



INSTITUT TEKNOLOGI SEPULUH NOPEMBER (ITS)
FAKULTAS TEKNOLOGI ELEKTRO DAN INFORMATIKA CERDAS
DEPARTEMEN TEKNIK ELEKTRO
Program Studi Magister (S2) Teknik Elektro

1	Nama Mata Kuliah / Course Name	: Metode Statistik dan Optimisasi / <i>Statistical Methods and Optimization</i>
2	Course Code	: EE235101
3	Kredit / Credits	: 2 SKS
4	Semester / Semester	: 1

Deskripsi Mata Kuliah / Course Description

Pada kuliah ini mahasiswa mempelajari dua topik utama, yaitu: (1) metode-metode statistik yang dibutuhkan untuk merancang penelitian serta untuk menganalisis dan menginterpretasikan hasil pengukuran dan simulasi, (2) dasar-dasar dan metode optimisasi yang dibutuhkan untuk menemukan solusi dari berbagai permasalahan teknis yang dijumpai pada penelitian, misal: pemrograman linier, optimisasi konveks, metode iteratif, optimisasi yang diinspirasi dari alam: algoritma genetika, dll.

In this course, students study two main topics, namely: (1) statistical methods needed to design research and to analyze and interpret measurement and simulation results, (2) the basics and optimization methods needed to find solutions to various technical problems encountered in research, for example: linear programming, convex optimization, iterative methods, optimization inspired by nature: genetic algorithms, etc.

Capaian Pembelajaran Lulusan (CPL) Yang Dibebankan Mata Kuliah / Program Learning Outcomes Charged to The Course

1. (CPL-01) Mampu menunjukkan sikap dan karakter yang mencerminkan: ketakwaan kepada Tuhan Yang Maha Esa, berbudi pekerti luhur, peka dan peduli terhadap masalah sosial dan lingkungan, menghargai perbedaan budaya dan kemajemukan, menjunjung tinggi penegakan hukum, mendahulukan kepentingan bangsa dan masyarakat luas, melalui inovasi, kreatifitas, dan potensi lain yang dimiliki.

(PLO-01) Able to demonstrate attitudes and character that reflect: devotion to God Almighty, noble character, sensitivity and concern for social and environmental issues, respect for cultural differences and diversity, uphold law enforcement, prioritize the interests of the nation and the wider community, through innovation, creativity, and other potentials possessed.

2. (CPL-03) Mampu mengelola pembelajaran diri sendiri, dan mengembangkan diri sebagai pribadi pembelajar sepanjang hayat untuk bersaing di tingkat nasional,

maupun internasional, dalam rangka berkontribusi nyata untuk menyelesaikan masalah dengan memperhatikan prinsip keberlanjutan.

(PLO-03) Able to manage self-learning, and develop oneself as a lifelong learner to compete at national and international levels, in order to make a real contribution to solving problems while paying attention to the principles of sustainability.

3. (CPL-04) Mampu menguasai filosofi yang mendasari konsep, prosedur, prinsip keilmuan, prinsip rekayasa, dan pengetahuan faktual untuk mengembangkan prosedur dan strategi yang diperlukan pada analisis dan perancangan sistem terkait bidang teknik elektro menggunakan teknologi informasi dan komunikasi.

(PLO-04) Able to master the philosophy underlying concepts, procedures, scientific principles, engineering principles, and factual knowledge to develop procedures and strategies required in the analysis and design of systems related to electrical engineering using information and communication technology.

Capaian Pembelajaran Mata Kuliah / Course Learning Outcomes

1. Menguasai konsep dan metode analisis statistik terhadap data pengukuran dan menguasai metode optimisasi terhadap suatu permasalahan dalam rekayasa di bidang teknik elektro / *Mastering the concepts and methods of statistical analysis of measurement data and mastering optimization methods for engineering problems in the field of electrical engineering.*
2. Mampu mendesain eksperimen dan menghitung analisis statistik terhadap data pengukuran dan mampu mendefinisikan permasalahan optimisasi dan mencari penyelesaian optimalnya / *Able to design experiments and calculate statistical analysis of measurement data and able to define optimization problems and find optimal solutions.*
3. Mampu menggunakan perangkat lunak dan tool untuk analisis statistik dan optimisasi, misal Matlab dan R. / *Able to use software and tools for statistical analysis and optimization, for example Matlab and R.*
4. Menunjukkan sikap bertanggungjawab atas pekerjaan di bidang keahliannya secara mandiri. / *Demonstrate a responsible attitude towards work in his/her field of expertise independently.*

Pokok Bahasan / Contents

1. Pengantar / *Introduction*
2. Statistik deskriptif / *Descriptive statistics*
3. Desain eksperimen / *Experimental design*
4. Analisis univariate, multivariate, dan varians / *Univariate, multivariate, and variance analysis*
5. Aplikasi metode statistik / *Applications of statistical methods*
6. Permasalahan optimisasi / *Optimization problems*
7. Matematika optimisasi / *Optimization mathematics*
8. Penyelesaian optimisasi secara analitik / *Numerical optimization solutions*
9. Penyelesaian optimisasi secara numerik / *Numerical optimization solutions*
10. Pemrograman dinamik / *Dynamic programming*
11. Pengantar algoritma-algoritma meta-heuristics dan evolusioner / *Introduction to meta-heuristics and evolutionary algorithms*

Prasyarat / Pre-requisite
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Pustaka / Reference
Utama / Primary: 1. William M. Mendenhall & Terry L. Sincich, "Statistics for Engineering and the Sciences," 6th ed., CRC Press, 2016. 2. Jay Devore, "Probability and Statistics for Engineering and the Sciences," 9th ed., CENGAGE Learning, 2016. 3. William Navidi, "Statistics for Engineers and Scientists," 3rd ed., McGraw-Hill, 2011. 4. Jorge Nocedal & Stephen J. Wright, "Numerical Optimization," 2nd ed., Springer, 2006. 5. Edwin K.P. Chong & Stanislaw H. Zak, "An Introduction to Optimization," 4th ed., John Wiley & Sons, 2013 6. Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loaiciga, "Meta-Heuristic and Evolutionary Algorithms for Engineering Optimization," John Wiley & Sons, 2017. Pendukung / Support : 7. Montgomery, D. C., Peck, E. A., & Vining, G. G. (2012). "Introduction to Linear Regression Analysis." Wiley. 8. Evans, M., Hastings, N., & Peacock, B. (2000). "Statistical Distributions." John Wiley & Sons. 9. Hillier, F. S., & Lieberman, G. J. (2013). "Introduction to Operations Research." McGraw-Hill. 10. Bazaraa, M. S., Jarvis, J. J., & Sherali, H. D. (2010). "Linear Programming and Network Flows." John Wiley & Sons. 11. Winston, W. L. (2003). "Operations Research: Applications and Algorithms." Cengage Learning. 12. Montgomery, D. C., Jennings, C. L., & Kulahci, M. (2015). "Introduction to Time Series Analysis and Forecasting." John Wiley & Sons. 13. Bertsimas, D., & Tsitsiklis, J. (1997). "Introduction to Probability." Athena Scientific.