MODULE HANDBOOK

QUALITY DESIGN

STATISTICS UNDERGRADUATE PROGRAM
DEPARTMENT OF STATISTICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
SURABAYA

ENDORSEMENT PAGE

	MODULE HANDBOOK **QUALITY DESIGN** **STATISTICS UNDERGRADUATE PROGRAM** **DEPARTMENT OF STATISTICS** **INSTITUT TEKNOLOGI SEPULUH NOPEMBER**

Proses *Process*	Penanggung Jawab *Person in Charge*			Tanggal *Date*
	Nama *Name*	Jabatan *Position*	Tanda tangan *Signature*	
Perumus *Preparation*	Dr. Muhammad Ahsan	Dosen Lecturer		
Pemeriksa dan Pengendalian *Review and Control*	Dr. M. Ahsan; Dr. Wibawati, S.Si, M.Si; Dr. Hidayatul Khusna	Tim kurikulum Curriculum team		
Persetujuan *Approval*	Dr. Wibawati, S.Si., M.Si	Koordinator RMK Course Cluster Coordinator		
Penetapan *Determination*	Dr. Kartika Fithriasari, M.Si	Kepala Departemen Head of Department		

MODULE HANDBOOK
QUALITY DESIGN

Module name	QUALITY DESIGN	
Module level	Undergraduate	
Code	SS234744	
Course (if applicable)	QUALITY DESIGN	
Semester	7	
Person responsible for the module	Dr. Muhammad Ahsan	
Lecturer	Dr. M. Ahsan; Dr. Wibawati, S.Si, M.Si; Dr. Hidayatul Khusna	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergradute degree program, elective, 7th semester.	
Type of teaching, contact hours	SCL Method (93.75%) Non-SCL Method (6.25%)	
Workload	1. Lectures [L] : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments [EA] : 3 x 60 = 180 minutes (3 hours) per week. 3. Independent learning [IL]: 3 x 60 = 180 minutes (3 hours)perweek.	
Credit points	3 credit points (SKS) Equivalent to 4.8 ECTS	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Design of Experiment	
Learning outcomes and their corresponding PLOs	CLO.1 Able to explain the concept of quality design for optimization and process improvement CLO.2 Able to explain optimization procedures with Taguchi Method and Response Surface Methodology CLO.3 Able to apply Taguchi Method and Response Surface Methodology in Industry CLO.4 Able to identify, formulate, and solve statistical problems in the field of quality design CLO.5 Able to use the computing techniques and modern computer devices needed to solve optimization problems through experimental design	PLO-6 PLO-7 PLO-9 PLO-10
Content	Quality Design (QD) is one of the courses in the field of industry that has the field of study of designing experiments to determine optimization. The purpose of studying QD is to know the application of statistical methods in determining the	

	optimization of single and multi-responses through the design of experiments, both with the Taguchi method and the Response Surface methodology. To achieve this, the learning strategy used is discussion and exercises as well as presentation tasks sourced from scientific study materials or publications
Assessment and its weight	Assignment 1 (25%) Assignment 2 (25%) Midterm Exam (25%) Final Exam (25%
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom
Reading list	1. Park, Sung H., Robust Design and analysis for Quality Engineering, Chapman Hall, 1996 2. Montgomery: Design and Analysis of Experiments, 6th Edition, 2008 3. Balavendram, N. Quality by Design Taguchi Techniques for IndustrialExperimentation. London: Prentice Hall Internasional.1995

	INSTITUT TEKNOLOGI SEPULUH NOPEMBER **FAKULTAS SAINS DAN ANALITIKA DATA** **PROGRAM STUDI SARJANA STATISTIKA** **DEPARTEMEN STATISTIKA**	**Kode Dokumen**

RENCANA PEMBELAJARAN SEMESTER/
SEMESTER LEARNING PLAN

MATA KULIAH (MK)/ *Course*	**KODE/** *Code*	**Rumpun MK/** *Course Group*	**BOBOT (sks)/** *Weight (credit)*		**SEMESTER/** *Semester*	**Tgl Penyusunan/** *Drafting Date*
PERANCANGAN KUALITAS / *QUALITY DESIGN*	SS234744	SBI	**T=3**	**P=0**	VII	17 Desember 2022

OTORISASI/ *AUTHORIZATION*	**Pengembang RPS/** *RPS Developer*	**Koordinator RMK/** *Course Group Coordinator*	**Ketua PRODI/** *Head of Department*
	Dr. Drs. Agus Suharsono, MS	Dr. Wibawati, S.Si., M.Si.	Dr. Kartika Fithriasari, M.Si

Capaian Pembelajaran (CP)/ *Learning Achievement*	**CPL-PRODI yang dibebankan pada MK/** *PLO*	
	CPL-6	Mampu merancang, mengumpulkan, dan melakukan manajemen data dengan metodologi yang tepat
	CPL-7	Mampu menggunakan perangkat komputasi modern untuk menyelesaikan permasalahan statistik
	CPL-9	Mampu menerapkan metode statistika untuk menganalisis permasalahan teoritis dan riil
	CPL-10	Mampu menerapkan metode statistika Bisnis, Industri, Ekonomi, Sosial, Lingkungan atau Kesehatan pada permasalahan riil
		Able to design, collect, and perform data management with the right methodology
	PLO-6	*Able to use modern computing devices to solve statistical problems*
	PLO-7	*Able to apply statistical methods to analyze theoretical and real problems*
	PLO-9	*Able to apply business, industrial, economic, social, environmental or health statistical methods to real problems*
	PLO-10	
	Capaian Pembelajaran Mata Kuliah (CPMK)/ *CLO*	

CPMK.1 Menjelaskan konsep perancangan kualitas untuk optimasi dan process improvement
CPMK.2 Mampu menjelaskan prosedur optimasi dengan Metode Taguchi dan Metode Respon Surface
CPMK.3 Mampu mengaplikasikan Metode Taguchi dan Metode Respon Surface dalam Industri
CPMK.4 Mampu mengindentifikasi, memformulasi, dan menyelesaikan masalah Statistika di bidang perancangan kualitas
CPMK.5 Mampu menggunakan teknik komputasi dan perangkat komputer modern yang diperlukan untuk menyelesaikan masalah optimasi lewat perancangan percobaan

CLO.1 Able to explain the concept of quality design for optimization and process improvement
CLO.2 Able to explain optimization procedures with Taguchi Method and Response Surface Methodology
CLO.3 Able to apply Taguchi Method and Response Surface Methodology in Industry
CLO.4 Able to identify, formulate, and solve statistical problems in the field of quality design
CLO.5 Able to use the computing techniques and modern computer devices needed to solve optimization problems through experimental design

Matrik CPL – CPMK
PLO-CLO Matrix

CPMK	CPL-6	CPL-7	CPL-9	CPL-10
CPMK-1	V			
CPMK-2			V	
CPMK-3		V	V	V
CPMK-4	V	V	V	V
CPMK-5		V		

Deskripsi Singkat MK/
Course Description

Perancangan Kualitas (PK) merupakan salah satu mata kuliah di bidang industri yang mempunyai bidang kajian merancang eksperimen untuk menentukan optimasi. Tujuan mempelajari PK adalah untuk mengetahui penerapan metode Statistika dalam menentukan optimasi respon tunggal maupun ganda melalui perancangan eksperimen, baik dengan metode Taguchi maupun metode Response Surface. Untuk mencapai ini maka Strategi pembelajaran yang digunakan adalah diskusi dan latihan serta tugas presentasi yang bersumber dari bahan kajian atau publikasi ilmiah.

Quality Design (QD) is one of the courses in the field of industry that has the field of study of designing experiments to determine optimization. The purpose of studying QD is to know the application of statistical methods in determining the optimization of single and multi-responses through the design of experiments, both with the Taguchi method and the Response Surface methodology. To achieve this, the learning strategy used is discussion and exercises as well as presentation tasks sourced from scientific study materials or publications

Bahan Kajian: Materi

1. Metode Taguchi: Orthogonal Arrays, Loss function, S/N ratio untuk karakteristik kualitas dengan respon kontinu dan diskrit, Optimasi dengan respon tunggal dan multiple.

Pembelajaran/ ***Course Material***	*2.* Metode Respon Permukaan: Optimasi dengan respon tunggal dan Multiple (*desirability function*). *1. Taguchi method: Orthogonal Arrays, Loss function, S/N ratio for quality characteristics with continuous and discrete responses, Optimization with single and multiple responses.* *2. Response Surface Method: Optimization with single and multiple responses (desirability function)*
Pustaka/ ***References***	**Utama/*Primary*:** Park, Sung H., Robust Design and analysis for Quality Engineering, Chapman Hall, 1996 **Pendukung/*Secondary :*** Montgomery: Design and Analysis of Experiments, 6th Edition, 2008 Balavendram, N. Quality by Design Taguchi Techniques for IndustrialExperimentation. London: Prentice Hall Internasional.1995
Dosen Pengampu/ ***Lecturers***	Dr.Drs Agus Suharsono, MS; Dr. Hidayatul Khusna, S.Si.
Matakuliah syarat/ ***Pre-requisite Course***	Desain Eksperimen *Design of Experiment*

Mg Ke- ***Week***	**Kemampuan akhir tiap tahapan belajar (Sub-CPMK)** ***Final capability for each learning step***	**Penilaian** ***Evaluation***		**Bantuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [Estimasi Waktu]** ***Learning Format Learning Methods Assignment for Student [Estimated Time]***		**Materi Pembelajaran [Pustaka]** ***Learning Material [References]***	**Bobot Penilaian (%)** ***Evaluation Weight (%)***
		Indikator ***Indicator***	**Kriteria & Bentuk** ***Criteria and Format***	**Luring** ***Offline***	**Daring** ***Online***		
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1	1. Dapat menjelaskan	1. Dapat menjelaskan	Tes	TM: 1x3x50”		1. Konsep dasar dalam	5%/5%

	konsep dasar dalam Quality by Design dan desain eksperimen 2. Dapat menerapkan Orthogonal Array standard dan mampu menggunakannya untuk membuat rancangan percobaan dalam metode Taguchi 1. *Can explain basic concepts in Quality by Design and experimental design* 2. *Can implement standard Orthogonal Array and be able to use it to create experimental designs in taguchi method*	perbedaan *off- line quality control* & *on-line quality control* 2. Dapat menjelaskan kegunaan dan manfaat Metode Taguchi dan Metode Respon Surface dalam dunia industri. 3. Dapat menjelaskan konsep *loss function* dan ukuran kapabilitas proses. 1. *Can explain the difference off- line quality control & on- line quality control* 2. *Can explain the usefulness and benefits of Taguchi Method and Surface Response Method in the industrial world.* 3. *Can explain the concept of loss function and process capability size.*	Observasi Aktifitas di kelas *Test,* *In Class Observation Activities*	LT: 1x3x60” BM: 1x3x60” *L: 1x3x50”* *EA: 1x3x60”* *IL: 1x3x60”*		metode Taguchi 2. Quality Loss Function (QLF) 3. Kualitas dan Kapabilitas Proses 4. Dasar-dasar dalam desain eksperimen *1. Basic concepts in the Taguchi method* *2. Quality Loss Function (QLF)* *3. Quality and Process Capability* *4. Fundamentals in experimental design*	
2,3	1. Dapat menerapkan Orthogonal Array tidak standard (modifikasi) dan mampu menggunakannya untuk membuat rancangan percobaan dalam metode Taguchi *3. Can implement*	1. Dapat menggunakan OA standard 2 level untuk merancang suatu percobaan 2. Dapat menggunakan OA standard 3 level untuk merancang suatu percobaan 1. *Can use 2-level standard OA to design an*	Tes Tugas 1 (Observasi Aktifitas di kelas *Test,* *Assignment 1,* *In Class Observation Activities*	TM: 2x3x50” LT: 2x3x60” BM: 2x3x60” *L: 2x3x50”* *EA: 2x3x60”* *IL: 2x3x60”*		Orthogonal Arrays I: 1. orthogonal array 2n dan 3n standard serta permasalahannya, 2. Tabel interaksi dan *graph linear* *Orthogonal Arrays I:* *1. Standard*	15%/20%

	non-standard Orthogonal Array (modification) and be able to use it to create experimental designs in Taguchi method	*experiment* 2. *Can use 3-level standard OA to design an experiment*				*orthogonal array 2n and 3n and the problems* *2. Interaction table and graph linear*	
4,5	2. Dapat memahami konsep SN rasio dan jenis-jenisnya untuk menganalisis data eksperimen respon kontinu dalam metode Taguchi *2. Able to understand the concept of SN ratio and its types to analyze continuous response experiment data in Taguchi method*	Dapat menggunakan OA tidak standard (modifikasi) *Can use non-standard OA (modification)*	Tes & Observasi Aktifitas di kelas (TOA) *Test In Class Observation Activities (TOA)*	TM: 2x3x50" LT: 2x3x60" BM: 2x3x60" *L: 2x3x50"* *EA: 2x3x60"* *IL: 2x3x60"*		Special Design Techniques: 1. Dummy level 2. Combination designs 3. Branching design, idle coloumn method	10%/30%
6,7	1. Dapat menganalisis Optimasi melalui metode Taguchi. 2. Memahami konsep SN rasio dan jenis-jenisnya untuk menganalisis data eksperimen diskrit dalam metode Taguchi 1. *Can analyze optimizations through taguchi method.*	1. Dapat menggunakan SN rasio untuk data respon kontinu 2. Dapat menganalisis SN rasio dengan Analysis ANOVA respon kontinu. *1. Can use SN ratio for continuous response data* *2. Can analyzes SN ratio with Analysis ANOVA continuous response.*	TOA *TOA*	TM: 2x3x50" LT: 2x3x60" BM: 2x3x60" *L: 2x3x50"* *EA: 2x3x60"* *IL: 2x3x60*		Park, Sung H., Robust Design and analysis for Quality Engineering , Chapman Hall, 1996	20%/50%

	2. *Understand the concept of SN ratios and their types to analyze discrete experimental data in the Taguchi method*						
8	**ETS/*Midterm***						**ETS/*Midterm***
9-11	Dapat melakukan analisis data metode Taguchi untuk kasus multi respon *Can perform taguchi method data analysis for multi response cases*	Dapat melakukan penyelesaian kasus multirespon dada metode Taguchi *Can perform multirespon chest case solving Taguchi method*	TOA Tugas-3 *TOA* *Assignment 3*	TM: 3x3x50” LT: 3x3x60” BM: 3x3x60” *L: 3x3x50”* *EA: 3x3x60”* *IL: 3x3x60”*		Park, Sung H., Robust Design and analysis for Quality Engineering , Chapman Hall, 1996	15%/75%
12-14	Dapat menggunakan metode Respon Surface untuk optimasi pada respon tunggal *Can use Surface Response method for optimization on a single response*	Dapat melakukan penyelesaian kasus optimasi melaui Response surface metodologi dan perannya dalam perbaikan kuaitas (quality improvemet) *Can do optimization case solving through Response surface methodology and its role in quality improvemet*	TOA *TOA*	TM: 3x3x50” LT: 3x3x60” BM: 3x3x60” *L: 2x3x50”* *EA: 2x3x60”* *IL: 2x3x60”*		Park, Sung H., Robust Design and analysis for Quality Engineering , Chapman Hall, 1996	15%/90%
15-17	Dapat menggunakan metode Respon Surface untuk optimasi pada respon ganda *Can use Surface Response method for*	Dapat melakukan penyelesaian kasus optimasi melaui Response surface metodologi untuk respon lebih dari satu. *Can perform case resolution optimization through the Response*	TOA *TOA*	TM: 3x3x50” LT: 3x3x60” BM: 3x3x60” *L: 3x3x50”* *EA: 3x3x60”* *IL: 3x3x60”*		Park, Sung H., Robust Design and analysis for Quality Engineering , Chapman Hall, 1996	10%/100%

	optimization on dual response	*surface methodology for more than one response.*					
18	**Evaluasi Akhir Semester / Ujian Akhir Semester/** *final exam*						