



UNC Charlotte – Lee College of Engineering Senior Design Program Company Information

Company Name	Systems Engineering	Date Submitted	11/18/2020
Project Title	Design of Agile Supply Chain via Drone Technology (UNCC_SE_DRONE)	Planned Starting Semester	Fall 2021

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

Discipline	Number	Discipline	Number
Mechanical		Electrical	0-1
Computer	0-1	Systems	5
Other ()			

Project Overview and Requirements:

Industry 4.0 represents the fourth industrial revolution that utilizes cyber-physical systems, IoT, cloud computing, and cognitive computing for automation and communication in manufacturing technology. In the same vein, supply chain has evolved to a more responsive system that is 1) faster, 2) more flexible, 3) more granular, 4) more accurate, and 5) more efficient [1]. This *agile* supply chain is capable of responding to demand in real time. While a set of technologies needs to be combined together to achieve the agility, this senior design project is particularly interested in the role of automated guided vehicles as the last-mile deliveries.

Advancements in diverse fields and technologies during last decade have enhanced vehicles with autonomous features such as driverless cars and drones. The goal of this project is to design an agile supply chain using three drones in the SEEM department to efficiently cope with real time demand. To achieve this goal, the team is required to simultaneously carry out the following tasks:

- 1) The team uses data analytics skills to understand the characteristics of the drones which include, but not limited to, load limit, battery consumption, flight pattern under adverse climate, etc. The characterization can be carried out via carefully designed experiments,



- which also requires DOE skills.
- 2) The team develops a computer simulation model using Arena that is capable of simulating the last-mile deliveries of consumer goods under various scenarios of uncertainties. Adequate animation must be built.
 - 3) The team investigates optimization methods for vehicle routing problems in order to develop a decision-making tool that provides optimal drone routing solutions with minimum costs.
 - 4) The team develops a scaled-down simulation platform that demonstrates the efficacy of the decision-making tool and operation of drones with a realistic scenario.

Expected Deliverables/Results:

Deliverables include:

- Complete characterization of drones: report that describes the characterization procedure in detail, along with spreadsheet and/or R codes (SD 1)
- Computer simulation model: report and Arena file (SD 1)
- Decision-making tool: report that describes the optimization model in detail, and executable tool that provides routing solutions. (SD 2)
- Demonstration in a scaled-down simulation platform. (SD 2)

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- SEGR 4141, SEGR 3102, SEGR 3105, SEGR 3107, SEGR 3110, OPRS 3111 (SEGR 3201)

[1] K. Alicke, D. Rexhausen, and A. Seyfert, Supply Chain 4.0 in Consumer Goods, 2017