

Annexe A: New/Revised Course Content in OBTL+ Format

Course Overview

The sections shown on this interface are based on the templates [UG OBTL+](#) or [PG OBTL+](#)

If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to [Data Transformation Status](#) for more information.

Expected Implementation in Academic Year	AY2024-2025
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Yang Yun
Course Author Email	yun.yang@ntu.edu.sg
Course Title	Power Engineering Design
Course Code	EE4523
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	EE3010 Electrical Devices & Machines and EE3015 Power Systems & Conversion or EE2005 Electrical Devices & Machines and EE3015 Power Systems & Conversion
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	EE4503 Power Engineering Design
Remarks (if any)	

Course Aims

There are two modules in this course. The course aim of the first module is to introduce the basic principles and procedures for the design and assessment of low-voltage and high-tension distribution networks. The course aim of the second module is to provide a platform to apply the knowledge acquired on power system protection to solve some realistic protection problems in power distribution systems, taking into consideration of the relevant industrial standards.

Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	Give a basic account of the relevant technical concepts and the international standards in the design and operation of distribution systems.
ILO 2	Design large electrical installations for power distribution systems such as residential and commercial buildings, airports and mass transport systems, manufacturing and industrial processing plants.
ILO 3	Apply the theories and concepts learnt to design a target distribution system and the associated protection schemes.
ILO 4	Design protection schemes for industrial distribution systems.
ILO 5	Apply the knowledge and skills acquired to solve power engineering problems.

Course Content

In this design course, the students will apply the concepts of various power system analysis techniques and system performance criteria in designing a medium/low-voltage distribution system and protection schemes for some typical industrial distribution networks. Students are required to carry out the detailed design with hands-on exercise and extensive use of computer simulation software. Students are also required to verify the results of the final design to meet specifications.

Reading and References (if applicable)

TEXTBOOKS

1. Ismail Kasikci, Analysis and Design of Low-voltage Power Systems: An Engineer's Field Guide, 1st Edition, Wiley-VCH, 2004. (TK1001.K19)
2. Blackburn J Lewis and Domin Thomas J, Protective Relaying: Principles and Applications, 4th Edition, CRC Press, 2014. (TK2861.B628 2014)
3. Robert W. Erickson and Dragan Maksimović, Fundamental of Power Electronics, 2nd Edition, Boston, MA: Kluwer Academic Publishers, 2001 (TK7881.15.E68 2001 & e-book)

REFERENCES

1. Code of Practice for Electrical Installations, (Singapore Standard, CP5 2018), Enterprise Singapore, 2018. (QC100.S617 CP5 2018)
2. Anderson Paul M, Power System Protection, 1st Edition, McGraw-Hill, 1999. (TK1010.A548 & e-book)
3. B. Khan, et.al., Active Electrical Distribution Network: A Smart Approach, 1st Edition, Wiley, 2021 (e-book)

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Distribution Network Configurations	1, 2, 5		In-person	Standard CP5 and Hands-on Design
2	Compensation of Reactive Power	1, 2, 5		In-person	Standard CP5 and Hands-on Design
3	Selection of Cable Size and Emergency Power Supply	1, 2, 5		In-person	Standard CP5 and Hands-on Design
4	Protection Against Electric Shock	1, 2, 5		In-person	Standard CP5 and Hands-on Design
5	Electrical Load Estimate and Fault Calculation	1, 2, 5		In-person	Standard CP5 and Hands-on Design
6	Lightning Protection	1, 2, 5		In-person	Standard CP5 and Hands-on Design
7	Power Distribution Equipment	1, 2, 5		In-person	Standard CP5 and Hands-on Design
8	Power System Protection	3, 4, 5		In-person	Design Notes and Hands-on Design
9	Overcurrent Protection	3, 4, 5		In-person	Design Notes and Hands-on Design

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
10	Overvoltage Protection	3, 4, 5		Online	Design Notes and Hands-on Design
11	Busbar and Transformer Protection	3, 4, 5		In-person	Design Notes and Hands-on Design
12	Grid-connected Converters in Distributed Power Systems	3, 4, 5		In-person	Design Notes and Hands-on Design
13	Control of Grid-Connected Converters	3, 4, 5		In-person	Design Notes and Hands-on Design

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lecture	The lectures provide important design concepts for the knowledge and skills that you will develop in Learning Outcomes 1 to 5. The lectures comprise explanations of theories and have many design examples for students to practice. The lectures can help students to understand how to apply the knowledge and theories learnt to solve practical power engineering problems, thus helping them to achieve Learning Outcomes 1 to 5.
Laboratory	The hands-on exercises are in every week to allow you to apply what you have learnt for each topic given in the lecture. Assignments are also given to allow you to work on mini projects with all topics combined when you acquire sufficient knowledge and skills, thus achieving Learning Outcomes 1 to 5.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Summative Assessment (EXAM): Final exam(Final Examination)	1, 2, 5	EAB SLO* (a), (b), (c), (d), (e)	50	Individual	Analytic	Multistructural
2	Continuous Assessment (CA): Assignment(Design Assignment)	3, 4, 5	EAB SLO* (a), (b), (c), (d), (e), (i), (j)	50	Individual	Holistic	Multistructural

Description of Assessment Components (if applicable)

Formative Feedback

You will be able to receive the feedback through:

1. assignment scores and answers;
2. brief comments on assignment reports for individual students;
3. report on overall assignment performance;
4. examination results; and
5. markers' report on overall examination performance and performance analysis on each examination question.

NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Creative Thinking	Basic
Digital Fluency	Intermediate
Problem Solving	Intermediate
Critical Thinking	Intermediate
Design Thinking	Intermediate

Course Policy

Policy (Academic Integrity)

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values. As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the academic integrity website for more information. On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Policy (General)

You are expected to complete all hands-on exercises and take all scheduled assignments by due dates. You are expected to take responsibility to follow up with course notes, assignments and course related announcements. Continuous assessments and hands-on exercises: You are required to attend all continuous assessments and work on the hands-on exercises.

Policy (Absenteeism)

Continuous assessments make up a significant portion of your course grade. Absence from continuous assessments without officially approved leave will result in no marks and affect your overall course grade.

Policy (Others, if applicable)

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Last Updated By: Nur Amalina Binti Ahmad