DEPARTMENT OF ROBOTICS AND AUTOMATION

INDUSTRIAL VISIT

TO

KGTTI

BY

5TH SEMESTER STUDENTS

OF

DEPARTMENT OF ROBOTICS AND AUTOMATION



RAJARAJESWARI COLLEGE OF ENGINEERING

BENGALURU – 560074.

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ABSTRACT

An industrial visit provides engineering students with an opportunity to connect classroom learning with the technologies and practices used in technical training and industry. The visit to Karnataka German Technical Training Institute (KGTTI), Bengaluru, was selected as a learning activity relevant to Robotics and Automation Engineering. KGTTI's published training portfolio includes Industrial automation, Manufacturing technology, Welding technology, Automobile technology and Embedded technology, among other technical fields.



This report introduces the institute and explains the engineering principles associated with the six selected areas. The industrial automation section covers programmable logic controllers (PLCs), sensors, actuators, drives and fluid-power systems.

The manufacturing and CNC sections explain computer-aided design and manufacturing, tool paths, machining and metrology. The welding section describes common arc-welding processes and quality considerations. The automobile section outlines vehicle systems, diagnostics and mechatronics, while the embedded technology section introduces microcontrollers, interfaces and communication protocols.

Introduction

Industrial visits complement classroom teaching by allowing students to see how engineering concepts are implemented in real equipment, training laboratories and industrial workflows. Textbook explanations often isolate topics such as sensors, machine tools, control logic and electronic circuits. In practical systems, these elements interact: a sensor detects a condition, a controller processes the signal, an actuator performs an action, and the system is monitored to verify the result.

For Robotics and Automation Engineering students, this systems-level perspective is especially important. Robots and automated machines rely on mechanical structures, electrical drives, embedded controllers, sensors, communication interfaces and safe operating procedures. Manufacturing facilities also depend on accurate machining, joining processes, measurement and quality assurance.

The visit report therefore focuses on six connected technical areas: industrial automation, manufacturing technology, CNC technology, welding technology, automobile technology and embedded technology/electronics.

About KGTTI, Bengaluru

The Karnataka German Technical Training Institute (KGTTI) operates as a technical skills development institution associated with the Karnataka German Multi Skill Development Centre (KGMSDC). Its stated purpose is to deliver multidisciplinary technical and vocational training aligned with industrial skill requirements. KGTTI's published material describes practical training facilities and technical programmes intended to support skill development and employability.

The official KGTTI website lists technical training areas that include Industrial Automation, Manufacturing Technology, Welding Technology, Automobile Technology and Embedded Technology. The Bengaluru centre's published course information includes topics such as PLC programming, pneumatics, hydraulics, sensory, drives, CNC programming and operation, CAD/CAM, welding processes, embedded systems and microcontroller interfacing.

These areas are relevant to a Robotics and Automation Engineering curriculum because they combine mechanical systems, electronics, control, programming and manufacturing. Their industrial applications range from automated production equipment and precision machining to vehicle diagnostics and embedded control devices.

Objectives of the Industrial Visit

1. To understand KGTTI's role in technical and industry-oriented skill development.
2. To become familiar with training areas relevant to manufacturing and automation.
3. To study the working principles of selected machines, controllers, sensors and electronic systems, where demonstrated.
4. To understand how automation integrates sensing, control, actuation and feedback.
5. To learn the purpose of CNC programming, machining accuracy and metrology in manufacturing.
6. To understand the principles and applications of common welding processes.
7. To identify the role of electronics and embedded controllers in industrial and automotive systems.
8. To observe the importance of safety, maintenance, qualityand professional conduct in technical environments.
9. To relate practical engineering systems to concepts taught in Robotics and Automation Engineering

Department Industrial Automation VISIT

Overview

Industrial automation uses control systems, sensors, actuators and software to operate machines and processes with reduced manual intervention. Automation can improve consistency, repeatability, productivity and process monitoring. KGTTI's published Industrial Automation training information includes PLC programming, pneumatics, hydraulics, electro-pneumatics, electro-hydraulics, sensory and drives.

Equipment and systems to document

Confirm which of the following were actually present during the visit: PLC training panels, push buttons and indicator lamps, proximity sensors, photoelectric sensors, pneumatic cylinders, directional control valves, pressure regulators, hydraulic components, motor drives, HMI panels or SCADA demonstrations.

Working principles

A programmable logic controller is an industrial controller designed to monitor inputs and control outputs according to a user-defined program. Inputs may include sensor signals, switches or process measurements. The PLC executes its logic and updates outputs connected to devices such as lamps, relays, solenoid valves or motor-control equipment. A typical sequence may involve detecting a part, checking a condition, activating a cylinder and confirming completion with another sensor.

Sensors convert physical conditions into electrical signals that a control system can interpret. Inductive proximity sensors are commonly used to detect metal objects without contact, while photoelectric sensors use light to detect an object or interruption in a beam. The actual sensor type and application should be recorded from the visit.

Pneumatic systems use compressed air to produce motion, commonly through cylinders. Hydraulic systems use pressurized liquid and are often selected when higher force is required. Directional valves route the fluid, while pressure-control components help regulate operation. Drives control the speed or torque of electric motors in applications that require adjustable motion.

Industrial applications

- Automated assembly and packaging lines.
- Part detection, counting and sorting systems.
- Material handling, clamping and pick-and-place equipment.
- Motor speed control and process monitoring.
- Machine interlocking and sequence control.

Relevance to Robotics and Automation Engineering

Industrial automation demonstrates the integration of sensors, controllers, actuators and mechanical systems. These are the same core elements found in robotic work cells. PLC concepts support industrial sequencing and safety interlocks, while sensorics and drives help students understand feedback, motion control and machine integration.



Pneumatic training board and experiment Electro-pneumatic experiment

Department - Manufacturing Technology

Overview

Manufacturing technology covers the processes, machines, tools and design methods used to convert raw material into usable components. Modern manufacturing may combine computer-aided design (CAD), computer-aided manufacturing (CAM), machining, inspection and process planning. KGTTI's published manufacturing portfolio includes CNC/CAM, AutoCAD, CATIA, Mastercam, CNC machining and metrology.

CAD and CAM

Computer-aided design software is used to create and modify 2D drawings and 3D models. A model can define geometry, dimensions and relationships between features. Computer-aided manufacturing uses design information to plan or generate manufacturing operations, such as tool paths for CNC machines. Depending on the software and process, the tool path may be simulated before machining to check for errors or collisions.

A typical workflow begins with a component drawing or 3D model. The programmer selects the manufacturing setup, tools and operations, generates tool paths, verifies the program and transfers approved instructions to the machine. Real industrial workflows include additional checks such as work holding, tool offsets, material selection and inspection.

Tools and equipment to identify

- CAD/CAM workstations and the software actually used.
- Conventional machine tools or machining demonstration equipment.
- Measuring instruments such as vernier calipers, micrometers or gauges, if observed.
- Work pieces, cutting tools, fixtures and tool holders, if shown.

Industrial applications

Manufacturing technology is used to produce components for automotive systems, industrial machinery, fixtures, tooling, consumer products and precision equipment. CAD/CAM can shorten the path from design to production and improve repeatability when models, programs and machine setups are properly controlled.

Relevance to Robotics and Automation Engineering

Robotic systems require brackets, links, end-effectors, mounts, housings and fixtures. Understanding manufacturing processes helps a robotics engineer design components that can be

produced accurately, assembled easily and maintained safely. Metrology helps verify that fabricated components meet their intended dimensions.



3D-printed products

Department - CNC Technology and Precision Manufacturing

Overview

Computer Numerical Control (CNC) is a method of controlling machine-tool movement through programmed instructions. CNC turning and milling are widely used for producing accurate parts. KGTTI's published manufacturing information identifies CNC programming and operation, turning, milling, CAD/CAM and metrology as training topics.

CNC turning

In CNC turning, the work piece commonly rotates while a cutting tool moves along programmed axes to remove material. Turning is suited to cylindrical components such as shafts, bushes and threaded parts. Operations can include facing, straight turning, grooving, drilling and threading, depending on the machine, tooling and program

CNC milling

In CNC milling, a rotating cutting tool removes material from a work piece held on a table or fixture. The tool and work piece move relative to one another along programmed axes. Milling can

create slots, pockets, flat surfaces, contours and complex shapes. Multi-axis systems can machine more complex geometry, subject to machine capability and setup

Programming and machine operation

A CNC program defines movement, operating modes and other instructions required by the machine. The exact code format and control system depend on the equipment. Before cutting, the operator must verify the program, work coordinate system, tool offsets, work holding, cutting tool and safety conditions. Simulation and a controlled trial can help identify errors before full production

Metrology and quality

Metrology is the science and practice of measurement. Manufacturing relies on measurement to confirm that parts match drawings and tolerances. Common instruments include vernier calipers, micrometers, height gauges, dial indicators and specialized gauges. Instrument choice depends on the dimension, required accuracy and inspection method. Correct measurement technique and calibration are important to avoid accepting defective parts or rejecting good parts.

Industrial applications

- Precision shafts, bushings, housings and machine components.
- Tooling, molds, fixtures and dies.
- Automotive and aerospace components where the process and certification requirements permit.
- Repeatable production of parts in small or large batches



CNC-machined products

Department Welding Technology

Overview

Welding joins materials, usually metals, by applying heat, pressure or a combination of both. The selected process depends on the base material, thickness, joint design, production rate and quality requirements. KGTTI's published welding information includes Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW/MIG/MAG), Gas Tungsten Arc Welding (GTAW/TIG) and pipe welding

Common welding processes

SMAW also called manual metal arc welding or stick welding, uses a flux-coated consumable electrode. The electric arc melts the electrode and base material, while the flux helps protect the molten weld pool and forms slag. The process is widely used in fabrication, construction and repair. GMAW commonly referred to as MIG or MAG depending on the shielding gas, feeds a consumable wire electrode continuously through a welding gun. Shielding gas protects the weld area from atmospheric contamination. The process can provide high deposition rates and is commonly used in fabrication and manufacturing. GTAW, commonly called TIG welding, uses a non-consumable tungsten electrode. Filler metal may be added separately when needed. TIG welding offers good control and is used where weld appearance or precision is important, although the process can be slower than some alternatives.

Joint preparation and weld quality

Weld quality depends on joint design, edge preparation, fit-up, cleanliness, heat input, travel speed, consumables and operator technique. Common weld discontinuities can include porosity, lack of fusion, undercut and cracking. Inspection may involve visual examination and, where required, suitable non-destructive testing methods

Safety practices

- Use the prescribed welding helmet, gloves, protective clothing and footwear.
- Ensure appropriate ventilation and follow local controls for fumes and gases.
- Keep flammable materials away from the welding area.
- Inspect cables, connections, electrode holders and gas equipment as applicable.
- Follow instructor guidance and never operate equipment without authorization.

Industrial applications and robotics connection

Welding is used in structural fabrication, machinery, vehicle bodies, pipelines and many manufactured assemblies. In automated manufacturing, robotic welding systems combine a robot, welding power source, torch, fixtures, process settings and safety guarding. Consistent part positioning and suitable process control are essential for repeatable weld quality.

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Welding process observation

Department Automobile Technology

Overview

Automobile technology involves the design, operation, inspection, maintenance and diagnosis of vehicle systems. Modern vehicles combine mechanical assemblies with electrical, electronic and software-based controls. KGTTI's published automobile-related training information includes service skills and automotive mechatronics.

Vehicle systems

A vehicle contains interacting systems such as the engine or traction motor, transmission, steering, suspension, braking, tyres, electrical supply and body systems. The specific arrangement varies by vehicle type. Routine inspection and maintenance help identify wear, damage, leaks and abnormal operation before they cause more serious problems.

Diagnostics and maintenance

Vehicle diagnostics is a structured process of identifying a fault, gathering evidence and checking possible causes. Depending on the vehicle, technicians may use visual inspection, measurements, diagnostic scan tools and service information. A fault code can guide investigation, but it does not automatically prove which component has failed. Diagnosis should be confirmed by appropriate tests.

Preventive maintenance may include checking fluid levels, tyres, brakes, battery condition, fasteners and scheduled service items according to the manufacturer's instructions. The exact checklist varies by vehicle and must follow relevant service documentation.

Mechatronics in automobiles

Automotive mechatronics combines mechanical systems, electronics, sensors and control software. Examples include electronic engine management, anti-lock braking, electronic stability control, power steering, automated transmission control and driver-assistance features. Sensors measure conditions such as wheel speed, temperature, pressure or position. Electronic control units process these signals and command actuators when required

Industrial applications and robotics connection

Automobile manufacturing uses industrial robots for welding, painting, material handling, inspection and assembly. Vehicle diagnostics also illustrates the use of embedded controllers,

communication networks and sensor data. These topics connect directly to robotics, automation, control systems and embedded electronics



Inspection by the students

Department Embedded Technology and Electronics

Overview

An embedded system is a computing system designed to perform a specific function within a larger product or machine. It typically combines a microcontroller or processor with firmware, memory, input/output interfaces and connected hardware. KGTTI's published embedded technology information refers to microcontrollers, embedded C, interfaces, timers, counters, interrupts, sensors, motors and communication protocols.

Microcontrollers and interfaces

A microcontroller integrates a processor, memory and peripheral interfaces on a single chip. A program reads inputs, performs calculations or logic, and controls outputs. Inputs may come from switches or sensors; outputs may drive indicators, relays, motor drivers or displays. A microcontroller usually cannot power a motor directly, so a suitable driver stage is used.

Timers and counters help measure intervals, generate periodic events and count signals. Interrupts allow the processor to respond to selected events without constantly polling every input. Analogue-to-digital converters (ADCs) convert analogue voltage signals into digital values, while digital-to-analogue converters (DACs), where available, produce analogue outputs.

Communication protocols

Embedded devices exchange information through communication interfaces. UART/USART supports serial communication; I²C and SPI are commonly used for short-distance communication between integrated circuits; CAN is widely used in automotive and industrial contexts; Ethernet and USB support other data-transfer needs. The appropriate protocol depends on speed, distance, wiring, reliability and system architecture

Sensors, actuators and control

Embedded systems can acquire data from temperature, position, pressure, proximity or other sensors and use that data to make decisions. For example, a controller may read a sensor, compare the measurement with a threshold and switch an output. More advanced systems may use feedback algorithms to regulate speed, position or temperature.

Industrial applications

- Industrial monitoring and control devices.
- Automotive electronic control units and diagnostic interfaces.
- Consumer appliances and smart devices.
- Robotics, motor control, sensor acquisition and IoT equipment.
- Medical, communication and process-control devices, subject to their specific safety requirements.

Relevance to Robotics and Automation Engineering

Robots depend on embedded controllers to read sensors, command motors, communicate with other devices and execute control logic. Understanding the interaction between hardware and firmware is useful when building prototypes, debugging circuits and integrating sensors, motor drivers and communication modules.



Multimedia Embedded System

Industrial **Safety and Professional** Practices

Safety is a basic requirement in technical laboratories and industrial workplaces. Students should follow instructions from trainers, remain within permitted areas and avoid operating equipment without authorization. The exact safety requirements depend on the machine and process.

- Identify hazards before work begins and follow the local risk-control procedure.
- Use the required personal protective equipment for the task.
- Keep guards, interlocks and emergency-stop devices in their intended condition.
- Do not touch rotating tools, hot surfaces, exposed electrical parts or pressurized lines.
- Use safe lifting and handling practices for components and work pieces.
- Keep walkways and work areas clean and report unsafe conditions.
- Follow lock out / tag out or other isolation procedures when required by authorized personnel.

  Respect photography restrictions and avoid capturing confidential drawings, screens or personal information

Learning Outcomes

By the end of the visit, students should be able to:

1. Explain how sensors, controllers and actuators work together in an automated system.
2. Describe the role of CAD/CAM in component design and manufacturing planning.
3. Distinguish CNC turning from CNC milling and explain the importance of measurement and tolerances.

4. Summarize the working principles and applications of common welding processes.

5. Identify examples of mechatronics and embedded control in automotive and industrial systems.

6. Recognize the importance of personal protective equipment, machine guarding and safe operating procedures

Conclusion

The industrial visit to the Karnataka German Technical Training Institute (KGTTI), Bengaluru, provided a useful opportunity to relate engineering education to technical skills development areas relevant to industry. The selected areas of industrial automation, manufacturing technology, CNC machining, welding, automobile technology, and embedded electronics collectively demonstrate how mechanical, electrical, electronic and software systems contribute to modern engineering. For students of Robotics and Automation Engineering, the most important takeaway is the need to understand complete systems rather than individual components in isolation. Sensors provide information, controllers interpret inputs, actuators create motion, manufacturing processes produce components, and measurement and safety practices help ensure reliable operation



Group photograph at KGTTI, Bengaluru

Note: Attendance sheet is attached with this report

Dr. Thanuj Kumar M
Faculty Coordinator

Dr. Satheesha V.
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Rajarajeswari College of Engineering

(An Autonomous Institute, Affiliated Visvesvaraya Technological University, Belagavi)
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Department of Robotics and Automation

Ref: RRCE/BLR/V/2026-27/02

Date: 06/10/2026

List of Students visiting KGTTI on 8th Oct 2026

Sl. No.	USN	Name of the Student	Signature
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2	1RR23RA022	Muthukrishnan V	
3	1RR24RA001	Abhilash K M	
4	1RR24RA002	Aishwarya S	
5	1RR24RA003	Akash.S	
6	1RR24RA005	Amrutha P	
7	1RR24RA007	Chandana L	
8	1RR24RA008	Chandu Prakash Reddy V S	
9	1RR24RA010	Deepthi R	
10	1RR24RA012	Gowtham K M	
11	1RR24RA013	Harshitha T R	
12	1RR24RA014	Kushal H	
13	1RR24RA015	M S Nithya Shree	
14	1RR24RA016	Megha C R	
15	1RR24RA017	Mohammed Faheem Khan	
16	1RR24RA018	Mohammed Faraz	
17	1RR24RA021	Pavan Reddy D R	
18	1RR24RA022	Praneeth S	
19	1RR24RA024	Rishigirish	
20	1RR24RA025	Rushank T R	
21	1RR24RA027	Shameem Unnisa	
22	1RR24RA028	Shreyas H L	
23	1RR24RA030	Spandana D M	
24	1RR24RA031	Sunas V	
25	1RR24RA032	Sushil	
26	1RR24RA034	Ujwala M C	
27	1RR24RA035	Vaishnavi K R	
28	1RR25RA400	Hruday Krishna	
29	1RR25RA401	Kiran H M	
30	1RR25RA402	M Tejas Sharma	
31	1RR25RA403	Nandan Kumar K	
32	1RR25RA404	Nithin K A	
33	1RR25RA405	P Nagananda Sharma	
34	1RR25RA406	Prabhath R	

08/10/2026.

08/10/26

Class Teacher

HOD R&A

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⑤ MD. Tanveer.	1RR25RA031	
⑥ Kavana. N	1RR25RA022	
⑦ Sahana. A	1RR25RA043	
⑧ Abhishek. PC	1RR25RA004	
⑨ Lavanya. P S	1RR25RA035	
⑩ Trupthi K Yadav.	1RR25RA060	
⑪ Anushree M G	1RR25RA006	
⑫ Aishwarya Angur	1RR25RA003	
⑬ Rathnaprabha.	1RR25RA040	
⑭ Padmavathi. K	1RR25RA020	
⑮ Syed Ifham Alam	1RR25RA052	
⑯ Mohammed Ishaq	1RR25RA030	
⑰ Sherwin Vincent	1RR25RA047	
⑳ Tarun. R	1RR25RA058	
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