Innovation and Design Thinking
- Concept Generation
- Introduction to Design Tools - CAD (CATIA v6)
- Concept Creation and 3D Modelling
- Detail Design & Engineering
- Introduction to GUI & Getting Started with CATIA
- Sketcher Workbench Pad, Shaft, pocket & RP
- Drawing Shapes, Modifying sketch and constraints
- Part Design Workbench Practice example
- Sketch based and dress-up features, Holes & Fillet
- Transformation features, Practice example
- Design for Assembly and Design for Manufacturing

CIIT-06: Mechatronics & Internet of Things (IoT) Engineering

- Fundamentals of Electronics and Mechatronics
- Basics of Electronics and Components
- Communication Protocols
- Various Micro Processors, Controllers
- Introduction to various Sensors
- IoT Application Arduino IDE
- IoT Applications to fields and implementation
- Cloud Concepts – Firebase
- Introduction Raspberry Pi Hardware Integration

CIIT-07: Manufacturing Execution System Engineering/ operator

- Introduction to MES, Objective MES, Benefits
- Discrete, Continuous & Batch Manufacturing
- Manufacturing Organization Structure
- MES functionality, Integration of Business Layer
- Integration of Shop floor system
- MES Components and Systems Introduction
- Automation & Process Control, Automation Purpose
- Basics of Control System PLC and HMI for MES
- PLC types, applications & programming
- SCADA Softwares and Design, HMI
- Sensors and Actuators - Limit Switch, Prox. Sensor
- Integration of PLC, Conveyor Belt, Sensors.
- Pick to Light System - Overview and Working
- MES Software and Core Functionalities

CIIT-08: Finite Element Analysis (MSC Nastran)

- Basics of Strength of Material
- Introduction to Geometric Model & FE Model
- Introduction to Finite Element Analysis (FEA)
- Introduction to MSC NASTRAN and PATRAN
- Linear static structural analysis
- Modal Analysis (Free-Free Run)
- Buckling Analysis
- Non-Linear Static Analysis
- Material Geometry and Contact Non-Linearity

3D-PRINTER



Make: Ultimaker 3 Extended, dual extrusion with open filament system.
Technology: Fused Filament Fabrication
Print head: Dual nozzle,
Nozzle replacement: Easily swappable print cores
Filament diameter: 2.85 mm
 Step accuracy X, Y, Z: 12.5, 12.5, 2.5 micron
Print head travel speed: 30 - 300 mm/s
Material flow speed: 0.40: up to 16mm³/s
Build plate: Heated glass bed
Nozzle diameter: 0.4mm
Nozzle temperature: 180 - 280 °C
Build plate temperature: 20 - 100 °C
Nozzle heat up time: < 2 min
Build plate heat up time: < 4 min (20 -> 60 °C)
Average operation noise: 50 dBA
Nozzle replacement: Easily swappable printcores
Filament storage: Open, reel holder incl guide for 2 spools of 750g
Filament Detection: NFC automatic material detection
Connectivity: Wifi, ethernet, stand alone via USB-drive
Bed levelling: Active leveling
Camera: Yes
Printer size: 342 x 380 x 489 mm
Build volume: 215 x 215 x 300 mm (left or right nozzle)
 197 x 215 x 300 mm (dual extrusion)
Supported materials: PLA, Tough PLA, Nylon, ABS, CPE, CPE+, PC, TPU 95A, PP, PVA, Breakaway
Nozzle temperature: 180 °C to 280 °C
Build plate: 20 to 100 °C heated glass build plate with active leveling
Connectivity: Wi-Fi, LAN, or USB port

3-D SCANNER



Technical Specifications:

Make: EinScan SE

Scan Mode : Auto Scan
Mode of Alignment : Turntable; Manual
Single Shot Accuracy : ≤0.1 mm
Minimum Scan Volume : 30 × 30 × 30 mm
Maximum Scan Volume : 200×200×200 mm
Range of Single Capture : 200×150 mm
Scan Speed : < 8 s
Point Distance : 0.17 mm ~ 0.2 mm
Texture : Yes
File Format : OBJ, STL, ASC, PLY
Camera Resolution : 1.3 Mega Pixels
Light Source : White Light
Stand-off Distance : 290 ~ 480 mm



ARC WELDING ROBOT

MAKE: YASKAWA AR-1440

02

12 kg payload supports a wide variety of motorized torches and sensors.

01

Slim, fast, six-axis AR1440 welding robot achieves unrivaled welding performance and productivity.

03

Slim profile design allows close proximity placement of robots for high-density work cells.

04

Symmetric wrist profile, with ample range, provides equal torch access to both sides of part.

05

50 mm thru-hole for torch cabling, hoses and sensor wires reduces cable interference and wear.

06

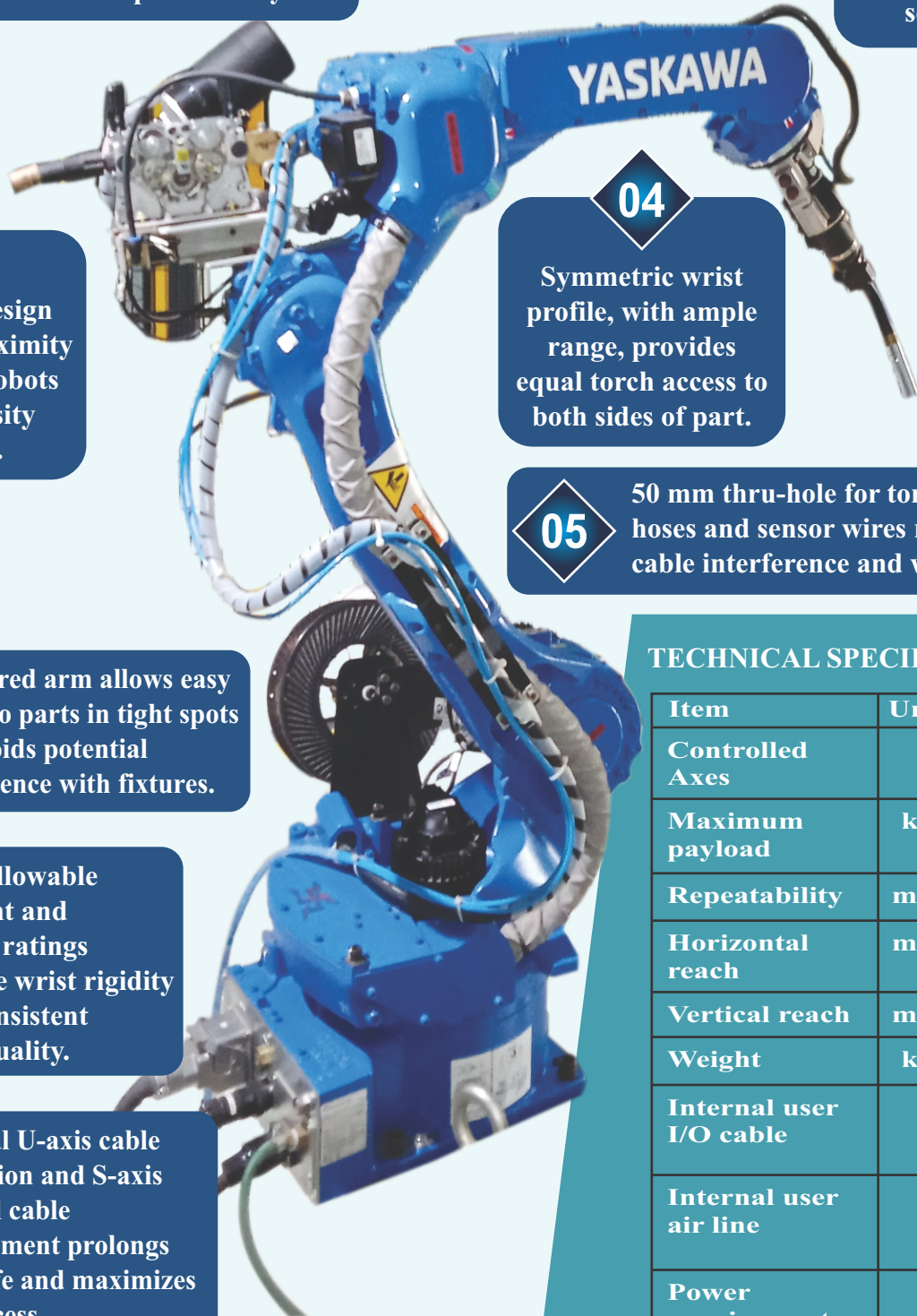
Contoured arm allows easy access to parts in tight spots and avoids potential interference with fixtures.

07

High allowable moment and inertia ratings provide wrist rigidity and consistent weld quality.

08

Minimal U-axis cable protrusion and S-axis internal cable management prolongs cable life and maximizes part access



TECHNICAL SPECIFICATIONS

Item	Unit	AR1440
Controlled Axes		6
Maximum payload	kg	12
Repeatability	mm	0.02
Horizontal reach	mm	1440
Vertical reach	mm	2511
Weight	kg	150
Internal user I/O cable		17 conductors w/ ground
Internal user air line		(1) 3/8" connection
Power requirements		380-480 VAC
Power rating	kVA	1.5

Pick N Place ROBOT (BRABO)



SPECIFICATIONS

Payload	10 kg
Max. Reach	750 mm
Controller Axes	5
Robot Arm-Wt.	95 kg
Structure	Articulated Arm
Axis Ranges	Axis 1: ± 1800
	Axis 2: ± 1300
	Axis 3: ± 1500
	Axis 4: ± 1800
	Axis 5: ± 3600
Max. Speed (A1, A2, A3, A4 & A5)	A1: 1100/s
Position Repeatability	± 0.2 mm
Acoustic Noise	< 70 dB
Sound Sensor	Yes
Touch Sensor	Yes
Light Sensor	Yes
Operating Temp	0 – 50 0C
Mounting	Floor

Manufacturing Execution System (MES)



SPECIFICATIONS

Conveyor (12m) with PLC
Emergency Stop & Authorization Box
Allen Bradley PLC of Compact Logic L16-ER
Buonfiglio Motor and Cables,
PLC integration Rittal IP-65 panels-AB-L16_ER
Buffer modules
3 Tier lamps
Hooter and Andon scheme
Pick to light sensor integration
Pick to light Racks with bin system 6 Nodes
Pick to Light sensor:
K50APFF100GREQ-50 E series Banner K50
Pick to Light cables Banner MQDC1-506
Tower Light Banner TL50GYRA
Station Tube lights and PC Stands
Mechanical Components for Assembly
Factory Magix software by TTL
Desktop-Label Printer Zebra GT800:
Resolution 203 dpi/8 dots per mm, Memory 8 MB Flash, 8 MB SDRAM, Print Speed 5"/127 mm per second, and Zebra Solutions Software.
Warranty - HP 5/5/5 Warranty SING

VERTICAL MACHINING CENTER (VMC)



SPECIFICATIONS

TRAVELS	UNITS	430V
X	mm	400
Y	mm	300
Z	mm	400
Dist . from spindle face to table top	mm	125-525
TABLE		
Table size	mm	650 x300
Max. load on table	mm	250
Table height from floor	mm	840
SPINDLE		
Tool shank type	rpm	BT - 40
Spindle Seed Std.	kW	60 -6000
Spindle Power Std.		
FEED		
Cutting Feed	mm/min	1 - 10000
Rapid Traverse	m/min	36/36/36
AUTOMATIC TOOL CHANGER		
No. of. Tools		20
Tool Dia . Max.	mm	80 / 100
Tool Weight Max.	Kg	8
Tool Length Max.	mm	250
Tool Change System		Twin Arm
Chip To Chip Time	Sec.	3.3 / 4
ACCURACY		
Positioning accuracy	mm	0.010
Repeatability	mm	+ 0.0003
CONTROL SYSTEM		
Fanuc	Std.	0IMF
INSTALLATION DATA		
Machine Width	mm	1600
Machine Depth	mm	2000
Machine Height	mm	2350
Machine Weight -Net	kg	2200

SPECIFICATIONS

TRAVELS	UNIT
Length	2300 mm
Width	1600 mm
Height	2100 mm
Chuck Size	165 mm
Maximum Turning Diameter	235 mm
Swing Over Cross Slides	160 mm
Swing Over Way Cover	410 mm
Maximum Speed	6000 RPM
FANUC Controller	
Tool Type	BTP 80
No. of Tool Stations	8

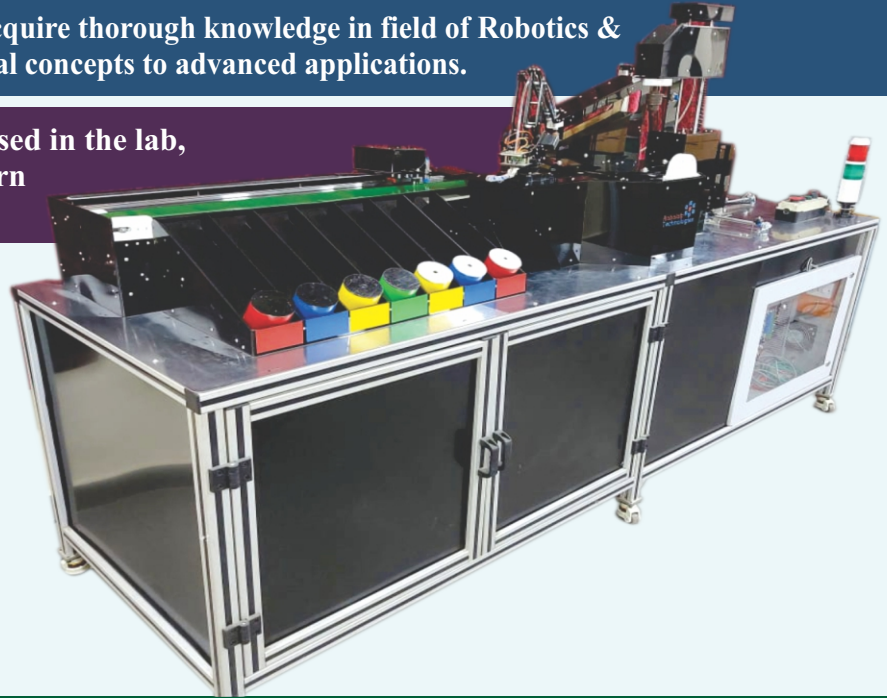
MAX TURN CNC PLUS+TURNING CENTRE



MINIATURE INDUSTRIAL PRODUCTION SYSTEM (MIPS)

MIPS enable the trainees & trainers to acquire thorough knowledge in field of Robotics & Automation starting from basic theoretical concepts to advanced applications.

A combination of all the technologies used in the lab, the MIPS is a complete platform to learn about industrial automation.



It includes a combination of various sensors, motors, pneumatic components, linear actuators, microcontrollers & PLC, etc. to build a miniature manufacturing unit that performs a specific task.

MIPS consists of total 11 modules i.e. Stacking Magazine Module, Linear Transfer Module, Lifting Module, Slide Module, Indexing Module, Drilling Module, Sensing Module, Robotic Manipulator Module, Conveyor Module, Separating Module, Storage Module.

Customized IDE Board:

IOTIF

Integrated Development

Environments:

Arduino Nano

Raspberry Pi 4

Added on board Support

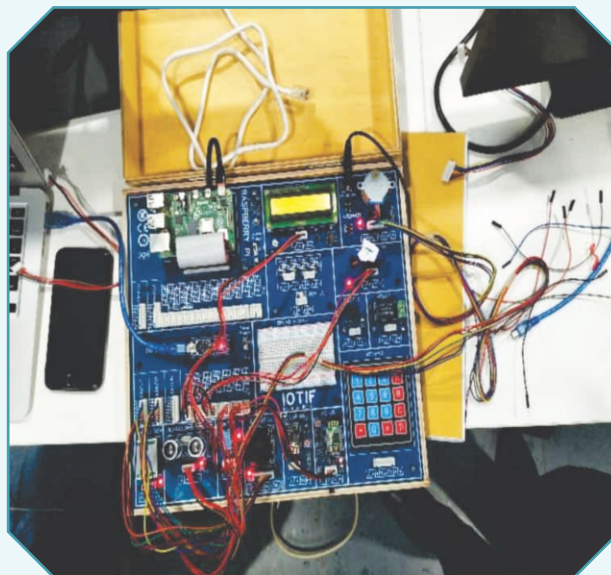
ESP-01 (Wi-Fi)

HC-05 (Blue Tooth)

Additional sensors:

- Turbidity • Torque,
- Acceleration • Gyroscopic
- Sound • Touch • Light
- Moisture • Humidity
- Turbidity • Heart Beat,
- Water flow • Water level Vibration
- Body Temperature • Oxygen level

INTERNET OF THINGS



Key Enablers:

- High End Industrial Workstations
- ThingWorx Industrial Connectivity
- Internet of Things Hardware
- Sensors and other accessories
- Data Analytics Tools
- Electric and Electronic components
- Industrial Best Practices

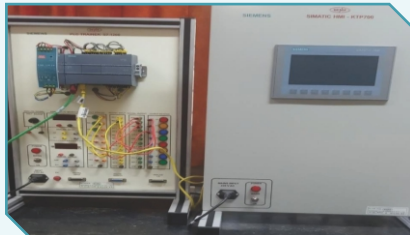
Career Opportunities:

- Automotive Industries
- Aerospace Engineering
- Construction Equipment's
- Locomotive
- Industrial Heavy Machinery
- Oil and Gas
- Consumer Goods
- Manufacturing Industries
- IT Industry
- Electricals and Electronics

INDUSTRIAL AUTOMATION

OBJECTIVES: ● Provide quality education in industrial automation ● Exploring Sensors-actuators, PLC, HMI and SCADA ● Develop effective mechanisms for transfer of technology for enhanced and sustainable production leading to improved livelihoods.

COURSE CONTENTS: ● Introduction to Industrial revolutions and process control ● Fundamental Components of Automation ● IO modules interfacing Techniques ● Electro Hydraulic and Electro Pneumatic systems ● SIEMENS SIMATIC S7 controllers ● PLC Programming concepts ● Analog operations and converters ● PLC Communication ● Fundamental of SCADA and HMI ● SCADA and HMI development ● Lab sessions on TIA portal, Siemens PLC and HMI ● PID Controller ● Miniature Industrial Production system ● Introduction to IoT and IIoT ● Mini project



SIEMENS 1215PLC

SIEMENS KTP700 HMI



Objects sorter



PID Controller



Linear Motion setup



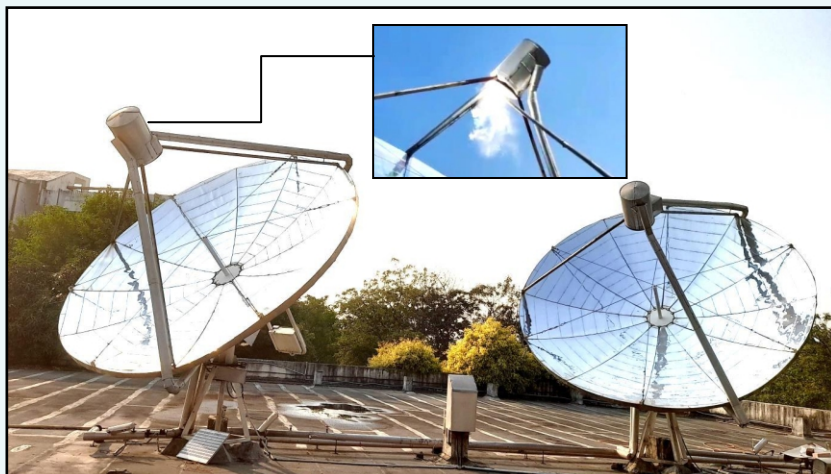
SOLAR ENERGY INSTALLATIONS AND TECHNOLOGY DEMONSTRATION ON CAMPUS

1. ROOFTOP SOLAR PHOTOVOLTAIC POWER PLANT

A total 460 kwp grid connected rooftop solar photovoltaic plant has been installed on campus. The solar plant consists of a total 1505 solar PV modules of TATA Power Solar and we are having different capacities like 260Wp and 320Wp.

2. CONCENTRATED SOLAR THERMAL (CST) PLANT

The research facilities are being used by undergraduate, postgraduate, and doctoral research students on campus. Some of the current research efforts include using CST to generate pressurized hot water for cooking and other applications, using collected heat in vapour absorption refrigeration (VAR) system, development of efficient thermal storage units and more.

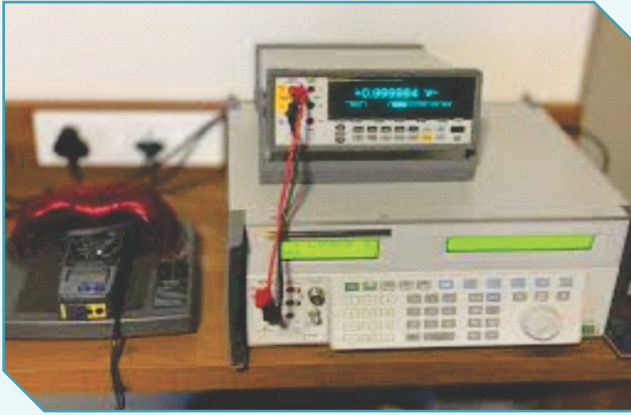


Concentrated Solar thermal (CST) Facility at RCOEM Nagpur

TESTING AND CALIBRATION FACILITIES

RCOEM is providing electrical calibration services for almost all, electrical, electronic, a test measuring instruments like DMMS, Panel meters, Oscilloscope, LCR meters, Power meters, Micro Ohmmeters, Function generators, Signal generators, Thermocouples, RTDs, Data logger etc.

Calibration Facilities :



Fluke Multiproduct Calibrator with 300 MHz Oscilloscope (Model: 5502A-3), Fluke 6.5 Digit Digital Multimeter (Model: 8846A). Fluke 50 Turn Current Coil (Model: 5500A/Coil).

Standards and Instruments Used :

Fluke Multiproduct Calibrator with 300 MHz Oscilloscope (Model: 5502A-3) as a source, Fluke 6.5 Digit Digital Multimeter (Model: 8846A). Make: Fluke 50 Turn Current Coil (Model: 5500A/Coil).

Source Parameters :

DC Current, AC Current, DC Voltage, AC Voltage, Resistance, Capacitance, Frequency, Power Factor, Power at various power factors.

Instruments Which Can Be Calibrated :

Multimeter up to 6 ½ digit, Clamp meter, LCR Meter, AC/DC Voltmeter, AC/DC Ammeter, Frequency Meter, Ohms Meter, Electronic thermometers, Chart recorders, Oscilloscope recorders, XY recorders, Data loggers.

Measurement Parameters :

AC/DC Voltage, AC/DC High Voltages, DC Current, AC Current (at 5 Hz TO 30 kHz Frequency), Resistance, Capacitance, Frequency.

**For Testing & Calibration Services Contact -
Dr. Rajesh Raut - 98234 04432**

Summary Specifications of Fluke 5502A-3 Multiproduct Calibrator :

Function and Range		
1	DC Voltage	0 to ± 1020 V
2	DC Current	0 to ± 20.5 A
3	AC Voltage	1mV to 1020 V 10Hz to 500kHz
4	Volt/Hertz	1000 V @ 10kHz/ 330V @ 100kHz
5	AC Current	29 uA to 20.5A 10Hz to 30 kHz
6	Resistance	
7	Capacitance	220 pF to 100 mF
8	Thermocouple (Source /Measure)	B,C,E,J,K,L,N,R,S,T,U 10 uV/oC and 1 mV/oC
9	RTD (Source temperature)	Pt 385-100 Ω, Pt 3926-100 Ω, Pt 3916-100 Ω, Pt 385-200 Ω, Pt 385-100 Ω, Pt 385-1000 Ω, Pt Ni 385-120 Ω(Ni120), Cu (427- 10 Ω)
10	Waveform	Sine, Square, Triangle, truncated sine.
11	Frequency uncertainty	< 25 ppm
12	Oscilloscope calibration	Calibrate oscilloscopes upto 300 MHz Band width with variable amplitude/ frequency / edge etc

COMPUTER AIDED MANUFACTURING (CAM)

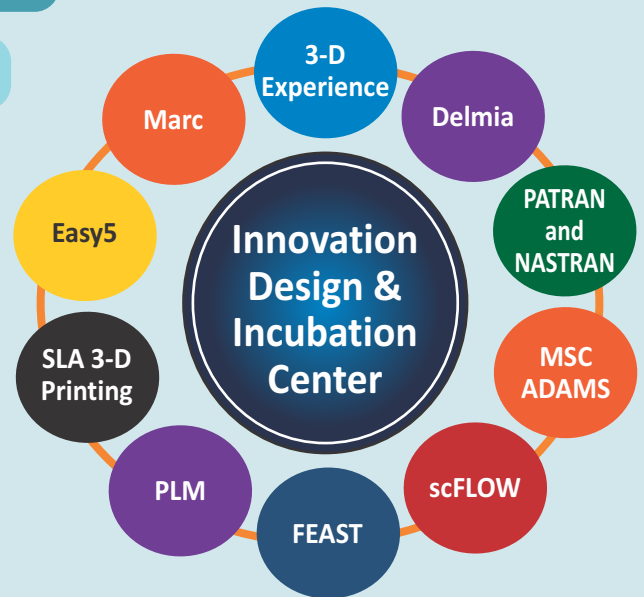
COMPUTATIONAL FLUID DYNAMICS (CFD)

COMPUTER AIDED ENGINEERING (CAE)

COMPUTER AIDED DESIGN (CAD)

FINITE ELEMENT ANALYSIS (FEA)

MULTI BODY DYNAMICS (MBD)



Shri Ramdeobaba Temple on Campus

INTERACT WITH US

RCOEM-TATA-CIIIT

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<http://www.rknec.edu/RCOEM-TATA-CIIIT.aspx#>

Email: ciit@rknec.edu

Course registration link: <https://forms.gle/GEvLBpRiyAdozgDP7>



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