SEEM4106: OPERATIONS MANAGEMENT OF PRODUCTION AND SERVICE SYSTEMS

Effective Term
Summer Term 2023

Part I Course Overview

Course Title
Operations Management of Production and Service Systems

Subject Code
SEEM - Systems Engineering and Engineering Management
Course Number
4106

Academic Unit
Systems Engineering (SYE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
MA2172 Applied Statistics for Science and Engineering or MA2177 Engineering Mathematics and Statistics and one of the following courses: MA1201 Calculus & Basic Linear Algebra II MA1301 Enhanced Calculus & Linear Algebra IIMA2001 Multi-variable Calculus and Linear Algebra / MA2170 Linear Algebra and Multi-variable Calculus

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

A production/service system refers to any system that processes resources (e.g. capital, materials, human skills and knowledge) in order to produce goods and/or services. Thus, production and service systems exist in virtually all kinds of companies, and some examples of such systems are factories producing toys, banks offering financial services to customers, hospitals offering surgical procedures to patients, and restaurants offering food services to customers. This course aims to equip students with the quantitative skills for analyzing and improving the operations of production and service systems. The emphasis will be on determining the relations and tradeoffs among key performance measures such as throughput, inventory level, customer-service level and cycle time in a system, based on the Little's Law and basic queuing theory. As a side benefit, these relations will provide the science to understand the advantages and disadvantages of various management techniques such as MRP, JIT, pull production systems and Lean.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the basic concepts of a production/ service system including: workstation, job, throughput, routing, inventory, work-in-process (WIP), cycle time, utilization, bottleneck rate, customer service level.	25			
2	Apply the Little's Law to analyze relations among cycle time, throughput, work-in-process and service level under various conditions.	25			
3	Apply the Little's Law and basic queuing theory to analyze and improve variabilities in a production/service line.	25			
4	Analyze and improve a pull production/service system in terms of work-in-process, cycle time variability, and analyze the relation between operations and quality in a production/service system.	25			

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures and in-class discussions	Lectures, in-class exercises, in-class Q&A and discussions will be used to implement CILOs 1-4.	1, 2, 3, 4	39 hours/semester
2	Consultation hour	1 hour per week will be scheduled as consultation hour for clearing doubts of students who can meet the teaching staff on an individual or small group basis in his/her office. Individualized discussions about homework and topics related to the course.	1, 2, 3, 4	13 hours/semester

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Homework sets and Test	1, 2, 3, 4	40	

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Assessment Rubrics (AR)

Assessment Task

Homework sets and Test

Criterion

Submitted written work

Excellent (A+, A, A-)

For all 4 CILOs, strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.

Good (B+, B, B-)

For at least 3 out of 4 CILOs, evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

Fair (C+, C, C-)

For at least 3 out of the 4 CILOs, evidence that student is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material

Marginal (D)

For at least 3 out of the 4 CILOs, sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature.

Assessment Task

Examination

Criterion

Submitted written work

Excellent (A+, A, A-)

For all 4 CILOs, strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.

Good (B+, B, B-)

For at least 3 out of 4 CILOs, evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

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Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature.

Part III Other Information

Keyword Syllabus

Management techniques for production and service systems, e.g. JIT, Kanban, Lean;
Basic concepts of a production/service system: workstation, job, throughput, routing, inventory, work-in-process (WIP), cycle time, utilization, bottleneck rate, customer service level;
Little's Law for expressing the relation between inventory level, cycle time, utilization and service level;
Basic queuing theory: M/M/1, M/M/1/b, G/G/1, G/G/m;
Process time variability, flow variability and variability interactions;
Variability improvement based on buffering, batching, increasing bottleneck utilization and reducing cycle time.
Description of pull production/service systems using the Little's Law and basic queuing theory.
Relation between operations and quality in a production/service system via the Little's Law and basic queuing theory.

Reading List

Compulsory Readings

	Title
1	Lecture notes and slides provided by the instructor

Additional Readings

	Title
1	Factory Physics, 3rd Edition, Wallace Hopp and Mark Spearman, McGraw-Hill Higher Education
2	Queuing Methods for Services and Manufacturing, 1st Edition, R.W. Hall, Prentice Hall
3	Manufacturing Systems Modeling and Analysis, 2nd Edition, Curry and Feldman, Springer-Verlag