	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***	:	Diagnosis Peralatan Sistem Tenaga Listrik / *Diagnostic Electrical System and Equipment*
2	**Course Code**	:	EE235312
3	**Kredit / *Credits***	:	3 SKS
4	**Semester / *Semester***	:	Pilihan

Deskripsi Mata Kuliah / *Course Description*

Mata kuliah ini membahas mengenai teknik diagnosa peralatan dan sistem tenaga khususnya transmisi tegangan tinggi. Untuk mengoptimalkan keseimbangan antara efisiensi biaya dan peningkatan kualitas sistem tenaga listrik, perlu untuk mendiagnosis kondisi peralatan sekarang dan untuk memperkirakan kinerjanya di masa yang akan datang. Pokok bahasan yang dibahas adalah strategi diagnosa sistem tenaga listrik, teknik diagnosa peralatan utama yang rentan karena umur termasuk Generator, Circuit breaker, trafo, GIS dan saluran.

This course discusses the diagnostic techniques of equipment and power systems, especially high voltage transmission. To optimize the balance between cost efficiency and improving the quality of the electric power system, it is necessary to diagnose the current condition of the equipment and to estimate its performance in the future. The topics discussed are the electric power system diagnostic strategy, diagnostic techniques for major equipment that are vulnerable due to age including Generators, Circuit breakers, transformers, GIS and lines.

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

1. (CPL-02) Mampu mengembangkan dan memecahkan permasalahan ipteks dalam bidang keilmuannya melalui riset dengan pendekatan inter atau multidisiplin hingga menghasilkan karya inovatif dan teruji, serta mendapat pengakuan nasional dan internasional.

   (PLO-02) Able to develop and solve science and technology problems in their scientific fields through research with an inter or multidisciplinary approach to produce innovative and tested work, and receive national and international recognition.

2. (CPL-04) Mampu menguasai konsep, prinsip keilmuan secara komprehensif, prinsip rekayasa, dan pengetahuan faktual tentang Teknologi Informasi untuk

mengembangkan prosedur dan strategi yang diperlukan pada analisis dan perancangan sistem terkait bidang Teknik Elektro.

(PLO-04) Able to master concepts, scientific principles comprehensively, engineering principles, and factual knowledge about Information Technology to develop procedures and strategies required in the analysis and design of systems related to the field of Electrical Engineering.

3. (CPL-08) Mampu mengambil keputusan dalam konteks menyelesaikan masalah pengembangan ilmu pengetahuan dan teknologi yang memperhatikan dan menerapkan nilai humaniora berdasarkan kajian analisis atau eksperimental terhadap informasi dan data.

   (PLO-08) Able to make decisions in the context of solving problems in the development of science and technology that pay attention to and apply humanities values based on analytical or experimental studies of information and data.

Capaian Pembelajaran Mata Kuliah / *Course Learning Outcomes*

1. Mampu menjelaskan konsep sistem monitoring, diagnosa dan aset manajemen sistem tenaga listrik. / *Able to explain the concepts of monitoring systems, diagnostics, and asset managementof electric power system*.
2. Mampu menguasai prinsip pengolahan sinyal untuk diagnostic : Wavelet, FFT, Bifurkasi, dan PRPD / *Able to master the principles of signal processing for diagnostics: Wavelet, FFT, Bifurcation, and PRPD.*
3. Mampu menjelaskan prinsip diagnosis Motor, Generator, transformator, Circuit breaker / *Able to explain the principles of diagnosing Motors, Generators, Transformers, Circuit Breakers.*
4. Mampu menjelaskan prinsip diagnosis diagnosa GIS, Saluran Transmisi dan Distribusi / *Able to explain the principles of GIS diagnosis, Transmission and Distribution Channels*

Pokok Bahasan / *Contents*

1. Laju kegagalan peralatan /*Equipment failure rate*
2. Keandalan sistem tenaga listrik /*Reliability of electric power systems*
3. Intelligent grid management system /*Intelligent grid management system*
4. Sistem monitoring /*Monitoring system*
5. Diagnosa sistem tenaga listrik /*Electrical power system diagnosis*
6. Aset manajemen /*Asset management*
7. Pengolahan signal menggunakan Wavelet /*Signal processing using Wavelet*
8. Pengolahan signal menggunakan FFT /*Signal processing using FFT*
9. Pengolahan signal menggunakan Bifurkasi /*Signal processing using Bifurcation*
10. Pengolahan signal menggunakan PRPD /*Signal processing using PRPD*
11. Diagnostic Motor /*Motor Diagnostics*
12. Diagnostic Generator /*Diagnostic Generator*
13. Diagnostic Transformator /*Transformer Diagnostics*
14. Diagnostic panel/ switchgear
15. Diagnostic GIS /*Diagnostic GIS*

16. Diagnostic saluran transmisi /*Transmission channel diagnostics*
17. Diagnostic saluran distribusi /*Distribution channel diagnostics*
18. Jurnal review /*Review journal*

Prasyarat / *Pre-requisite*

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Pustaka / *Reference*

Utama / *Primary*:

1. M. Hanai, H. Kojima, N. Hayakawa, K. Shinoda and H. Okubo, "Integration of asset management and smart grid with intelligent grid management system," in IEEE Transactions on Dielectrics and Electrical Insulation, vol. 20, no. 6, pp. 2195-2202, December 2013.
2. M. Shahidehpour and R. Ferrero, "Time management for assets: chronological strategies for power system asset management," in IEEE Power and Energy Magazine, vol. 3, no. 3, pp. 32-38, May-June 2005
3. Subrata Karmakar, Induction Motor Fault Diagnosis Approach Through Current Signature Analysis, Springer Singapore, 2016
4. Greg C. Stone, Ian Culbert, Edward A. Boulter, Hussein Dhirani, Electrical Insulation for Rotating Machines: Design, Evaluation, Aging, Testing, and Repair, 2nd Edition, July 2014, Wiley-IEEE Press, ISBN: 978-1-118-05706-3
5. Franco Sebastian Gentile, Jorge Luis Moiola, Guanrong Chen, Frequency-domain Approach To Hopf Bifurcation Analysis: Continuous Time-delayed Systems, World Scientific Publishing Company, 2019
6. “Handbook of Large Turbo-Generator Operation and Maintenance”, Geoff Klempner and IsidorKerszenbaum, John Wiley, 2008
7. Visa Musa Ibrahim, Zulkurnain Abdul-Malek, Nor AsiahMuhamad, Status Review on Gas Insulated Switchgear Partial Discharge Diagnostic Technique for Preventive Maintenance, Indonesian Journal of Electrical Engineering and Computer Science, Vol. 7, No. 1, July 2017, pp. 9 ~ 17, DOI: 10.11591/ijeecs.v7.i1.pp9-17
8. https://dimrus.com/dilin_e.html

Pendukung / *Supporting*:

1. William A. Thue, Electrical Power Cable Engineering, Third Edition, December 13, 2011 by CRC Press, ISBN 9781439856437