

Course Description

Graduate_CourseDescription-Industrial Engineering

Quality Management

The Industrial Revolution in Europe was the transition to new manufacturing processes in the period from about 1760 to sometime between 1820 and 1840. Scientific management began with F. Taylor in the 1880s and 1890s within the manufacturing industries. Its main objective is improving economic efficiency. In 1920s and 1930s modernized quality control, statistical quality control, was established by Dodge, Romig and Shewhart. And in 1950s Total Quality Control by Feigenbaum was proposed. After oil crisis in 1970s, since 1980s key issues in firms became customers' needs as impact of sustainable management. and QM was established. Therefore Quality management ensures that an organization, product or service is consistent. It has four main components: quality planning, quality control, quality assurance and quality improvement. Quality management is focused not only on product and service quality, but also on the means to achieve it. Quality management, therefore, uses quality assurance and control of processes as well as products to achieve more consistent quality.

Statistical Process Control

Statistical process control (SPC) which uses statistical methods is applied in order to monitor and control a process. At its full potential, the process can make as much conforming(or non-defective) product as possible with a minimum (if not an elimination) of waste such as rework or scrap. Key tools used in SPC include statistical methods like control charts, design of experiments etc. also it is needed computer system ,especially for big data, and solutions like minitab, SPSS, SAS etc.

Multivariate Analysis and Quality Management

Multivariate analysis (MVA) is based on the statistical principle of multivariate statistics Key tools used in MVA include statistical methods like factor analysis, multivariate multiple regression etc.. In design and analysis, the technique is used to perform trade studies across multiple dimensions while taking into account the effects of all variables on the responses of interest. In quality management multivariate analysis can be complicated by the desire to include physics-based analysis to calculate the effects of variables for a hierarchical "system-of-systems."

Advanced Operations Management

This course provides knowledge about analytical principles of manufacturing systems design, analysis and control. Emphasis will be placed on stochastic analysis. Topics including role of variability and impact on cycle time, push versus pull production strategies including Kanban and constant WIP control, queuing theory will be covered in class.

Scheduling Theory

Various prototypes of scheduling problems in production systems, project management are discussed in view of resources and tasks, problem structure, performance measures, and complexity. Complexity analysis, specialized solution algorithms for each prototype, and the use of general solution techniques, and other recent search techniques are explained. Queuing theory, stochastic analysis, and simulation techniques for dynamic or stochastic scheduling problems are also introduced.

Advanced Topic in Engineering Economy

Key factor in this lecture is ' feasibility '. Feasibility study is very important role in firms' behavior. Main issues are from engineering valuation by Marston in 1930s and classical methods by Ireson etc. to feasibility study for public sector including SNA(system of national accounts).

Advanced Reliability Engineering

This course treats advanced topics on the statistical methodology for high-reliability product design. Main issue includes reliability measures, life distribution, reliability data analysis, life test, accelerated life test, HALT/HASS, environmental test, robust reliability design.

Time Series Analysis

Efficient process control is a key element in the maintenance and improvement of quality and productivity. This course is about two complementary statistical approaches to achieve such control.

System Analysis

This lecture is concerned about the efficient system design by the systemic analysis to the individual module and between the modules using the input/output analysis and correlation analysis.

Research Methodologies in Human Factors Engineering

This course introduces research methods and applications to analyze and understand diverse aspects of human factors in engineering systems. Emphasis will be placed on building knowledge and skills to define, model, and solve the problems dealing with human factors issues.

Design and Evaluation of Products

This course provides an introduction to the principles, tools and case studies of designing ergonomic product and service systems. Emphasis will be placed on understanding the functions and activities of human factors engineers in developing product and services as an early stage of the total quality management(TQM) process.

Industrial Economic Analysis

Basics of both industrial economics and managerial economics are studied. Topics include industrial organization, competitive environment, pricing strategy, technology strategy, and science and technology

strategy of the government.

Advanced Robust Design

This course treats engineering methods for robust product design. Robust design determines the optimal values for product and process variables under various uncontrollable parameters through designed experiment. Main topics of this course includes concepts of quality engineering, signal to noise ratio, static and dynamic robust design, selection of quality characteristics, noise strategy, parameter optimization experiment, working with interactions etc.

Six Sigma and Quality Management

This lecture is about the quality management and Six Sigma. We introduce the creating profit or reducing cost management techniques by improving the all business processes using the statistical methodologies. Statistics is the prerequisite subject.

Economics of Personnel Management

Basics of Personnel Management economics are studied. Topics include human capital theory, organizational theory, technology and quality management strategy, industrial relations strategy.

Advanced of Design of Experiments

This lecture is concerned about the follow-up program to the Design of Experiments in the undergraduate course. We introduce the methodologies such as mixture DOE, EVOP and RSM to search the optimum process condition.

Simulation Methods and Applications

Systems simulation structure, logic and methodologies; generation of random numbers and deviates; system simulation languages, models and analysis; applications to industrial situations. In-depth study into the design-modeling and subsequent analysis of contemporary production/service systems; factory/service systems are modeled using the ARENA language; emphasis is placed on the critical analysis of alternative flow designs of modeled systems using flow and economic parameters to assess system improvement.

Intelligent Systems Design

In order to make the right decisions and to decrease human errors, this course provides several intelligent techniques and artificial intelligent methods of computer based intelligent systems. As main contents, knowledge based database, inference systems and related expert systems are provided.

Cognitive Task Analysis

This course offers the methodologies to analyze cognitive task of HMS operation. The methodology for cognitive task analysis includes AH(abstraction hierarchy) Human Reliability Analysis (HRA) by which

cognitively oriented human errors can be resolved. CTA can be a key role to resolve task related problems which conventional TA method can not analyze.

Optimized Modeling and Analysis

This course provides several optimization techniques for seeking global and local optimums. As main contents, meta-heuristics, stochastic optimization, Montecarlo simulation and game theory are introduced. Many industrial engineering applications are practiced with related software.

Engineering Valuation

Valuation of industry assets made by the in the 1930s Marston is currently being expanded to the intangible fixed assets. Winfrey curve is famous such as those in that field.

Stochastic Processes and Queuing Theory

The course deals with stochastic modeling and performance analysis methods for system design and operation of complex engineering systems such as production / manufacturing systems, service systems. The course covers basic concepts, modeling and analysis, and applications for fundamental stochastic models, including Poisson processes, renewal processes, Markov chains, stationary processes, Brownian and diffusion processes, basic queuing models and queuing networks, and Markov decision processes.

Data Analysis

This lecture is intensive course to the statistics, and is fundamental lecture to complete the whole required courses in graduate school. We introduce the concept of estimation and test to the distribution functions and parameters. We deals with the analysis model based on the regression analysis.

Geometric Dimensioning and Tolerancing

Geometric Dimensioning and Tolerancing is an international language that is used on engineering drawings to accurately describe a part. The GD&T language consists of a well-defined set of symbols, rules, definitions, and conventions. GD&T is a design philosophy on how to design and dimension parts.

Integrated Kinematics and Circuit Design

Design, as the epitome of the goal of engineering, facilitates the creation of new products, processes, software, systems, and organizations through which engineering contributes to society by sttiwsfying its needs and aspirations. This course presents the principles of design and constitutes a treatise or exposition of the design axioms and their applications.

Supply Chain Management / Advanced Planning & Scheduling

In this course, it will connect suppliers and consumers through the business process to improve the industrials agility. It will learn about Advanced planning & Scheduling(APS), Order Management, Total Production Planning, Agile Manufacturing, e-Procurement and e-Marketplace.

Project Management

Basic project management for engineering graduate students; project development and economic justification; estimating; scheduling; network methods; critical path analysis; earned value management; recycling and rework; project organizational structures; project risk assessment; resource allocation; ethics; characteristics of project managers.

Product Design and Engineering I

This course examines a process to develop an innovative product with convergence of design and engineering based on the basic knowledge of them.

Materials and Production

Manufacturing is a "value adding" process, where the conversion of stuff into things adds value to the material. Thus, the objective of a company engaged in manufacturing is to add value and do so in the most efficient manner, using the least amount of time, material, money, space, and manpower. Meeting these goals requires a well-designed and efficient manufacturing system.

Advanced Theory of Inventive Problem Solving

This course treats advanced topics on classical and contemporary TRIZ. The main topics of this course includes problem solving and TRIZ, standard structured problem solving, cause-effect chain analysis, ideality, s-curve-analysis and the trends of evolution, 9-windows, functional modeling and trimming, scientific effects, standards and su-field modeling, advanced contradiction problem solving, subversion analysis, root cause analysis. TRIZ has been getting a grave attention in increasing the efficiency of a product/process innovation and new product development process.

Principles of Economics

Basics of classical economics, institutional economics, and social economics are studied. Approaches to market failure are reviewed. Macroeconomic approaches are also examined.

Business Process Reengineering in Engineering Design Process

Students will learn through the industrial agility of the processes and their effects for the business management that will improve the business innovation.

Manufacturing Execution Systems

In this lecture, it will normally focus on the basics of manufacturing execution system. Through MESA, people will learn and experience the basic techniques they have to know.

Advanced Topics in Human Factors and Ergonomics

In order to acquire new knowledge of the Human Factors and Ergonomics with a study of the latest theory and articles published in the relevant field and discuss its practical applicability.

Artificial Intelligence

This course provides several Meta-heuristic methods and intelligent techniques for dissolving many engineering and design problems. As main contents, computation theories, intelligent control theory, fuzzy control, neural network, genetic algorithm and other learning methods are provided. In addition, real applications and their intelligent controls are discussed with self-organization processes.

Data Mining

The course, Data Mining, handles theories and practices of classifying and analyzing various data in engineering and management fields. As main contents, several contemporary algorithms in supervised learning and unsupervised learning are discussed with Bayesian probability / Network, MCMC and Simulation based Optimization. In addition, data extraction and analysis using Computer Vision are studied as applications.

System Engineering

This course offers system engineering process(SEP) concept and tools to analyze, design, construct and evaluate the integrated system consisting of people, product and process through a product life cycle rather than project management. Students learn the integrated solution of process and product which has iterative, controlled and top-down based interactive process control.

Computer Aided Modeling and Intelligent Design

This course handles theories and applications of contemporary computer aided modeling and intelligent design methods. As main contents, simulation functions, data representation for large-scale CAD model, cooperative modeling protocol, extraction of design intent, intelligent geometric modeling and contemporary topology theories are provided.

Advanced Capstone Design I

In this course, students study comprehensively about the range of design and engineering covering from planning and strategy to mass production of product through projects. And also study about a series of procedure, method and analytic technique reflecting ergonomic issue which is related to product usability.

Advanced Capstone Design II

The output of preceding subject, Advanced Capstone Design, is modified, verified and supplemented through prototyping process. And also by evaluating this final output base on evaluation method, students can raise the degree of completion their project.

Design Engineering Economics

This course focuses on economic analysis from a viewpoint of product development that was not dealt in existing economics and economic engineering courses.

With existing theory of economic engineering, students learn about economics that should be analyzed in terms of product developing process, each process and total process through various temporal value and

techniques.

In addition, while conducting practical problems and planning project, students learn about techniques and how to apply it through related economic analysis.

Product design and engineering II

This course, an intensive course of Product design engineering I, aims to derive final out put through term project.

Nonlinear Control and Optimization

This course introduces theories and applications for modeling nonlinear systems and controlling them in many engineering fields. The course provides the characteristics of controls and optimizations using complexity theory and focuses on nonlinear control. As main contents, complexity theory, dual theory, convex/concave optimization, nonlinear optimization and several meta-heuristic methods are presented and discussed.

Contemporary Design Engineering Issue I

This course sheds new light on the identity and value of a product by examining contemporary design and engineering issues. And aims drawing a product concept which enriches human's life much more.

Contemporary Design Engineering Issue II

As an intensive course of Contemporary Design Engineering Issue I, this course conducts an in-depth study about changing process of design and technology for rapid growing product.