Tsuyama College	Year	2021	Course Title	Manufacturing Engineering

Course Information

Course Code	0159	Course Category	Specialized / Elective
Class Format	Lecture	Credits	Academic Credit: 2
Department	Department of Integrated Science and Technology Communication and Informations System Program	Student Grade	5th
Term	First Semester	Classes per Week	2
Textbook and/or Teaching Materials	Textbook : "Industrial Engineering-Manufacturing Management Engineering" (Corona Publishing), Reference book: "Production system engineering, 6th edition" (Kyoritsu Shuppan), etc.		
Instructor	KONISHI Daijiro		

Course Objectives

Learning purposes :
The challenges facing society are becoming more complex, and industrial products are required to add new value rather than simply improving their functions. Under this background, we will consider manufacturing management and science for process innovation that responds to changes in the social environment. Through this lecture, learners will acquire basic knowledge about the process from design to manufacturing in factory production.

Course Objectives :
1. To explain the history of production technology and the significance of production systemization.
2. To explain the production process from the perspectives of "flow of things (unique technology)", "flow of information (management technology)", and "flow of value (cost evaluation)".
3. To explain manufacturing methods that can effectively utilize management resources, and scientifically analyze and improve manufacturing methods.

Rubric

	Excellent	Good	Acceptable	Not acceptable
Achievement 1	Students can explain the history of production technology and the significance of production systemization from the perspective of management technology and systems.	Students can understand and explain the history of production technology and production systems.	Students can understand the history of production technology and production systems.	Students can not understand the history of production technology and production systems.
Achievement 2	Students can explain the production process from the perspectives of "flow of things (unique technology)", "flow of information (management technology)", and "flow of value (cost evaluation)".	Students can understand and explain the production process.	Students can understand the production process.	Students can not understand the production process.
Achievement 3	Students can explain manufacturing methods that can effectively utilize management resources, and scientifically analyze and improve manufacturing methods.	Students can explain manufacturing methods that can effectively utilize management resources, and scientifically analyze manufacturing methods.	Students can understand manufacturing methods that can effectively utilize management resources.	Students can not understand manufacturing methods that can effectively utilize management resources.

Assigned Department Objectives

Teaching Method

Outline	General or Specialized : Specialized Field of learning : Design and production / management Foundational academic disciplines : Engineering / Mechanical Engineering / Industrial Engineering / Processing Relationship with Educational Objectives : This class is equivalent to "(3) Acquire deep foundation knowledge of the major subject area". Relationship with JABEE programs : The main goal of learning / education in this class is "(A) A-2". Course outline : We handle industrial engineering through "weft" from the viewpoint of product development and industrialization, as opposed to mechanical engineering divided into "warp" such as materials, fluids, heat, and mechanical mechanics. Through the lectures, we first learn that the production system is economically evaluated as a "flow of value" by integrating the "flow of things" that converts materials to products and the "flow of information" for management. Next, we understand that production activities are carried out not only by the production process but also by the complicated design, planning, and management processes, and learn about each of these processes.
Style	Course method : The class will be conducted using board writing and PowerPoint, paying attention to the relationship with the items learned in the experiments and practice. In addition, exercises will be provided according to the progress of learning so that students can deepen their understanding. There is a exercise every lesson. There are assignments that must be submitted. Grade evaluation method : Exams (70%) + Exercises (including assignments outside class hours)(30%). Regular exams will be totally conducted 2 times, and the evaluation ratios will be the same. Textbook and calculators are allowed for the exam. In addition, students with grades of less than 60 may be retested.

Notice	Precautions on the enrollment : This subject is a "subject that requires study outside of class hours". Classes are offered for 15 credit hours per credit, but 30 credit hours are required in addition to this. Follow the instructions of your instructor for these studies. Course advice : To learn while thinking about how to break away from the era of mass production, mass consumption and disposal, and how to effectively use limited resources to build a sustainable society as the times change. Therefore, as preparatory learning to be performed in advance, it is useful to learn the current situation and trends of production systems in Japan and overseas by reading the Nikkan Kogyo Shimbun and Nihon Keizai Shimbun. Foundational subjects : Manufacturing Technology (Mechanical Systems Program 2nd year), Design of Machine Elements I (Mechanical Systems Program 3rd year) etc. Related subjects : Graduation Thesis(5th year), Production Management Engineering (2nd year advanced course) etc. Attendance advice : Students should fully prepare and review each week's lessons. Students are allowed up to 25 minutes late, but attendance beyond this time limit is considered absent.

Characteristics of Class / Division in Learning

☐ Active Learning	☑ Aided by ICT	☑ Applicable to Remote Class	☐ Instructor Professionally Experienced

Elective must complete subjects

Course Plan

			Theme	Goals
1st Semester	1st Quarter	1st	Guidance, Production System and Management as a Management Strategy Method [Production Mechanism, Issues / Elements / Evaluation Indicators of Production System, Transition of Production Activities, Occurrence and Development of Mass Production, QCD, Composition of Production System, Product-out, Market-in] The main items of the learning contents outside the class hours are described below, so if you check the related items such as the terms shown in [Item], you will deepen your understanding of the lesson contents. In addition, items related to some of the items will be taken up as exercises. Learning contents outside class hours [Items] (Instructions): [Lot, lot production, inventory, setup change, throughput, lot size, bar chart (Gantt chart), economies of scale (sex), economy of speed (sex) , Economies of scope (sex)] (Investigate the terms shown in [Item] and consider the difference between large lot production and small lot production.)	Explain the history of production technology and the significance of production systemization from the perspective of management technology and systems. It can be recognized that viewpoints such as quality, cost, efficiency, and delivery date are important for corporate activities. The production system can be decomposed into its components and parts, and the relationship between those elements can be examined. Explain how the entire production system is trying to adapt to changes in the social environment.
		2nd	"Flow of Things": Basic Knowledge about Factory Planning-Production Process 1 [Classification of Production Process, Classification by Layout, ABC Analysis] Learning contents outside class hours [Items] (Instructions): [Product architecture, modularity, mass customization, supply chain (management), recall] (Investigate the terms shown in [Items], and the advantages of the module production method. Consider the issues.), [P-Q analysis (ABC analysis)]	Understand and explain the production process. Explain the type of production. Explain the significance and necessity of equipment layout. From the data, production varieties can be classified into 3 groups (A, B, C).
		3rd	"Flow of Things": Cell Production System-Production process 2 [Machining Cell, Assembly Cell] Learning content outside class hours [Items] (Instructions): [Digital Engineering (CAD / CAM, CAE, etc.)] (Investigate the terms shown in [Items] and think about automation of production activities to improve productivity. 1.), [FA, System Integration, CIM] (Investigate the terms shown in [Item] and think about automation of production activities to improve productivity 2.)	Explain the roles of NC machine tools / robots and humans in the production process.
		4th	"Flow of Information": Technical Information-Design Process 1 [Product Strategy, Product Design, Drawings] Learning content outside class hours [Items] (Instructions): [Standardization / simplification of products / parts, Value Analysis (VA), Group Technology (GT), P-Q analysis (ABC analysis), Fixed costs and variables Cost] (Investigate the terms shown in [Item] and consider a cost reduction approach for each product that the development / design department and production technology department play a central role in.)	Practice a series of processes (problem recognition, conception, design, production, evaluation, etc.) for presenting design solutions to problems and requirements. Explain the development procedure and production flow of new products. Explain product design and production design.

		5th	"Flow of Information": Technical Information-Design Process 2 [Process, Technical Sequence, Operation Level, Process Design, Operation Design, Standard Time] Learning content outside class hours [Item] (Instructions): [Break-Even Point] (Investigate the terms shown in [Item] and think about design considering cost reduction 1-Select production equipment.)	Can design systems, components, and processes that meet the requirements. Understand and explain process design. Understand and explain operation design.
		6th	"Flow of Information": Technical Information-Design Process 3 [Production System Design, Systematic Layout Plan: SLP] Learning content outside class hours [Item] (Instructions): [Material handling] (Investigate the terms shown in [Item] and think about a design that considers cost reduction. 2--Propose a process design with less waste.)	Explain the significance and necessity of production equipment and factory layout. The layout of production equipment in the factory can be planned and designed. Logistics flow lines can be planned.
		7th	"Flow of Information": Assembly System Design-Design Process 4 [Assembly System Design, Line Balancing] Learning content outside class hours [Item] (Instructions): [Improve productivity by eliminating bottlenecks, save labor by synchronizing target cycle times] (Investigate the terms shown in [Item] and consider cost reduction 3-Solve a simple line balancing problem.)	The production line (assignment of workers) of the factory can be planned and designed. Solve simple line balancing problems.
		8th	1st semester mid-term exam	
	2nd Quarter	9th	Return and commentary of exam answers,"Flow of Information": Planning Information-Planning Process 1 [Production Planning, Demand Forecasting] Learning content outside class hours [Item] (Instructions) :: [Linear approximation, linear regression, least squares method] (Investigate the terms shown in [Item] and the computer can be used in practice. 1-Draw a graph with Excel and linearly approximate it.)	Explain the production plan. Demand can be predicted accurately.
		10th	"Flow of Information": Planning Information-Planning Process 2 [Main Functions of Production Planning, Aggregate Production Planning (APP), What is Optimization, Mathematical Planning Method] Learning content outside class hours [Items] (Instructions): [Mathematical programming (linear programming, simplex method)] (Investigate the terms shown in [Items] and computers can be used in practice 2- Solving linear programming (simplex method) with Excel solver)	Can give a basic explanation about scheduling. The production plan can be optimized based on the linear programming method.
		11th	"Flow of Information": Planning Information-Planning Process 3 [Production Arrangement, Master Production Schedule (MPS) (Material Requirements Planning (MRP), Capacity Requirements Pplanning (CRP))] Learning contents outside class hours [Item] (Instructions): [Not small and not large numbers in elementary integer theory: max (a, b), min (a, b)] (Investigate the terms shown in [Items] and master the functions max (a, b) and min (a, b).)	Explain the method of each planning of materials, capacity and load (man-hours).
		12th	"Flow of Information": Planning Information-Planning Process 4 [Detail Schedule, Scheduling Problem, Scheduling, Ordering (Dispatching) Rules, Flow Shop Scheduling Method] Learning content outside class hours [Item] (Instructions): [Not small and not large numbers in elementary integer theory: max (a, b), min (a, b)] (Investigate the terms shown in [Items] and verify the optimality of the Johnson method.)	Can give a basic explanation about the detail schedule. Explain flow shops scheduling.
		13th	"Flow of Information": Planning Information-Planning Process 5 [Job Shop Scheduling Method] Learning content outside of class hours [Items] (Instructions): [Horizontal bar stacking graph] (Investigate the terms shown in [Items] and computers can be used in practice 3-Draw bar chart (Gantt chart) in Excel) .)	Explain job shop scheduling.

		14th	"Flow of Information": Management Information-Management process 1 [Management and production Control, Inventory Problem, ABC Analysis, Inventory Model, Fixed-Orde Quantity Model, Fixed-Orde period Model, s-S Model, 2-bin Model] Learning content outside class hours [Items] (Instructions):	Understand and explain the functions included in production control. The ordering method can be selected depending on the situation. Inventory control can be calculated.
		15th	(1st semester final exam)	
		16th	Return and commentary of exam answers	

Evaluation Method and Weight (%)

	Examination	Exercises	Mutual Evaluations between students	Behavior	Portfolio	Mini test	Total
Subtotal	70	30	0	0	0	0	100
Basic Proficiency	0	0	0	0	0	0	0
Specialized Proficiency	70	30	0	0	0	0	100
Cross Area Proficiency	0	0	0	0	0	0	0