# Senior Thesis Project Plan

**Student:** Bektur Umarbaev, AMI-116

**Title:**

*"Energy-Efficient Routing Scheme For Wireless Air Monitoring Network"*

**Goal:**

- Implement/Develop and evaluate the routing scheme for Air Quality Monitoring System by National Academy of Science of Kyrgyz Republic (NASKR).
- Scheme has to:
    - Minimize energy consumption/increase the network lifetime of WSN.
    - Consider the constraints and requirements presented by the hardware and network topology of the system.

**Major tasks:**

- Based on existing literature, gain an understanding of how routing schemes for WSN are designed, what factors are responsible for energy consumption in WSN.
- Conduct a research of existing routing algorithms developed/implemented for WSN.
- Based on findings, design algorithm or scheme for the system, which considers the limitations of the hardware and requirements network topology of the system.
- Implement/Develop and evaluate proposed routing scheme.

**Plan:**

- Initial research of the subject. Theoretical background of WSN:
    1. Wireless sensor network systems modelling
    2. General WSN environment description
    3. Description of the structure (topology) of the wireless sensor network
    4. Grid distance
    5. Analysis of energy consumption per distance of a grid-based
    6. WSN
    7. Energy model
    8. Basic static energy consumption for a wireless sensor network – single hop and multi-hop routing
    9. Sensing models
    10. Analysis of events extraction in wireless sensor networks
- Survey the existing routing algorithms for WSN. Pros and cons of each.
- Based on research and survey:
    1. In case there is no suitable scheme for the system:
        - Introduce routing scheme
        - K-means, Hierarchical, Shortest Path
        - Description of scheme
    2. In case of finding suited algorithm:
        - Introduce chosen algorithm
        - Describe theoretical and mathematical base of algorithm

        - Describe algorithm in detail
- Design algorithm or scheme for the system based on previous findings. It should take into consideration the limitations and requirements of the hardware and network topology of the system.
- Implement the algorithm or scheme on electronic devices. Conduct the test and evaluation of the scheme.
- References:


1. Gregory J. Pottie and William J. Kaiser. *Wireless integrated network sensors*. Communications of the ACM, 43(5):51–58, May 2000.
2. Karl, Holger, and Andreas Willig. *Protocols and architectures for wireless sensor networks*. John Wiley & Sons, 2007.
3. Ketshabetswe, Lucia Keleadile, et al. "Communication protocols for wireless sensor networks: A survey and comparison." *Heliyon* 5.5 (2019): e01591.
4. Pantazis, Nikolaos A., Stefanos A. Nikolidakis, and Dimitrios D. Vergados. "Energy-efficient routing protocols in wireless sensor networks: A survey." *IEEE Communications surveys & tutorials* 15.2 (2012): 551-591.
5. Raghavendra, Cauligi S., Krishna M. Sivalingam, and Taieb Znati, eds. *Wireless sensor networks*. Springer, 2006.
6. Zhao, Feng, Leonidas J. Guibas, and Leonidas Guibas. *Wireless sensor networks: an information processing approach*. Morgan Kaufmann, 2004.
7. Zheng, Jun, and Abbas Jamalipour. *Wireless sensor networks: a networking perspective*. John Wiley & Sons, 2009.
8. To be added...