GOVERNMENT ENGINEERING
COLLEGE THRISSUR

SUMMER INTERNSHIP PROGRAM

ON

CYBER PHYSICAL SYSTEMS

PRE REGISTRATION GUIDELINES

Department of Electronics
& Communication Engineering

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1. What is Cyber Physical System (CPS)?

Cyber Physical Systems (CPS) are advanced technological systems that seamlessly integrate computational algorithms and physical components. At their core, CPS consists of a network of sensors, embedded processors, actuators, and communication interfaces that interact continuously with the physical environment. These systems enable real-time monitoring, intelligent control, and adaptive response—forming the foundation of innovations in autonomous vehicles, smart manufacturing, robotics, precision healthcare, intelligent transportation, and beyond. With the advent of Industry 4.0 and the growing emphasis on automation, connectivity, and intelligent decision-making, CPS has emerged as a cornerstone for next-generation engineering solutions. It represents a convergence of multiple domains including embedded systems, communication networks, control systems, and data analytics.

Kerala's First B.Tech. Program in CPS – An Industry-Aligned Initiative

Recognizing the transformative potential of CPS and the increasing demand for skilled professionals in this field, **Government Engineering College, Thrissur became the first institution in Kerala to launch a B.Tech. program in Cyber Physical Systems during the 2024–25 academic year. The program is offered under the Department of Electronics & Communication Engineering** and is designed as an industry-integrated, project-based curriculum.

This innovative academic initiative aims to produce engineers who are not only conceptually strong but also proficient in practical implementation—equipped to tackle real-world CPS challenges and contribute to technology-driven industries from day one.

2. About the Internship

The Summer Internship on Cyber Physical Systems, hosted by the Department of Electronics & Communication Engineering, GEC Thrissur, is a four-week, intensive hands-on training program that provides engineering students with an opportunity to explore, design, and prototype intelligent CPS hardware systems.

This internship reflects the core philosophy of the B.Tech. CPS program—bringing together academic learning and industrial practice. Participants will work alongside faculty experts and industry professionals, gaining end-to-end exposure to embedded systems, electronics design, sensor networks, industrial instrumentation, and prototyping.

Internship Tracks:

- Track A: **Hardware Design for CPS & IoT Applications**
  Focuses on embedded platforms, microcontroller interfacing, PCB design, sensor fusion, and IoT integration.
- Track B: **Instrumentation for CPS**
  Emphasizes real-time data acquisition, signal conditioning, and industrial instrumentation—including Programmable Logic Controllers (PLCs).

Participants will engage in project-oriented learning, contributing to the development of indigenous laboratory infrastructure and gaining experience that bridges classroom theory and industry-ready skills.

3. Program Objectives

The Summer Internship Program on **Cyber Physical Systems (CPS)** is designed with the following key objectives:

1. **To provide hands-on experience in CPS hardware development**
   Equip undergraduate students with practical exposure to embedded systems, sensors, actuators, control systems, and data communication by engaging them in the complete cycle of hardware design, prototyping, testing, and deployment.
2. **To promote indigenous design and fabrication of laboratory equipment**
   Encourage innovation and self-reliance by enabling participants to design cost-effective, scalable, and curriculum-aligned hardware setups, reducing dependence on expensive imported alternatives.
3. **To enable multidisciplinary learning across CPS domains**
   Facilitate collaborative learning by involving students from various engineering disciplines (ECE, EEE, Robotics, Instrumentation, Mechatronics, etc.) and exposing them to real-world challenges in automation, IoT, and instrumentation.
4. **To strengthen design-to-deployment workflows**
   Guide participants through a structured engineering process—from requirement analysis, circuit design, and PCB layout to enclosure design, firmware/software development, testing, and documentation—reflecting industry practices.
5. **To build functional hardware platforms for academic and research use**
   Develop reusable infrastructure and devices such as:
   - A unified development board with modular add-ons for IoT/CPS experiments
   - Standalone instrumentation setups for ten identified laboratory experiments
6. **To integrate project-based learning into the academic ecosystem**
   Align with the National Education Policy (NEP) by offering an experiential learning model that nurtures problem-solving, creativity, and teamwork while building resources that benefit future student batches and research.
7. **To document and disseminate outcomes for long-term utility**
   Ensure all designs, source codes, schematics, manuals, and test results are compiled systematically and made available through the department's academic resources for long-term reference and reuse.

4. Program Outcomes

Upon successful completion of the one-month internship program on **Cyber Physical Systems**, the participants will be able to:

1. **Understand the core principles of CPS architecture and integration**
   Gain a clear understanding of how physical systems interact with computational elements through embedded controllers, sensors, and actuators.
2. **Design and develop functional embedded hardware platforms**
   Apply concepts of electronics, control, and communication to design unified and modular hardware capable of executing a range of experiments related to IoT, instrumentation, and robotics.
3. **Demonstrate hands-on skills in electronics prototyping and system integration**
   Use development platforms like Arduino, STM32, and Raspberry Pi along with sensors, drivers, displays, and mechanical interfaces to build and test complete systems.
4. **Calibrate and validate sensor-based measurement systems**
   Gain expertise in setting up, calibrating, and using various transducers and instrumentation circuits for displacement, temperature, level, and pressure measurement.
5. **Fabricate custom lab equipment and experimental setups**
   Participate in the end-to-end development of indigenous lab devices such as LVDT calibration kits, temperature transmitter systems, and capacitance-based level sensors.
6. **Collaborate in multidisciplinary engineering environments**
   Work in diverse teams simulating real-world industrial and research environments, practicing team-based design thinking and problem solving.
7. **Document and present engineering work effectively**
   Produce professional documentation including circuit schematics, PCB layouts, firmware source code, test results, and user manuals for all developed modules.
8. **Build a foundation for future research and innovation in CPS**
   Prepare participants for advanced academic pursuits or product development roles by building experience in system design, prototyping, and testing.
9. **Contribute to institutional infrastructure through project outputs**
   Leave behind functional, low-cost lab setups and hardware platforms that can be reused and improved upon by future student batches and faculty.

5. Who Can Participate?

This internship program is **open to undergraduate students** from both engineering and science backgrounds who have an interest in Cyber Physical Systems and related domains. The program welcomes participants from a variety of disciplines to foster a multidisciplinary learning environment and simulate real-world engineering collaboration.

6. Eligibility

- **Engineering Students (B.Tech.) from the following branches:**
  - Electronics and Communication Engineering (ECE)
  - Applied Electronics & Instrumentation
  - Electrical and Electronics Engineering (EEE)
  - Instrumentation and Control Engineering
  - Robotics and Automation
  - Mechatronics
  - Biomedical Engineering
  - Mechanical Engineering (with Robotics & Automation focus)
  - Electrical & Computer Engineering
  - Electronics & Computer Engineering
  - Computer Science and Engineering (with IoT/Embedded System focus)
- Students pursuing **B.Sc. in Electronics, Instrumentation, or allied branches from Arts and Science colleges** are also eligible to apply. (A basic understanding of electronics, microcontrollers, or programming is desirable)

7. Prerequisites

- Willingness to engage in hands-on hardware development, testing, and prototyping.
- Ability to work collaboratively as part of a multidisciplinary team.
- Interest in real-world applications of embedded systems, IoT, robotics, and instrumentation.
- Commitment to the full duration of the internship (including Saturdays).
- Basic understanding of electronics, microcontrollers, and digital systems.
- Openness to learning new tools such as PCB design software, CAD tools, and cloud IoT platforms.

8. Registration Guidelines

The registration process for the Summer Internship Program on Cyber Physical Systems 2025 is conducted in two phases to ensure a smooth and verified enrolment procedure. Please follow the steps carefully:

8.1. Phase I: Preliminary Registration

- Interested candidates must complete the Phase I Registration through the provided Google Form link or QR code.
- During this step, applicants are required to submit the following:
  - **Basic personal information** (Name, Gender, Date of Birth etc.)
  - **Academic details** (Branch, Semester, Institution, etc.)
  - Upload of a recent **passport-size photograph**
  - Upload of **college ID card** (scan/photo)
- Additionally, you will be asked to select your track preferences:
  - **Priority 1** (Mandatory): Your most preferred track
  - **Priority 2** (Optional): Your secondary preference (can be left blank if not applicable)

Note: Track allotment is subject to availability and preferences will be considered on a best-effort basis.

Once Phase I is submitted, you will receive a confirmation email from the official internship mail ID *(internships.ece@gectcr.ac.in)*. This mail will contain:

- **Registration ID**
- **Payment details**
- **Phase II registration link**
- **Bonafide certificate format** to be filled, signed, and stamped by your college authorities

8.2. Payment Details

- **Internship Fee: ₹4,720/- (₹4,000 + 18% GST)**
- **Payment Mode: Online Bank Transfer / UPI**

8.3. Phase II: Final Registration

After completing the payment, participants must fill out the Phase II Registration Form. The following documents must be uploaded:

- **Registration ID**
- **Transaction ID or reference number of the payment**
- **Screenshot of the payment receipt**
- **Scanned copy of the duly signed Bonafide certificate**
- **Indicate if college hostel accommodation is required**

Note: The hard copy of the Bonafide certificate must be submitted during venue registration on 02/06/2025

9. Accommodation Facility

A limited number of seats are available in the college hostels for interns. Hostel accommodation will be provided subject to availability and will be charged separately as per the existing Government of Kerala hostel fee regulations. ***In case hostel accommodation cannot be provided, participants are expected to arrange their own stay outside the college campus.***

Key Guidelines:

- Participants who require hostel accommodation must **indicate their preference clearly** during the registration process (Phase-II)
- **Prior intimation is mandatory** to reserve hostel seats.
- **Selection criteria** for hostel allotment will be based on the following:
  - **Distance from the participant's permanent residence** (higher priority for those coming from distant locations)
  - **Seat availability at the time of allocation**
- Allotment decisions by the Hostel authority will be **final and binding**.

Further instructions regarding hostel fee payment, reporting time, and stay regulations will be communicated to selected candidates along with their final confirmation.

10. Last Date for Registration

- Registrations will be closed by **23rd May 2025** or earlier if seats are filled.

11. Guidelines for Interns

To ensure smooth execution and meaningful learning during the internship, the following guidelines must be followed by all selected participants:

11.1. Laptop and Software Requirements

- Each participant must bring a personal laptop for the entire duration of the internship.
- The laptop will be required for programming, circuit design, simulation, data logging, documentation, and interfacing tasks.
- Pre-internship instructions for software installation will be communicated in advance. (Arduino IDE, STM32CubeIDE, Python, etc., based on track requirements).

11.2. Attendance and Punctuality

- Interns must **report by 9:30 AM** and attend the full session till 4:30 PM every day, including Saturdays.
- A **minimum of 90% attendance** is mandatory to be eligible for certification.
- Late arrivals or early departures will be recorded and may affect evaluation.

11.3. Conduct and Discipline

- Interns are expected to maintain discipline, integrity, and professionalism throughout the program.
- Respect peers and facilitators, and follow institutional codes of conduct.
- Misconduct, plagiarism in documentation, or damage to infrastructure/components may lead to immediate disqualification.

11.4. Teamwork and Collaboration

- Interns will work in **assigned teams or project groups**. Active collaboration and contribution to group tasks are essential.
- Documentation and testing should be done collaboratively, but each intern must **maintain their own record** of learnings.

11.5. Project Ownership and Usage

- All prototypes, circuits, and hardware setups developed during the program will be considered **intellectual property of the institution**.
- Interns may include the work in portfolios or resumes with proper attribution but may not claim commercial rights.

11.6. Lab Safety and Equipment Handling

- Interns must handle all tools, components, and lab instruments with **utmost care and responsibility**.
- Safety protocols, including the use of protective gear during fabrication/testing, must be strictly followed.
- Any loss or damage must be reported immediately.
- Lab access is restricted to designated hours unless permitted by coordinators.

11.7. Evaluation and Documentation

- Interns are expected to document their work and progress regularly as per the given formats.
- Group-based project assignments will require effective collaboration and timely submissions.
- All final designs, source codes, and reports must be submitted before the conclusion of the internship.
- Weekly reviews will be conducted to monitor involvement, problem-solving ability, and technical understanding.
- Final evaluations will be based on prototype quality, documentation, and presentation.

12. Program structure & Time Schedule

The internship is scheduled from **2nd June 2025 to 1st July 2025**, running **Monday to Saturday**, with daily sessions from **9:30 AM to 4:30 PM**. The program will follow a structured timeline that includes orientation, hands-on design, prototyping, testing, documentation, and final demonstration.

12.1. Daily Schedule (Tentative):

Time	Activity
9:30 AM – 10:00 AM	Morning briefing / review of daily goals
10:00 AM – 1:00 PM	Hands-on sessions / prototyping
1:00 PM – 2:00 PM	Lunch break
2:00 PM – 4:00 PM	Testing, software interfacing, documentation
4:00 PM – 4:30 PM	Daily wrap-up and mentor feedback

12.2. Overall Timeline:

Week	Focus Area
Week 1 (2nd–7th June)	Orientation & Design Phase • Introduction to CPS concepts • Team formation and hardware planning • Familiarization with tools, platforms, and safety protocols • Initial design of circuits, schematics, and modules
Week 2 (9th–14th June)	Hardware Implementation Phase – I • PCB prototyping and assembly • Interfacing components and submodules • Software setup and embedded programming • Track-wise hardware integration begins
Week 3 (16th–21st June)	Hardware Implementation Phase – II & Testing • Advanced feature development • Functional testing of modules • Debugging and performance optimization • Begin preliminary documentation
Week 4 (23rd June –1st July)	System Integration, Documentation & Demonstration • Final hardware integration • Complete technical documentation • Prepare for presentations and demos • Final evaluation and feedback sessions

The schedule is flexible to accommodate hardware delivery timelines and project-specific dependencies. Additional sessions or industry interactions may be arranged as needed.

13. Syllabus

The internship program is divided into **two focused tracks**, each designed to provide participants with practical, hands-on experience in their respective domains. All tracks emphasize **designing indigenous lab hardware setups** that align with academic curricula and real-world applications in Cyber Physical Systems.

Track 1: Hardware Design for CPS & IoT Applications

Objective:

To design and fabricate a unified base hardware platform with modular add-ons to perform a wide range of embedded system experiments relevant to CPS and IoT domains.

List of Experiments:

1. Interface LED/Buzzer with delay control
2. Interface push button/digital sensor and activate LED.
3. Interface a switch and show status through relay, buzzer, and LED.
4. Interface a 4x4 keyboard and display input on an LCD.
5. Use external interrupt to toggle an LED.
6. Display hex digits 0 to F on a 7-segment LED.
7. Interface and control a DC motor.
8. Interface a stepper motor and rotate in both directions.
9. Interface a DAC to generate triangular and square waveforms.
10. Generate PWM using internal module and vary duty cycle.
11. Interface DHT11 and display temperature & humidity.
12. Interface Bluetooth and send sensor data to smartphone.
13. Upload sensor data to ThingSpeak cloud.
14. Retrieve and display data from ThingSpeak cloud.

Deliverable:

A compact, multi-functional embedded system trainer board with detachable modules and documentation for academic deployment.

Track 2: Instrumentation for CPS

Objective:

To design and fabricate individual lab hardware setups for common instrumentation experiments used in CPS.

List of Experiments:

1. Study and calibration of LVDT for displacement measurement.
2. Calibration of capacitive transducer for angular displacement.
3. Design of a temperature transmitter using RTD.
4. Calibration of strain gauge for temperature compensation.
5. Level measurement using capacitance sensors.
6. Bridge amplifier setup for temperature measurement.
7. Calibration of thermistor-based temperature sensing.
8. Calibration of thermocouple-based temperature measurement.
9. Measurement of level using a differential pressure transmitter.
10. Displacement measurement using strain gauge-based transducers.
11. Introduction to PLCs
12. Design & Fabrication of PLC trainer kit
13. Assembling and testing custom PLC trainer hardware
14. Interfacing sensors and actuators with PLC

Deliverable

- 11 individual hardware setups, each built to match experiment requirements and equipped with signal conditioning and display interfaces.
- Basic PLC Trainer Kit for educational use and Development of I/O interface modules (digital and analog) for PLCs.

Note: Each track will culminate in a **functional demonstration**, **technical report**, and **open review session** with faculty and invited experts.

14. Evaluation and Certification Criteria

To ensure quality learning and meaningful participation, a structured evaluation and certification system will be followed throughout the internship.

14.1. Evaluation Criteria

Interns will be assessed on a continuous basis based on the following parameters:

Criteria	Weightage (%)
Attendance & Punctuality	25%
Team Participation & Collaboration	10%
Hands-on Implementation & Practical Skills	25%
Product development skill	15%
Documentation & Reporting	15%
Final Presentation & Demonstration	10%

Note: Track-specific evaluation rubrics may apply, considering nature of deliverables in each domain (Hardware, Instrumentation).

14.2. Assessment Modes

- **Daily Reviews** – Monitored by assigned mentors.
- **Weekly Progress Reports** – Brief write-ups submitted by teams.
- **Final Review Session** – Teams will present their final prototypes, demonstrate features, and explain design and implementation strategies.

14.3. Certification Criteria

Interns will be issued certificates by the **Department of Electronics & Communication Engineering, GEC Thrissur**, only upon meeting all of the following:

- Minimum **90% attendance**.
- Completion of **assigned tasks** and active participation.
- Submission of **final documentation**.
- Successful demonstration of the **final prototype** (team-based).

A certificate with distinction will be awarded to top-performing interns based on mentor recommendations and evaluation scores.

15. Internship Outputs

At the end of the internship, each track will produce clearly defined academic and technical outputs. These deliverables serve as evidence of the interns' learning and the program's effectiveness.

15.1. Hardware Design for CPS & IoT Applications

- **A unified embedded hardware platform** capable of supporting all listed experiments (UART, PWM, interrupts, sensors, communication protocols, etc.).
- **Set of plug-and-play modular add-on boards** for different interfaces (keypad, DAC, motor driver, Bluetooth, DHT11, etc.).
- **Tested software libraries and demo codes** for all interfaced modules (Arduino, Raspberry Pi, STM32).
- **Documented circuit schematics and PCB layouts**.
- **Team-wise project reports** with implementation, testing data, and cloud integration logs.

15.2. Instrumentation for CPS

- **Ten standalone indigenous instrumentation setups**, one for each experiment (e.g., LVDT calibration, RTD transmitter design, thermocouple calibration).
- **Measurement & calibration documentation** for each experiment with setup photographs and circuit/block diagrams.
- **PLC Trainer Kit** for laboratory applications
- **Lab-ready equipment with enclosures and test documentation**.
- **User manuals and student experiment booklets** for each setup.
- **A compiled report** detailing design process, testing procedures, and calibration charts.

15.3. General Deliverables for All Tracks

- Internship certificate (on successful completion).
- Individual performance evaluation sheet.
- Access to shared internship GitHub repository (for code and docs).
- Networking opportunities with peers and resource persons.

16. Event Schedule & Venue Plan

To ensure smooth execution and optimal learning engagement, the following venue arrangements and event schedules have been finalized for the **Cyber Physical Systems Internship Program**, scheduled from **2nd June to 1st July 2025**.

16.1. Venue Details

- Common Events (Registration, Inauguration, Valedictory Function):
  ***Gloria Gopi Memorial Hall*, Government Engineering College Thrissur**
- **Track-wise Lab Venues:**
  - **Hardware Design Track:** SDPK Hall, ECE Department
  - **Instrumentation Track:** Computer Lab, ECE Department

16.2. Key Events Schedule

Event	Day	Date & Time	Venue
Venue Registration & Kit Distribution	Day-1	Monday, 2nd June 2025 9:00 AM – 9:30 AM	*Gloria Gopi Memorial Hall*
Inaugural Ceremony	Day-1	Monday, 2nd June 2025 9:30 AM – 10:30 AM	*Gloria Gopi Memorial Hall*
Orientation & Track-wise Familiarization and Ice breaking	Day-1	Monday, 2nd June 2025 10:30 AM – 4:30 PM	*Gloria Gopi Memorial Hall & Department Labs*
Final Project Exhibition Setup and Dry Run	Day 29	Monday, 30th June 2025 10:00 AM – 4:00 PM	*Department Labs*
Final Project Exhibition & External Evaluation	Day 30	Tuesday, 1st July 2025 10:00 AM – 12:30 PM	*Department Labs*
Valedictory Function & Certificate Distribution	Day 30	Tuesday, 1st July 2025 2:00 PM – 3:30 PM	*Gloria Gopi Memorial Hall*

Department of Electronics
& Communication Engineering presents

Government Engineering College
Ramavarmapuram Thrissur

Summer Internship Program

on

Cyber Physical Systems

2nd June 2025 to 1st July 2025

Tracks

- **Hardware Design**
  for IoT Applications
- **Instrumentation**
  for CPS

Register before
23/05/2025

FOR REGISTRATION

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