

Course Title: Electric Power Devices (Hybrid)
Course #: EE 470

Credit Hours: 3
Semester: SP 2022
Cap:

Faculty: Sundaram Arumugam

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Office: Tech 235

Office Phone: 505 979 1959

Office Hours (face-to-face or online): Online MW 12.30 to 2.50

Preferred Communication (email and/or text; will respond within 24 hours): E mail

Modality (face-to-face, hybrid, or online): Hybrid

Class Location and Meeting Times (if face-to-face): Tech 312 TR 3.30 to 5.00

Meeting Hours and Online Hours (if hybrid): TR 3.30 to 5.00

Required Materials: Text Book, stationeries, Laptop, internet Connection

Textbooks: Switchgear and Protection , Author Arun Ingole, Publisher Pearson Education , ISBN 9353063388, 9789353063382

Tools:

Lab Fee (if applicable):

Mission, Vision, and Philosophy

Mission: Navajo Technical University honors Diné culture and language, while educating for the future.

Vision: Navajo Technical University provides an excellent educational experience in a supportive, culturally diverse environment, enabling all community members to grow intellectually, culturally, and economically.

Philosophy: Through the teachings of Nitsáhákees (thinking), Nahátá (planning), Ína (implementing), and Siihasin (reflection), students acquire quality education in diverse fields, while preserving cultural values and gaining economic opportunities.

Course Description

Course Outcomes	Course Assessments
A strong understanding of switch gear Equipments	Assignment, Quiz, Test
A strong understanding of working of circuit breakers and relays	Assignment, Quiz, Test
A strong understanding of fuses according to the rating	Assignment, Quiz
A strong understanding of various protection schemes	Project, Quiz, Test

A strong ability to understand the working of different types of switchgear equipment's .	Assignment, Quiz, Test
A strong ability to design the ratings for fuses according to the requirement	Assignment, Quiz, Test
A strong ability to understand various protection schemes of various power system	Project, Quiz, Test
A strong ability to know various methods of over voltage protection in power systems.	Assignment, Quiz, Test
A strong knowledge of Electrical protection	
An ability to communicate in a group	

Connections to Program Assessment (Course-Embedded Measures)

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
3. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Activities

Week	Date	Class Topics/Reading Due	Assignments Due	Assessments
1	01/19/2021	Introduction - switch gear - Essential features of Switchgear—Switchgear Equipment	✓	
		Last day to add/drop		
2	01/24/2022 01/26/2022	Bus-bar Arrangements— Switchgear Accommodation—Short circuit— Short circuit currents—Faults in a Power System	✓	
3	01/31/2022 02/02/2022	Circuit Breakers—Arc Phenomenon, Principles of arc extinction, Methods of arc extinction, Important, Terms, Classification of circuit breaker	✓	
4	02/07/2022 02/09/2022	Oil circuit breakers—Types of oil circuit breakers—Plain break oil circuit breakers—Arc control oil circuit breakers— Low oil circuit breakers		✓
5	02/14/2022 02/16/2022	Maintenance of oil circuit breakers—Air blast circuit breakers. . Types of air blast circuit breakers—SF6 Circuit Breaker—Vacuum circuit breakers		

6	02/21/2022 02/23/2022	Switchgear Components— Problems of circuit interruption.		✓
7	02/28/2022 03/02/2022	Resistance Switching—Circuit Breaker Ratings, Fuses— Desirable Characteristics of Fuse Elements—Fuse element materials—Important Terms		✓
8	03/07/2022 03/09/2022	Graduation Petition due		
		Revision and Test	Midterm	
		Midterm grades due		
9	03/21/2022 03/23/2022	Types of Fuses—Low voltage fuses—High voltage fuses, Current carrying capacity of fuse element, Difference between a fuse and circuit breaker	✓	
10	03/28/2022 03/30/2022	Protective Relays—Fundamental requirements of Protective Relaying—Basic Relays—Electro magnetic Attraction Relays— Induction Relays—Relay timing		✓
11	04/04/2022 04/06/2022	Important terms—Time P.S.M. curve—Calculation of relay operating time—Functional relay types—Induction type Over- current Relay—Induction type directional power Relay	✓	✓
12	04/11/2022 04/13/2022	Distance or Impedance relays— Definite distance type impedance relays—Time-distance impedance relays—Differential relays— Current differential relays— Voltage balance differential relay—Translay System—Types of Protection.		✓
13	04/18/2022 04/20/2022	Voltage Surge—Causes of Over voltages—Internal causes of over voltages—Lightning— Mechanism of Lightning Discharge	✓	✓
14	04/25/2022 04/27/2022	Types of Lightning strokes— Harmful effects of lightning— Protections against lightning— The Earthing Screen—Overhead Ground wires—Lightning Arresters—Types of lightning arresters—Surge Absorber		

15	05/02/2022 05/04/2022	Revision		
16	05/09/2022 05/11/2022	Project Presentation		
			Finals	
17		Grades due to the Registrar		
		Graduation		

Grading Plan

Homework: :2.5
Class Participation :2.5
Assignment(s) :10
Quizzes :10
Mid-term: 25
Final Exam: 25
Portfolio:

A = 100-90%
B = 89-80%
C = 79-70%
D = 69-60%
F = 59% or less

Grading Policy

Students must do their own work. Cheating and plagiarism are strictly forbidden. Cheating includes (but is not limited to) plagiarism, submission of work that is not one's own, submission or use of falsified data, unauthorized access to exams or assignments, use of unauthorized material during an exam, or supplying or communicating unauthorized information for assignments or exams.

Participation

Students are expected to attend and participate in all class activities. Points will be given to students who actively participate in class activities including guest speakers, field trips, laboratories, and all other classroom events.

Cell phone and headphone use

Please turn cell phones off **before** coming to class. Cell phone courtesy is essential to quality classroom learning. Headphones must be removed before coming to class.

Attendance Policy

Students are expected to attend all class sessions. A percentage of the student's grade will be based on class attendance and participation. Absence from class, regardless of the reason, does not relieve the student of responsibility to complete all course work by required deadlines. Furthermore, it is the student's responsibility to obtain notes, handouts, and any other information covered when absent from class and to arrange to make up any in-class assignments or tests if permitted by the instructor. Incomplete or missing assignments will necessarily affect the student's grades. Instructors will report excessive and/or unexplained absences to the Counseling Department for investigation and potential intervention. **Instructors may drop students from the class after three (3) absences unless prior arrangements are made with the instructor to make up work and the instructor deems any excuse acceptable.**

Study Time Outside of Class for Face-to-Face Courses

For every credit hour in class, a student is expected to spend two hours outside of class studying course materials.

Study Time for Hybrid or Blended Courses

For a hybrid or blended course of one credit hour, a student is expected to spend three hours per week studying course materials.

Study Time for Online Courses

For an online course of one credit hour, a student is expected to spend four hours per week studying course materials.

Academic Integrity

Integrity (honesty) is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Students who engage in academic dishonesty diminish their education and bring discredit to the University community. Avoid situations likely to compromise academic integrity such as: cheating, facilitating academic dishonesty, and plagiarism; modifying academic work to obtain additional credit in the same class unless approved in advance by the instructor, failure to observe rules of academic integrity established by the instructor. **The use of another person's ideas or work claimed as your own without acknowledging the original source is known as plagiarism and is prohibited.**

Diné Philosophy of Education

The Diné Philosophy of Education (DPE) is incorporated into every class for students to become aware of and to understand the significance of the four Diné philosophical elements, including its affiliation with the four directions, four sacred mountains, the four set of thought processes and so forth: Nitsáhákees, Nahát'á, Íina and Siih Hasin which are essential and relevant to self-identity, respect and wisdom to achieve career goals successfully.

At NTU's Zuni Campus, the A:shiwí Philosophy of Education offers essential elements for helping students develop Indigenous and Western understandings. Yam de bena: dap haydoshna: akkya hon detsemak a:wannikwa da: hon de:tsemak a:ts'umme. *Our language and ceremonies allow our people to maintain strength and knowledge.* A:shiwí core values of hon i:yyułashik'yanna:wa (respect), hon delank'oha:willa:wa (kindness and empathy), hon i:yyayumola:wa (honesty and trustworthiness), and hon kohoł lewuna:wediyahnan, wan hon kela i:tsemanna (think critically) are central to attaining strength and knowledge. They help learners develop positive self-identity, respect, kindness, and critical thinking skills to achieve life goals successfully.

Students with Disabilities

Navajo Technical University is committed to serving all students in a non-discriminatory and accommodating manner. Any student who feels that she or he may need special accommodations should contact the Accommodations Office (<http://www.navajotech.edu/student-services#accomodations-services>) in accordance with the university's Disability Accommodations Policy (see http://www.navajotech.edu/images/about/policiesDocs/Disability_Exhibit-A_6-26-2018.pdf).

Email Address

Students are required to use NTU's email address for all communications with faculty and staff.

Final Exam Date: 05/17/2022