Topics for Introduction to Computing

# 1. Understanding about Android technologies and applications in smartphone.

*Requirements*: knowledge in mobile programming (using Java or Kotlin), ARM architecture, Android architecture and runtime, application framework, develop Android apps using Android Studio and Android SDK or Xamarin.

# 2. Smart house.

*Requirements*: understanding home automation, smart devices and mobile applications to control them (lighting, entertainment system, appliances, etc.), device positioning, device connectivity, system frameworks that have support for smart homes, understanding about IoT, security, safety and ethical issues.

# 3. Understanding about OS in TinyOS/ Contiki.

*Requirements*: knowledge in OS types and architectures, important functions of an OS such as: memory management, process and process scheduling, file system, security, networks management, software/hardware management. Setup a fully operational TinyOS/Contiki OS box.

# 4. Understanding about IoT

*Requirements*: conceptual models, system architecture, sensors and sensors networks, embedded systems, RFID tags, applications. Smart devices and their applications in real life. IoT development frameworks. Current challenges and issues of IoT.

# 5. Data mining.

*Requirements*: fundamental understanding about data mining (DM), knowledge discovery (KDD) and data science, the basic process in DM, knowledge representations, KDD techniques and applications.

# 6. Data warehouse

*Requirements*: definitions, architecture and characteristics, properties, components and their functionalities, data representation, development process, business intelligence.

# 7. Computer Vision

*Requirements*: understanding about image acquisition and processing, challenges, mathematics foundation, techniques and algorithms, API frameworks, applications, the combination of CV with AI and ML.

# 8. Machine learning

*Requirements*: knowledge in artificial intelligence (AI), AI and machine learning (ML) techniques, ML applications. Fundamental components of machine learning (data, features, algorithms). Neural networks and deep learning.

# 9. Virtualization technologies.

*Requirements*: definitions, history and benefits of virtualization, processor microarchitecture, types of virtualization (server, application, desktop).

# 10. Multiprocessing, suggest a model.

*Requirements*: multiprocessing definition, multiprocessing architecture and principles, shared objects and synchronization, multitasking and task scheduling, locks, concurrency objects, shared memory models, load balancing, hardware and software support.

# 11. Distributed Computing/Cloud Computing.

*Requirements*: fundamental of distributed computing/cloud computing, Moore’s Law, Amdahl’s Law, history and architectures, concurrency components, fault tolerance, hardware support and software frameworks (Hadoop, Spark), application of distributed computing/cloud computing.

# 12. Mobile Computing.

*Requirements*: fundamental of mobile computing, wireless communication, IoT, location awareness, security, mobility support, challenges, mobile devices and applications.

# 13. Big Data

*Requirements*: understanding large-scale computing and massive dataset, patterns mining and machine learning using Big Data, distributed computing/cloud computing, Moore’s Law, Amdahl’s Law, goals and applications of Big Data, software frameworks support for Big Data.

Instructions:

Each group (4 or 5 students) should prepare a topic from the list above or suggest a new one and present in the class in the last three or four weeks of this semester.