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MODULE HANDBOOK

QUALITY DESIGN

BACHELOR DEGREE PROGRAM
DEPARTEMENT OF STATISTICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER

ENDORSEMENT PAGE

	MODULE HAND BOOK **QUALITY DESIGN** **DEPARTMENT OF STATISTICS** **INSTITUT TEKNOLOGI SEPULUH NOPEMBER**

Proses ***Process***	**Penanggung Jawab** ***Person in Charge***			**Tanggal** ***Date***
	Nama ***Name***	**Jabatan** ***Position***	**Tandatangan** ***Signature***	
Perumus *Preparation*	Dr.Drs Agus Suharsono, MS	Dosen *Lecturer*		**March 28, 2019**
Pemeriksa dan Pengendalian *Review and Control*	Dr.Drs Agus Suharsono, MS	Tim kurikulum *Curriculum team*		**April 15, 2019**
Persetujuan *Approval*	Wibawati, S.Si, M.Si	Koordinator RMK *Course Cluster Coordinator*		**July 17, 2019**
Penetapan *Determination*	Dr. Kartika Fithriasari, M.Si	Kepala Departemen *Head of Department*		**July 30, 2019**

MODULE HANDBOOK

QUALITY DESIGN

Module name	**Quality Design**	
Module level	Undergraduate	
Code	KS184633	
Course (if applicable)	Quality Design	
Semester	Sixth Semester (Genap)	
Person responsible for the module	Dr.Drs Agus Suharsono, MS	
Lecturer	Dr.Drs Agus Suharsono, MS	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergradute degree program, **mandatory**, 6th semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	1. Lectures : 3 x 50 = 150 minutes per week. 2. Exercises and Assignments : 3 x 60 = 180 minutes (3 hours) perweek. 3. Private learning : 3 x 60 = 180 minutes (3 hours) per week.	
Credit points	3 credits points (SKS)	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	Desain Eksperimen/ *Design of Experiment*	
Learning outcomes and their corresponding PLOs	*CLO.1 Explains the concept of quality design for optimization and process improvement* *CLO.2 Able to explain optimization procedures with Taguchi Method and Surface Response Method* *CLO.3 Able to apply Taguchi Method and Surface Response Method 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* *CLO.6 Have knowledge of current and future issues related to the field of quality design* *CLO.7 Able to communicate effectively and cooperate in interdisciplinary and multidisciplinary teams* *CLO.8 Has professional responsibilities and ethics*	PLO – 1 PLO – 2 PLO – 3 PLO – 4

	CLO.9 Able to motivate yourself to think creatively and learn throughout life	
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 double responses through the design of experiments, both with the Taguchi method and the Response Surface method. To achieve this, the learning strategy used is discussion and exercises as well as presentation tasks sourced from scientific study materials or publications.*	
Study and examination requirements and forms of examination	• In-class exercises • Assignment 1, 2, 3 • Mid-term examination • Final examination	
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom.	
Reading list	1. Balavendram, N. 1995. Quality by Design Taguchi Techniques for IndustrialExperimentation. London : Prentice Hall Internasional. 2. Montgomery. 2008. Design and Analysis of Experiments. 6th edition. 3. Park, Sung H. 1996. Robust Design and analysis for Quality Engineering. Chapman Hall.	

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	MK Prasyarat	Desain Eksperimen
RP-S1	Dosen Pengampu	Dr.Drs Agus Suharsono, MS

Bahan Kajian/*Learning Materials*	Dasar Sains, Teori Statistika, Pengumpulan Data, Deskripsi dan Eksplorasi, Komputasi dan Data Processing, Pemodelan, Industri dan Bisnis *Basic Design, Statistical Theory, Data Collection, Description and Exploration, Computing and Data Procesing, Modeling, Industry and Business*
CPL yang dibebankan MK	CPL-1 Mampu menerapkan pengetahuan teori statistika, matematika, dan komputasi CPL-2 Mampu merancang dan melaksanakan pengumpulan data dengan metodologi yang benar CPL-3 Mampu menganalisis data dengan metode statistika yang tepat dan mengintepretasikannya CPL-4 Mampu mengindentifikasi,memformulasi, dan menyelesaikan masalah statistika di berbagai bidang terapan *CPL-1 Able to apply statistical, mathematical, and computational theory knowledge* *CPL-2 Able to design and implement data collection with the correct methodology* *CPL-3 Able to analyze data with the right statistical methods and interpret it* *CPL-4 Able to identify, formulate, and solve statistical problems in various applied fields*
CP-MK	CLO.1 Menjelaskan konsep perancangan kualitas untuk optimasi dan process improvement CLO.2 Mampu menjelaskan prosedur optimasi dengan Metode Taguchi dan Metode Respon Surface CLO.3 Mampu mengaplikasikan Metode Taguchi dan Metode Respon Surface dalam Industri CLO.4 Mampu mengindentifikasi,memformulasi, dan menyelesaikan masalah statistika di bidang perancangan kualitas CLO.5 Mampu menggunakan teknik komputasi dan perangkat komputer modern yang diperlukan untuk menyelesaikan masalah optimasi lewat perancangan percobaan CLO.6 Memiliki pengetahuan tentang isu terkini dan mendatang yang berkaitan dengan bidang perancangan kualitas CLO.7 Mampu berkomunikasi secara efektif dan bekerjasama dalam tim yang interdisiplin dan multidisiplin CLO.8 Memiliki tanggung jawab dan etika profesi CLO.9 Mampu memotivasi diri untuk berpikir kreatif dan belajar sepanjang hayat *CLO. 1 Explaining the concept of quality design for optimization and process improvement* *CLO. 2 Able to explain optimization procedures with Taguchi Method and Surface Response Method* *CLO. 3 Able to apply Taguchi Method and Surface Response Method 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* *CLO. 6 Have knowledge of current and future issues related to the field of quality design* *CLO.7 Able to communicate effectively and cooperate in interdisciplinary and multidisciplinary teams* *CLO.8 Has professional responsibilities and ethics*

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	CLO.9 Able to motivate yourself to think creatively and learn throughout life

Perte-muan *Meeting*	**Kemampuan Akhir Sub CP-MK** *Sub CLO Final Capability*	**Keluasan (materi pembelajaran)** *Extent(Learning Materials)*	**Metode Pembelajaran** *Learning Methods*	**Estimasi Waktu** *Estimated Time*	Bentuk Evaluasi *Evaluation Form*	Kriteria dan Indikator Penilaian *Assessment Criteria and Indicator*	**Bobot Penilaian** *Scoring Weight*
1	1. Dapat menjelaskan 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*	• Konsep dasar dalam metode Taguchi • Quality Loss Function (QLF) • Kualitas dan Kapabilitas Proses • Dasar-dasar dalam desain eksperimen • *Basic concepts of the Taguchi method* • *Quality Loss Function (QLF)* • *Process Quality and Capability* • *The basics in experimental design*	Ceramah interaktif Diskusi (CID) *Interactive lectures, Discussions (CID)*	150 menit *150 Minutes*	Tes Observasi Aktifitas di kelas *Test, In Class Observation Activities*	1. Dapat menjelaskan 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.*	5%/5%

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2	3. Dapat menerapkan Orthogonal Array tidak standard (modifikasi) dan mampu menggunakannya untuk membuat rancangan percobaan dalam metode Taguchi *3. Can implement non-standard Orthogonal Array (modification) and be able to use it to create experimental designs in Taguchi method*	Orthogonal Arrays I : • orthogonal array 2^n dan 3^n , standard serta permasalahannya, • Tabel interaksi dan graph linear *Orthogonal Arrays I :* • *orthogonal arrays 2n and 3n , standard and its problems,* • *Interaction tables and linear graphs*	CID Active Learning (AL) *CID, Active Learning*	150 menit *150 Minutes*	Tes Tugas 1 (Observasi Aktifitas di kelas *Test, Assignment 1, In Class Observation Activities*	1. Dapat menggunakan OA standard 2 level untuk merancang suatu percobaan 2. Dapat menggunakan OA standard 3 level untuk merancang suatu percobaan 3. Mengumpulkan tugas tepat waktu, 4. Kehadiran sesuai aturan 1. *Can use 2-level standard OA to design an experiment* 2. *Can use 3-level standard OA to design an experiment* 3. *Collect tasks on time,* 4. *Attendance according to the rules*	15%/20%
3,4	4. Dapat memahami konsep SN rasio dan jenis-jenisnya untuk menganalisis data eksperimen respon kontinu dalam metode Taguchi	*Special Design Techniques* : • *dummy level*, • combination designs, • *Branching design, idle coloumn method*	CIDLS *CIDLS*	300 menit *300 Minutes*	Tes & Observasi Aktifitas di kelas (TOA) *Test In Class Observation Activities*	Dapat menggunakan OA tidak standard (modifikasi) *Can use non-standard OA (modification)*	10%/30%

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	2. Able to understand the concept of SN ratio and its types to analyze continuous response experiment data in Taguchi method	*Special Design Techniques :* • *dummy level,* • *combination designs,* • *Branching design, idle coloumn method*			*(TOA)*		
5,6	3. Dapat menganalisis Optimasi melalui metode Taguchi. Memahami konsep SN rasio dan jenis-jenisnya untuk menganalisis data eksperimen diskrit dalam metode Taguchi 5. *Can analyze optimizations through taguchi method. Understand the concept of SN ratios and their types to analyze discrete*	• *Parameter design* untuk data kontinu. (Analisis rasio *signal to noise*) untuk data kontinu • ANOVA dan persen kontribusi • Confidence interval untuk dugaan kondisi optimum • Percobaan Konfirmasi • *Design parameters for continuous data. (Ratio analysis signal to noise) for continuous data* • *ANOVA and percent contribution*	CIDLS *CIDLS*	300 menit *300 Minutes*	TOA *TOA*	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.*	20%/50%

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	experimental data in the Taguchi method	• *Confidence interval for expected optimum condition* • *Test Confirmation*					
7	**ETS/*Midterm***						
8	6. Dapat melakukan analisis data metode Taguchi untuk kasus multi respon *6. Can perform taguchi method data analysis for multi response cases*	Optimasi multi respon secara simultan dengan Metode TOPSIS, dll *Simultaneous multi-response optimization with TOPSIS Methods, etc.*	CIDLS *CIDLS*	300 menit *300 Minutes*	TOA Tugas-3 *TOA* *Assignment 3*	Dapat melakukan penyelesaian kasus multirespon dada metode Taguchi *Can perform multirespon chest case solving Taguchi method*	15%/75%
9,10	7. Dapat menggunakan metode Respon Surface untuk optimasi pada respon tunggal *7. Can use Surface Response method for optimization on a single response*	Response surface design and analysis : • *response surface modeling* and its role in quality improvemet • *analysis of a second order model, respons surface design for fithing second order models* *Response surface design and analysis :*	CIDLS *CIDLS*	150 menit *150 Minutes*	TOA *TOA*	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*	15%/90%

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		• *response surface modeling and its role in quality improvemet* • *analysis of a second order model, surface design response for fithing second order models*					
11	8. Dapat menggunakan metode Respon Surface untuk optimasi pada respon ganda *8. Can use Surface Response method for optimization on dual response*	Optimasi lewat fungsi *desirability* dan *Non linear programming*	DPS *DPS*	600 menit *600 Minutes*	TOA *TOA*	Dapat melakukan penyelesaian kasus optimasi melaui Response surface metodologi untuk respon lebih dari satu. *Can perform case resolution optimization through the Response surface methodology for more than one response.*	10%/100%
12,15	**EAS/*Finalterm***						

PUSTAKA/*References* **:**

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