Engineering Design Project (EE401 – EE402)

Rules and Regulations for Choosing a Project:

- The list of projects and tasks for each team member (student) is listed at the bottom of this page.

- Each student should choose and signup to be a team member of a project.

- Students can form their own group. Or a student that couldn't find a group should signup individually to be a team member of the project that he/she wants. The Engineering Design Project Committee will form the groups for individually signed students.

- A project can be assigned to up to two different groups.

- The occupancy of each project and team member role follows **FIRST-COME FIRST-SERVE** policy.

- Once a student signup for a team member role there **CANNOT** be any changes.

- The dates for signing up are **6th April** (Student who already formed their group) and **7th April** (Both individual students and students who already formed their group)

- To sign up for a team member role the student should see

    - Thursday, 6th April:
        - 11:00 – 13:00 Assist. Prof. Dr. Ali Serener
    - Friday, 7th April:
        - 13:00 – 15:00 Assist. Prof. Dr. Huseyin Haci

- For the students who **FAIL** to sign up by **7th April**. The student's mark will be **deducted by 10%** and the Engineering Design Project Committee will assign the student with a team member role of a project.

Rules and Regulations for Writing the Project Proposal (EE401):

- Each student should individually write and submit a project proposal as per the team member of the project he/she has chosen.

- The project proposal should be related to the part of the project he/she will undertake.

- The project proposal should be about (and no less than) 3000 words.

- The project proposal will constitute 30% of the grade that the student will get for EE402.

- The project proposal will be submitted through plagiarism prevention software – Turnitin. Similarity score for the overall proposal should be less than 20% and each source should be less than 2%.

- The deadline for project proposal submission is **22nd May**.

Engineering Design Projects:

Project 1: Healthcare Monitoring

Description:

The project will be to monitor the heart–rate of the wearer and report it to the Internet. Sensors will be placed on the chest of a person and used to sense the heart beat signals. A microcontroller will be used to process the sensor data and make control decisions. The heart–rate information will be uploaded to a website and if needed an emergency signal will be send together with location information to a doctor and emergency contact person.

Tasks for team members:

Member 1: Code the microcontroller for the following tasks:

- Establish the connection between heart-beat sensors and the microcontroller.
- Establish the connection between microcontroller and a smart phone/tablet through Bluetooth technology.
- Display the log of heart-beat at the smart phone/tablet.
- Activate a visual (e.g. turn on a LED) and sound (e.g. sound a buzzer) alert when the heart–rate of the wearer become greater than a given value (max_threshold)
- Activate a visual (e.g. turn on a LED) and sound (e.g. sound a buzzer) alert when the heart–rate of the wearer become less than a given value (min_threshold)

Member 2: Establish the data communication between microcontroller and internet. Also send emergency messages to a doctor and emergency contact person when an abnormality is detected.

- Use WiFi and GSM (3G) technologies to connect the microcontroller to the internet
- Send emergency message (including GPS location) to a doctor and emergency contact person when;
    - the heart–rate of the wearer become greater than a given value (max_threshold)
    - the heart–rate of the wearer become less than a given value (min_threshold)

Member 3: Provide power to the Healthcare Monitoring system. Power source of the Healthcare Monitoring system will be a power bank. Solar panel placed on top of a backpack will be used to charge the power bank (when the user is outside). An electrical outlet can also charge the power bank (when the user is indoors).

- The amount of power generated by the solar panels and used by the system should be displayed.
- The amount of power left at the power bank and average number of hours this power can support the Healthcare Monitoring system should be displayed.

Member 4: Logging GPS location of the wearer.

- The GPS location of the wearer should be uploaded to internet periodically (every 10 mins)
- The GPS location of the wearer should be included in an emergency message that will be send to a doctor and contact person in case of an emergency.

Project 2: Smart Home

Description:

The project will be to automate and remotely control a house, i.e. make a house smart. Sensors will be used to sense the environment (e.g. temperature, humidity, water level). Microcontrollers will be used to process the sensor data and make control decisions. The control decisions will actuate necessary devices (e.g. servo motor, water pump, solenoid lock) to perform tasks.

Tasks for team members:

Member 1: Code the microcontroller for the following tasks:

- Start a fan when the temperature is above a given threshold or a corresponding signal is received from the user (via smartphone and internet).
- Open/close the door lock when a corresponding signal is received from the user (via smartphone and internet).
- Water the garden when the humidity level of the soil is lower than a threshold or a corresponding signal is received from the user (via smartphone and internet).
- Open the curtains when the light level is above a threshold or a corresponding signal is received from the user (via smartphone and internet).

Member 2: Establish the data communication between microcontroller and internet. Also send email to the house owner about start/end of automated tasks.

- Use WiFi and Ethernet technologies to connect the microcontroller to the internet
- Send email to the house owner when;
    - the fan is started/stopped
    - the door lock is opened/closed
    - the water pump started/stopped
    - the curtains opened/closed

Member 3: Provide power to the house automation system. Solar panel and main grid is used to power the system.

- The primary source for the system will be the solar panels. Solar panels should fill the batteries and the batteries should provide the power to the system.
- As a backup, the system should be connected to the main grid. If the batteries cannot provide enough power, the system should use power from main grid.
- The amount of power generated by the solar panels and used by the system should be displayed.

Member 4: Video surveillance of the home.

- There should be two cameras installed at the house. First camera shows the entrance to house and garden. The other camera showing inside the house.
- The user must be able to see the videos online through a website and from a smart phone.

Project 3: Software for Intelligent vehicle

Member 1: 2 USB cameras should be connected to a processor and **calibrated** using OpenCV

Member 2: The calibrated images then should be processed and disparity map (in low resolution) should be calculated using Normalized Cross Correlation.

Members 3 and 4: The road surface (assuming planar road) estimation should be calculated using V-disparity and Obstacles should be calculated using U-disparity

Members 5 and 6: Assuming known camera parameters, detecting painted lane markings using a camera.

Project 4: Hardware for intelligent vehicle

Preferably obstacle detection and lane detection results are provided by other group but if necessary any sensor or sensors can be used as an input.

Member 1: A model car should be built that can follow the detected lanes and stop when an obstacle is detected. Furthermore, velocity of the car should be calculated using hardware/sensors.

Members 2 and 3: When needed, an operator should be able to control the model car using an android phone. The communication can be dealt with any wireless system. The model car should also be able to follow the leading car automatically (Platooning (automobile))

Members 4 and 5: Furthermore, plate of the leading vehicle should be detected and recognized

---

Project 5: Wireless Music System:

Music from an MP3 player should be wirelessly send to an amplifier connected to a speaker around the room.

Two Arduinos should be used:

Member 1: One for the transmission of music from the MP3 player.

Member 2: The other for the reception.

At the receiving end, the audio should be:

Member 3: Fed into an amplifier.

Member 4: Amplified before going into the speaker.

Project 6: Solar Juicer:

A system should be designed that can operate a juicer through a solar panel. Panel readings should be displayed on a cell phone application.

Member 1: Solar panel should charge a battery.

Member 2: Battery should operate a fruit or a vegetable juicer.

Member 3: Solar panel should communicate with an android phone through a microcontroller.

Member 4: Android phone should display the power readings.
