**Advanced Networks – IFN 649**  
  
Raja – Unit Co-ordinator  
  
Lectures on Tuesday 12-2  
  
In person tutorial Tuesday 4-6PM  
  
Lectures – 2 hours with breaks  
  
Tutorials hands on  
  
Lab tutorials start week 2 - Weekly  
  
Connecting heterogenous networks with networks  
  
Group based project  
  
Lab exercises in groups of two  
  
Practical Network Assignments (lab) – 25%  
  
Project:  
  
Proposol – Week 4 (10%)  
Project Design – Wek 10 15%  
Presentation (group) – Week 12 – 20%  
Functionality 15%  
Innovation 5%  
Final Exam Written – With one on one oral exam 30%  
  
  
Modules  
  
Overview of Advanced Internet of Things (IOT) Week 1-3  
Layered Approach to Internet of Things (Week 4-6)  
Design Considerations – (Week 7-11) Security and energy consumption etc  
  
Internet of Things:  
  
Connectioning Physical and Digital domains  
Sensor network with core building block of Internet of Things  
Accuation  
Sensor networks with be focus of this course  
controllers change things in physical world (tempture etc)  
  
  
Sensor networks:  
Started in 1999  
Radios and sensors  
Environmental monitoring (Animals, factories etc)  
Convergence of Efficient micro controllers and cheap radios  
wireless sensor networks – no fixed infrastructure, lower power, new possibilism of sampling  
Tree network topology.

* Advantages of Wireless sensor network deployment:  
    
  Close to signal sources, yielding high SNR (signal to noise ratio)  
  Distributed network  
  Ad-hoc, no infrastructure, nodes can handle failure of link or node  
    
  Wireless networks are easier to setup  
  Wired Networks are more reliable   
  Wireless IOT can be insecure  
  Wireless can be unreliable due to networks  
  Over reliance of IOT devices – When not working people cant work without them  
  Can be usuful to help people  
  Privacy and data concerns

Projects:  
  
Batmon – Monitor flying bat migration patterns.

Indoor IoT Application – Balancing thermal comfort and energy efficiency for HVAC systems.  
  
LoRA – Low power and long-range technology – Will be explained in later lecture  
  
each deployment requires technology with constrations   
  
Full understand deployment and understand constraints and gather correct information  
  
Understand protocols and constraints for network applications.  
  
Building Blocks and Infrastructure of IoT:  
  
Embedded Sensors (IoT edge)  
Network+ Midleware  
Secure Data Store  
Cloud Computing  
Data Analytics (Signal Procesing, Machine learning, Inference, Contexturual Computing  
  
Hardware:  
Processor  
Radio – Transmit data  
Sensors  
Actuators – control environment   
Battery - Power  
  
Software:  
Operating Systems  
Network Protocols  
Devices drivers  
Visualization  
Data Analytics  
  
5 Layer OSI model:  
PHY Layer (1) (IEEE-802-.15.4,IEEE-802..11 LoRa)  
MAC layer (2) (TSCH,LoRaWAN,ZigBee)  
Network layer (3) RPL  
Transport layer (4) TCP,UDP  
Application Layer (5) MQTT,CoPP  
  
Don’t overspec protocols for simple networks  
Security is very important in IoT network applications  
Device  
Network  
Data Security  
  
A lot of Security content is later in course  
  
Practical Asignment VERY IMPORTANT  
  
Sensoring Tier  
Adenuino controller used, Attaching sensors to the anenuni controller  
  
Will be given kit for Assignment, given in next weeks  
  
Pre-Procesing Tier  
Raspbery Pi – Need to buy another one  
  
AWS (Amazon Web Services) Processing, Storage and Analytics.  
  
Be exposed to cloud computing platform – learn AWS.  
  
Sensoring tier  
3 sensors (Anaduino)  
Network 1 (Bluetooth)  
Pre processing (Raspbery pi)  
Network 2 (Wifi)  
Analytics/Visualization Tier (AWS)  
  
Can add downstream if required. Upstream most important  
  
Raspbery Pi – Buy from bookshop  
Sensors,bluetoth etc kit S block level 9 room 911 from next week wait for blackboard  
  
Application guidelines:  
  
Sensor must be used  
Sensor data must be relayed to AWS cloud  
Ardunio to raspberry pi via Bluetooth  
Raspberry Pi to AWS via wifi or ethnet  
  
Propose a realistic and feaablie application for oyur project.  
  
Realistic – Should solve a problem  
All 3 tier must be part of applications  
justify the role of each tier  
Explain software and hardware andsetup and design choices  
will be judged by a small panel in week 12  
To get maximum points  
you should have fully working solutions to motivate your design choices and demonstrate a good understanding of networks  
  
Your code should be aviable to a github reposity.  
  
What will you learn:  
  
Arduni programming  
propose project – DUE WEEK 4!!!  
  
Teensy only accept 3.3v  
can buy and use own sensors but get tutors approval beforehand  
do not buy and interface a complex snesors  
  
up to 2 members per team.  
  
oral examination will be part of assessment.   
  
download powerpoint from blackboard.