



AICTE Training and Learning (ATAL)
Virtual Faculty Development Program (FDP) on
Internet of Things (IoT): Architecture & System Level Design

Organizer: *Indian Institute of Technology Goa (IIT Goa)*

Sponsor: All India Council for Technical Education (AICTE)

Industry Partner: Arm Education Program South Asia

Dates: 14-18 November, 2020

IIT Goa, At GEC Campus, Farmagudi, Ponda 403401, Goa

FDP Coordinator: Dr. Sharad Sinha

Assistant Professor, Computer Science and Engineering,

Indian Institute of Technology (IIT) Goa

Registration Link: <https://www.aicte-india.org/atal>

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Host Institute: Indian Institute of Technology Goa (IIT Goa)

IIT Goa was established in 2016 as one of the 3rd generation IITs. It strives to become a unique institution of higher learning, offering state of the art education, research, and training in science and technology to have impact on society, environment and global challenges.

Nevertheless, in a short span of four years since its establishment, IIT Goa has established itself in the region through its S&T outreach activities, grants and awards to its faculty and engagement with industry. It has signed MoUs with industry, academia and national R&D labs both within India and abroad for student and faculty exchange, and joint academic and research activities.

Host Department: Computer Science and Engineering

The Department of Computer Science and Engineering under the School of Mathematics and Computer Science at IIT Goa offers B.Tech, M.Tech and PhD degree programs in Computer Science and Engineering. In its short existence of four years, it has attracted significant research funding from DST and Ministry of Electronics & IT, Govt. of India. It has also hosted an India Science and Research Fellow (ISRF) under ISRF 2019, from the Royal University of Bhutan who worked on IoT Based Fire Monitoring of Dzongs in Bhutan, under the guidance of Dr. Sharad Sinha, Assistant Professor, who is also the coordinator for the proposed ATAL FDP.

Faculty members have published multiple research papers in prestigious ACM and IEEE journals, transactions and magazines. The department has also entered into MoU with multiple industry partners like Arm University Program (Arm Education), Megh Computing, Express Analytics and C-DAC.

The department has consistently organized STEM workshops and outreach activities for high school students (August 2019), faculty development program on system on chip design and Arm architecture for faculty from other IITs, NITs etc. (December 2019). Its faculty members have also visited local schools to promote CSE education and colleges in Goa to conduct workshops for non-CSE faculty (February 2020).

Arm University Program

The Arm University Program connects educational and research institutions to a variety of ARM materials, including development tools and platforms, IP, and starting points. Students and faculty members involved in university courses or projects concentrating on Internet of Things (IoT), system-on-chip (SoC) design, computer architecture, embedded systems development, or assembly programming can benefit from Arm technology.

**Resource Persons for FDP are affiliated to IIT Goa, IIT Palakkad, Arm University Program and Arm, and C-DAC, Pune*

Content of the Faculty Development Program (FDP) on Internet of Things

Focus Area: Architecture and System Level Design

A. The FDP on IoT is organized to fulfil the following three critical objectives:

1. Theory of architecture and system level design of IoT
2. Hands-on experience on using IoT boards and simulation platforms for deploying real world applications (*to be conducted virtually*)
3. Model curriculum for IoT with relevance to Indian higher education institutions

B. Content for Theory Sessions

1. Embedded processors and operating systems for IoT
2. IoT Sensors, IoT System Architecture, Bounds on Computational Complexity in IoT Systems
3. Cloud-Based IoT, IoT Communication Protocols (HTTP, UPnP, CoAP, MQTT, XMPP)
4. Communication Interfaces (UART, SPI, I2C, JTAG, Ethernet), Concepts of Connected Home and Connected Campus
5. IoT Security and Penetration Testing
6. IoTIFY for IoT Simulation.

C. Content for Hands-on Sessions

1. Basic Python, C/C++ Programming
2. Introduction to Raspberry Pi, Arm Mbed Platform
3. Interfacing with sensors, actuators and control
4. Connecting to a cloud IoT platform and creating an end to end application (edge to cloud)
5. IoTIFY/SimPy based IoT simulation

Tentative Program Schedule for FDP

Dates	10.30 AM to 11.30 AM	Break 11.30- 11.45	11.45 AM to 01.15 PM	Break for Lunch 01.15 PM to 02.30 PM	02.45 PM to 04.30 PM	End of the Day (Networking and Discussions) 04.30 PM to 05.00 PM
14/11/2020	Session 1: Registration & Inauguration (20 min.) -IoT Landscape		Session 2: Introduction to IoT– Architectures, Implementations and Challenges		Session 3: Embedded Processors and Operating Systems for IoT	
15/11/2020	Session 4: Role of Interrupts and Low Power Computation in IoT		Session 5: IoT Sensors – architecture and programming IoT Interfaces (SPI, I2C, UART, JTAG, Ethernet)		Session 6: Hands-on tutorial on basic Python Programming for IoT	
16/11/2020	Session 7: IoT Communication Protocols -I (HTTP, UPnP, CoAP)		Session 8: IoT Communication Protocols -II (XMPP, MQTT)		Session 9: Web- based hands-on session on Interfacing Sensors and Raspberry Pi/ Arm Mbed	Session 10: Discussion on Model IoT Course Syllabus
17/11/2020	Session 11: IoT System Security		Session 12: Industrial IoT (IIoT) Case Study		Session 13: Hands-on session on connecting boards and sensors to a cloud IoT platform for control and command (using Mbed platform as example)	

18/11/2020	Session 14: Hands-on Session on IoTIFY/SimPy		Session 15: Online Examination for Participants		Session 16: Keynote Talk by Arm (TBC) & Valedictory Function	
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Target Participants

1. Faculty Members in CSE, IT, EE, ECE and related areas from AICTE Accredited Institutions. PG Scholars in these disciplines.
2. Faculty members from mechanical engineering, civil engineering etc. are also encouraged to apply if they have basic knowledge of programming in any programming language.

General Information

1. There is no registration fee for participants.
2. Top 10 scorers in the examination *may* also receive **Book Prizes (TBC)**

Course Coordinator

Dr. Sharad Sinha

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