

Guideline to the work and reports of IENG492

1. In old times, when somebody wanted to be the master of his/her profession, then the person had to prepare a masterpiece. The work on the masterpiece required the use of almost all tools and tricks of the profession. The graduation project is similar to the preparation of the masterpiece. Here, you must use almost all chapters of industrial engineering. Thus, the course of the graduation project is not about to learn further new knowledge, although you certainly shall do so; however, the main emphasize is on that you exercise your profession in the first time, you work, i.e., a synthesis of all courses you learned during your undergraduate studies.

2. The course is about a potential investment in Turkish Republic of Northern Cyprus or any other country. The report should show all professional thinking and calculation what is necessary to make a correct decision on the establishment. Thus, the course is not about what you learned during your university studies; however, it is about that how you can use your accumulated knowledge. Reporting only pure theory has no value. There are further consequences in the presentation and in the correct answers for exam questions.

3. The final report must contain at least the following chapters:

- (a) Introduction. It contains some general information on the project. Practically all other chapters are written first and as a last one is written this chapter which is the first one in the report.
- (b) Industry. The company has typical products which are produced in a certain kind of industry. For example, refrigerator is produced by the household electric industry. This chapter discusses the properties of this industry including for example the closeness to the market and the final customers, other actors on the market including retailers, the special properties required by the transportation of the products, and typical size and value of the products.
- (c) Company. The chapter describes the structure of the company including both staff and line, *i.e.*, administrative units and production units.
- (d) Market. The size of the market, *i.e.*, the yearly consumption rate is the most important parameter of the market. Opportunities to export the product from TRNC must be discussed here as well. Who are the main competitors of your future company? The most important calculation/decision what must be provided in this chapter that how large is the market share what you want to obtain. This decision seriously affects the Capacity Planning chapter.
- (e) Product Description. Which are the functions of the product? What kinds of variants do exist on the market? Which variants will be produced by your company?
- (f) Technology. This chapter discusses all important processes and the types of the necessary equipments including assembly line if it is applied. The most important element of this chapter is a flow chart showing the operations of the technology.

The function of each operation must be explained. Figures of machines can be used as illustrations.

- (g) Capacity Planning. Based on the market share determined in chapter Market the capacities of the equipments are determined here. If the market shows seasonal effect, then capacities must be able to serve the peak demand. If some methods are applied for smoothing of the demand, then the capacities must be determined accordingly, and the methods must be discussed in chapter Inventory Policy.
- (h) Process Design. This chapter discusses that how is it possible to realize the technology to be applied.
- (i) Machinery and Equipment. The equipment needed by the designed process must be selected here. It is necessary to discuss the equipment of all operations mentioned on the flow chart of the Chapter Technology. A typical error committed in chapters Process Design and Machinery and Equipment is that very up-to-date and brand-new equipment are selected. In many cases, it is not an economic way of the investment as they are too expensive. The option of purchasing used equipment must be considered as well. The capacities of the equipment must be conforming to the market share determined in Chapters Market Analysis and Capacity Planning.
- (j) Location Analysis. At least three location alternatives must be considered. If critical factors exclude a location, then this decision must be explained and justified.
- (k) Facility Layout. It is a particular arrangement of the building and surrounding of the company including production area, offices, warehouses, parking areas and other necessary places like restrooms. A drawing of the layout must be provided with the exact sizes of all rooms.
- (l) Material Handling. Material handling is thought to be the transportation of materials and products within the factory. It is not that much restricted. For example, storing and packing are also the parts of material handling. A careful selection of the used equipments must be provided. The selection must be justified.
- (m) Waste Management. Saving the environment from pollution is a very important issue in our times. All kind of production produces waste which will be transformed into pollution in the case of the reckless behavior of the company. However, waste is the useful raw material in other industries in many cases. This chapter gives a complete description what will happen to the wastes and other pollutions produced by your company.
- (n) Energy and Water Supply. An estimate of the necessary energy and water must be provided. The estimation must be based on the technology and the selected equipments. Thus, this chapter uses the results of several previous chapters.
- (o) Quality Management. It is very important for a company that its products are reliable and have the parameter values promised in the product description. Thus, the production must be under continuous control. Which parameters of the product will be measured? Which quality control methods will be applied?
- (p) Personnel and Workforce. How many employees will have higher education? What will be their jobs? What kind of education do you expect from workers and

other personnel? Is any disease or other physical condition which exclude a person from employment?

- (q) Information System. Is any computer software which will be used? If so, how much is its price? Do you need a local area network? If so, which units will communicate to one another? Is basic internet serving all the needs of your company?
- (r) Industrial Standards. An industrial environment must satisfy a lot of technical standards. Wikipedia describes technical standard as follows: “A **technical standard** is an established [norm](#) or [requirement](#) in regard to technical [systems](#). It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes and practices.” The product, the working environment, packing, quality control, material handling, transportation, etc. Must satisfy some relevant standards. The product must satisfy different standards in Turkey than in the European Union. If the product of the company is exported to EU then it must satisfy both. All relevant standards must be collected in this chapter. See also paragraph No. 4.
- (s) MRP and MPS. Master Production Schedule (MPS) and Material Requirement Planning (MRP) are important subsystems of production control. MPS is the schedule of the finished product and it goes to the top management. It is based on the contracts of the company. MPS is the schedule of the semi-finished products. The schedule produced by MRP makes feasible the schedule of MPS. The chapter must contain *examples* typical for the company. The production quantities must be related to the market share of the company and BOM.
- (t) Inventory Management. A good inventory policy keeps the costs of the company on a low level. The inventory policy depends on the forecasted demand. Thus, the chapter must contain *examples* forecast methods and mathematical models for determining the optimal inventory policy for different items which will exist at the company.
- (u) Financial Analysis. The chapter analyses the two sides of the financial balance of the company. One side contains first costs (investment), yearly fixed costs, yearly variable costs including raw material, energy, and production costs, and loan and its installments. The other side is the income which is basically the selling price. The balance of the two sides shows that how much profitable is the company and how long time is needed to pay back the invested capital.
- (v) Feasibility Analysis. Although this chapter is generally short, it is the most important one. An investment can be non-feasible for two different reasons. The first one is that the intended investment cannot be realized by technological, environmental, legal, or political reasons. The second type of reason is that the intended investment cannot produce profit, or enough profit. This issue is based on the result of chapter Financial Analysis. *What is very important in connection this chapter is that your job is not to prove that the investment is feasible. Your job is to find out the truth.* This is what you should do in real life. If you conclude that an investment is feasible although it is not, then you cause a great damage to your company. See also paragraph No. 7.

(w) Project Management. Construction industry is an example for an industry such that the product of the industry is a project. A high-quality company may sell production units to other companies although the company works in industries as car making or household equipments. The investment analyzed in courses IENG490 and IENG492 is a project on its own right. The chapter discusses that case which is relevant to the company.

4. All industrial products, working environments, procedures and technologies must satisfy some industrial standards. Standards are unambiguously determined conditions, which must be satisfied by every actor of a market. For example, ISO9000 is a large set of standards.

In this course a great emphasize is put on the industrial standards. Therefore, it should be mentioned in chapter that which standards are satisfied by your company if it is relevant. Even in the reference list, a separate sub-list of the standards must be prepared.

5. The investment must be as much economic as possible. There are methods to decrease the invested amount. For example, it is not necessary that all equipments are brand new. You must consider the option of purchasing used items. Another method is leasing instead of purchasing. Highly automated equipment as NC machine, AGV are nice solution from pure technical point of view, however they are expensive and, in this way, not necessarily economic.

6. The quality of the presentation is determined that how much familiar you are to the discussed topic. Therefore, a simple reading of a projected text has low quality. Further on the presented material must be features of the particular investment and not a general theory.

7. The final conclusion of the report must be contained in the Feasibility Study. *This chapter must contain a sentence delivering the opinion of the team about feasibility of the investment.* The investment is feasible if

(i) All physical condition of the realization can be satisfied and

(ii) The investment is expected to produce profit.

8. Relevant materials can be collected from internet. However, the source of the information must be provided. This rule also applies to the figures and pictures.