MODULE HANDBOOK DESCRIPTION

Module designation	*EPS Substation Technology & Grounding*
Code	*FBA0004*
Semester(s) in which the module is taught	*6 / third year*
Person responsible for the module	*Agung Budi Muljono, ST., MT.*
Language	*Indonesian*
Relation to curriculum	*elective*
Teaching methods	*lectures, case base method, project base method*
Workload (incl. contact hours, self-study hours)	Contact minutes every week, each week of the 16 Weeks / semester: • Lectures: 2 × 50 minutes. • Exercises and Assignments: 2 × 60 minutes. • Self-learning: 2 × 60 minutes. total study hours = 5 hours 40 minutes/week
Credit points	*2 SKS (~3.2 ECTS)*
Required and recommended prerequisites for joining the module	*Electric Power Transmission (FBA3102)* *Power System Analysis II (FBA3208)* *Modern Power Distribution (FBA3211)*
Program Learning Outcomes (PLO)	- *Knowledge (PLO2):* *Able to apply knowledge of science and mathematics, electrical technology, information technology and/or materials technology to gain a thorough understanding of the principles in the field of electrical engineering.* - *Engineering Analysis (PLO3):* *Able to choose methods, make literature reviews, design experiments with simulations, and analyze results to reach the right conclusions, as well as develop guidelines for using tools.* - *Engineering Design (PLO4):* *Able to design and develop components, systems and/or processes to support engineering activities and create technological innovations by optimally utilizing potential resources.*

Module objectives/intended learning outcomes	1. *Students able to explain the function and role of the substation in the electric power system.*	*PLO2*
	2. *Students are able to explain the classification of substations and substation facilities*	*PLO2*
	3. *Students are able to describe and explain single, double, and ring bus bar connection systems as well as systems without bus bars.*	*PLO2*
	4. *Students are able to explain the types and characteristics of the circuit breaker and the operating mechanism of the circuit breaker.*	*PLO3*
	5. *Students are able to determine rating and selection of circuit breakers.*	*PLO3*
	6. *Students are able to analyze the causes of overvoltage in the electric power system*	*PLO3*
	7. *Students are able to calculate the isolation coordination of substation equipment and analyze the insulation strength of the substation equipment, distance and protection margin*	*PLO3*
	8. *Students are able to explain the neutral grounding method*	*PLO4*
	9. *Students are able to design and evaluate the method of grounding the neutral point of the electric power system.*	*PLO4*
	10. *Students are able to explain the purpose of equipment grounding and calculate the type of induced overvoltage (touch voltage and step voltage)*	*PLO4*
Content	1. *Introduction to substation technology* 2. *Electrical equipment at the substation* 3. *Substation network connection system* 4. *Substation control and security system* 5. *Isolation coordination at substations* 6. *Power system neutral grounding* 7. *Unearthed system or delta system (Δ)* 8. *Grounded system (Y)* 9. *Transmission system protection against ground faults* 10. *Equipment grounding* 11. *Step Voltage and Touch Voltage*	

Examination forms	- *Written case study* - *Written and oral project study* - *Essay midterm and final test*
Study and examination requirements	*The final grade in the module is composed of;* *a. Case I assessment : 15 %* *b. Case II assessment : 15 %* *c. Case III assessment : 20 %* *d. Written Midterm assessment : 20 %* *e. Written Final assessment : 30 %* *Students must have a final grade of 65% or higher to pass*
Reading list	**1.** Arismunandar, 1991, "Teknik Tenaga Listrik jilid 3 - Gardu Induk", Pradnya Paramitha, Jakarta. 2. Hutauruk, T.S., 1991. "Pengentanahan Netral Sistem Tenaga dan Pengentanahan Peralatan", Penerbit Erlangga, Jakarta. 3. Partap Singh Satnam and Gupta, 1979, "Sub-station Design and Equipment", Mc-Graw Hill. 4. John D. Mc.Donald, 2012, "Electric Power Substations Engineering", CRC Pers. 5. Kadarisman, P, Muchtar, K, Sarimun, W., 2003 *Masalah Pentanahan Netral Sistem Tegangan Menengah* 20kV , PT.PLN (persero) Jasdik 6. Stevenson Jr., WD., 1985. *Analisis Sistem Tenaga Listrik* , Penerbit Erlangga, Jakarta. 7. Djiteng Marsudi, 2006, "Operasi Sistem Tenaga Listrik", Edisi Pertama– Penerbit. Graha Ilmu – Yogyakarta. Hadi Saadat, 1999, "Power System Analysis", McGraw-Hill *Company*.