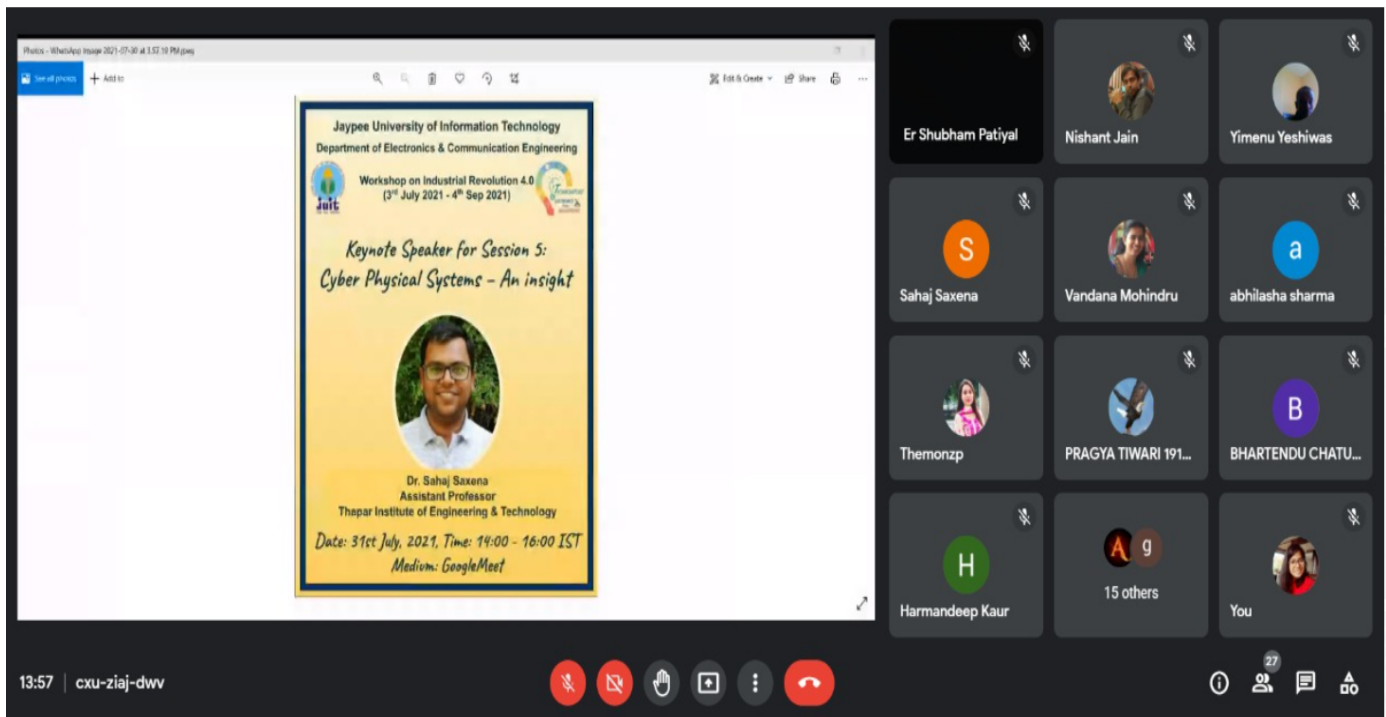


Jaypee University of Information Technology

Event Report : Session-5


31st July, 2021

The Department of Electronics and Communication Engineering, JUIT Waknaghat conducted the fifth session of the Workshop Industrial Revolution 4.0 titled "**Cyber Physical Systems - An insight**" on 31 July 2021. **Dr. Sahaj Saxena**, Assistant Professor, Thapar Institute of Engineering & Technology, Patiala, Punjab was the guest speaker of the session .



He began with the introduction of Cyber physical systems and Industrial revolution with the theme "**Cyber physical systems are the key enabler in catalyzing industry 4.0 to realize the vision of digital system**". The guest speaker gave an overview of the fundamentals and the history of CPS and further explained the applications of cyber physical systems, mainly in transportation and energy, healthcare and environment and sustainability.

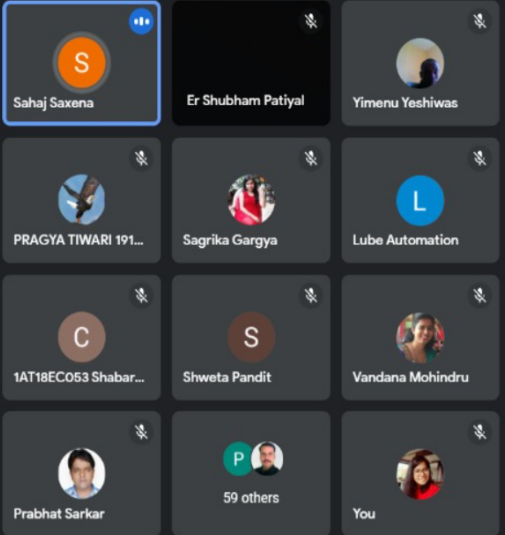
Transportation and energy



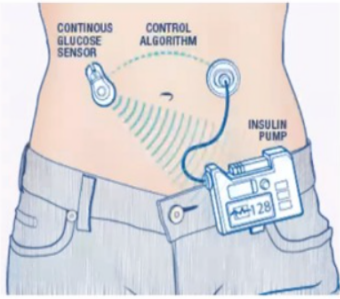
Smart energy system
Source: <https://newsroom.cpsenergy.com/saen-editorial-smart-grid/>

- In the future, we will travel in **driverless cars** that **communicate securely** with each other on smart roads and in **planes** that coordinate to **reduce delays**.
- Drones** will check infrastructure for damage and deliver Wi-Fi to access **disaster zones**.
- Homes and offices will be powered by a **smart grid** that is user-aware and will use sensor to analyse the environment and **optimize** lighting, heating and cooling.

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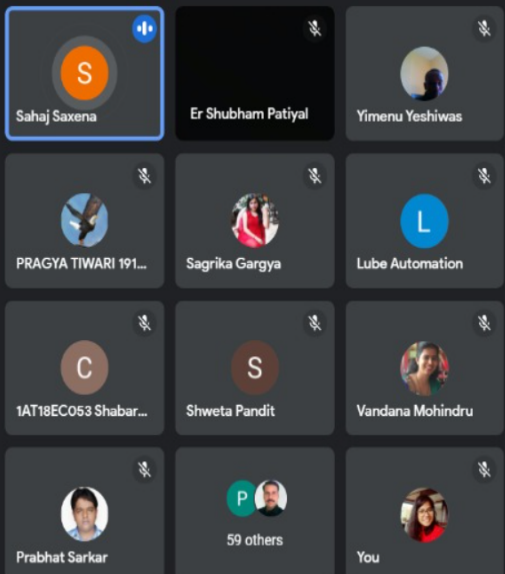
Healthcare and medicine



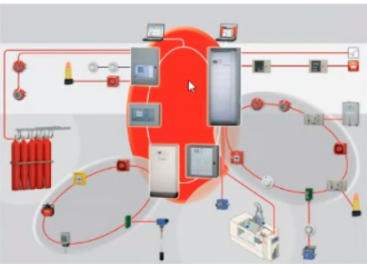
Artificial pancreas system
Source: <https://www.ah-lab.cs.dartmouth.edu/news>

- Cyber-physical systems are poised to transform the delivery of health care enabling **smart medical treatments and services**.
- Sensors** in the home will detect changing health conditions; new operating systems will make personalized medical devices interoperable
- Robotic surgery and bionic limbs** will help heal and restore movement to the injured and disabled and one day even augment human abilities.

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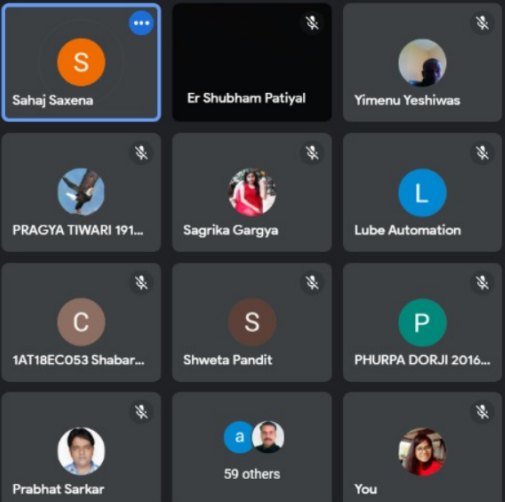
Environment and sustainability



Fire detection and extinguishing control panels
Source: <https://www.minimax.com/au/en/technologies/fire-detection-systems-and-suppression-control/fire-detection-and-extinguishing-control-panels/>

- Cyber-physical systems are increasingly used to promote **sustainability**.
- Cyber-physical systems are helping firefighters detect and deter fire, improving **agriculture** practices and enabling scientists to mitigate underwater oil spills.
- Advances in cyber-physical systems will enable **capability, adaptability, scalability, resiliency, safety, security and usability** that will far exceed the simple embedded systems of today.

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He spoke about the two broad categories of CPS , Autonomous Cyber Physical systems and Closed Loop Human Machine systems and stressed the security, privacy risk and techniques in the system by sharing the data of occurrence of cyber-attacks to collapse the operations.

Overview of cyber security

- Inserting **man-made signals** into the system to collapse the operation
- Robust strategy to identify the disastrous signals (**cyber attacks**), mitigate them and build a resilient (**cybersecure**) power system
- About **800 cyberattacks** have been occurred intentionally or unintentionally
- More than **250 attacks** have been reported in US
- Attack incidents: **Ukrainian power grid attack*** on 23 rd December 2015, **RQ-170, Maroochy attack**

*Case, D. U. (2016). Analysis of the cyber attack on the Ukrainian power grid. *Electricity Information Sharing and Analysis Center (E-ISAC)*, 388.

He also highlighted the national scenario and recent trends where the governments and the labs are investing a huge sum of money into developing the technologies like artificial intelligence , machine learning , IOT , sensors, Data bank and advanced communication systems. The recent trends are also supporting data driven technologies.

National Scenario

The governments and labs are investing huge amounts of money into developing this technology

- **National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)**
- **Technology Innovation Hubs (TIHs)**

- ✓ Artificial Intelligence and Machine Learning
- ✓ Technologies for Internet of Things and Everything (IoT & IoE), sensors, activators and control
- ✓ Databanks & Data Services, Data Analytics
- ✓ Advanced Communication Systems
- ✓ Robotics & Autonomous Systems
- ✓ Cyber Security and Cyber Security for Physical Infrastructure

Must Read

1. Dibaji, S. M., Pirani, M., Flamholz, D. B., Annaswamy, A. M., Johansson, K. H., & Chakraborty, A. (2019). **A systems and control perspective of CPS security**. *Annual Reviews in Control*, 47, 394-411.
2. Ratasich, D., Khalid, F., Geissler, F., Grosu, R., Shafique, M., & Bartocci, E. (2019). **A roadmap toward the resilient internet of things for cyber-physical systems**. *IEEE Access*, 7, 13260-13283.
3. Carreras Guzman, N. H., Wied, M., Kozine, I., & Lundteigen, M. A. (2020). **Conceptualizing the key features of cyber-physical systems in a multi-layered representation for safety and security analysis**. *Systems Engineering*, 23(2), 189-210.

He ended the presentation by sharing some useful and reliable resources to explore the topic in depth. At the end of the session, queries of the participants were answered and the feedback was collected from participants. The session was well appreciated by the participants.