

ENELE202A Principle of Electrical Machines

PART (1)

CLASS LESSON NOTES FOR BASIC CONCEPTS AT FOUNDATION/ADVANCED DIPLOMA LEVEL

In this subject you will learn basic principles of electrical machinery. You will develop specialised knowledge and skills relating to:

Transformers:

- Transformer Principles and Construction
- Efficiency
- Impedance
- Equivalent circuit
- Polarity
- Vector groups
- Parallel operations
- Special Transformers (Auto and Instrument etc)

Induction Motors:

- Principle of Induction Motor
- Construction and operation of Squirrel Cage Induction Motors (SCIM) and Wound Rotor Induction Motors (WRIM)
- Operation and characteristics
- Induction Generator
- Single Phase Induction Motor

Synchronous Machines:

- Principles of operation
- Characteristics
- Motors
- Alternators

DC Machines:

- Principles of operation
- Shunt Series Compound Machines
- Characteristics

Single Phase and Special Motors:

- Split Phase motor
- Capacitor Start/Run motor

- Shaded Pole motor
- Universal motor
- Hysteresis motor
- Stepper motors
- Brushless DC motors
- Permanent magnet motors
- Variable reluctance motors
- Stepper motors
- Brushless DC motors

Electronic Control of Motors

- DC Motors
- AC Motors.

Electrical Machines

Week 1 Lesson

Week 2 Lesson

Week 3 Lesson

Electrical Magnetism

Week 1 Lesson

Week 2 Lesson

Week 3 Lesson

Electro-mechanics

Subjects	Points	Competency Units
Electro-mechanics		Electrical Machines Machine Principle

Part 1 Over all Knowledge of the subject

Electro-mechanics

Part 2 Competency units of the subject

Electro-mechanics

Electrical Machines Drive and Power System
Machine Principle

Advanced Electro-magnetics Field & Materials

Subjects	Points	Competency Units
Advanced Electro-magnetics Field & Materials		Electromagnetism

Part 1 Over all Knowledge of the subject

Advanced Electro-magnetics Field & Materials

Part 2 Competency units of the subject

Electro-magnetics Field

Electromagnetism

Electro-magnetism Examples

Electro-mechanics (2 pt)

Part (1) Overview Knowledge of the subject

Folder		Advanced Engineering Mathematics		
File		Elementary linear algebra		
		Instruction Study the notes, calculate the example problems then do the exercises numbers as indicated		
File name	Chapter	Page		Topics Note- PDF File page number and the page number of the scanned document may be different. The student need to check both as necessary
Theory				
chap01_emd.pdf			All	Electro-mechanic -1.0.1 Scope of application 1.1 Electro-magnetic theory 1.1.1a Magnetic field system, Table 1.1 1.1.1.b Electric field system Table 1.2
chap02_emd.pdf			All	Lumped electro-mechanical elements
chap03_sec_emd.pdf			All	Lumped parameter-electro-mechanic
chap04_sec_emd.pdf			All	Rotating machines
chap05_sec_emd.pdf			All	Lumped parameter-electro

					mechanical dynamics
Problems					
chap02_prb_emd.pdf			All		Example problems
chap03_prb_emd.pdf			All		Example problems
chap04_prb_emd.pdf			All		Example problems
chap05_prb_emd.pdf			All		Example problems
emdsoln_01.pdf			All		Solutions for all example problems
Exercise	Q378	to	Q400		of Assignment (25)

Part (2) Competency Units

Electrical Machines
Machine Principle

Folder	Electrical Machines				
File	Electrical Machines				
	Instruction Study the notes, calculate the example problems then do the exercises numbers as indicated				
Chapter	Page				Topics
					Note- PDF File page number and the page number of the scanned document may be different. The student need to check both as necessary
	45				DC Generator, Example problems
	58				DC Motors, Example problems
	121				Efficiency & heating of electrical machines, Example problems
	131				Three phase transformer, Example problems
	142				Three phase induction motors, Example problems
	177				Synchronous generators, Example problems
	194				Synchronous motors, Example problems
	229				Basic of industrial motor control, Example problems
Exercise	Q401	to	Q430		of Assignment Number (26)

Machine Principle

Folder	Machine Principle (1 pt)				
File	Machine Principle				
	Instruction Study the notes, calculate the example problems then do the exercises numbers as indicated				
Chapter	Page				Topics
					Note- PDF File page number and the page number of the scanned document may be different. The student

				need to check both as necessary
2	114			Rotating machines
3	116			Machinery mounting
4	118			Balancing
6	124			Bearing
7	139			Power transmission
Exercise Q431 to Q435 of Assignment Number (27)				

Advanced Electro-magnetics Field & Materials

Part (1) Overview Knowledge of the subject

Folder		Advanced Electro-magnetic Field & Materials		
File				
		<u>Instruction</u> Study the notes, calculate the example problems then do the exercises numbers as indicated		
File name	Chapter	Page		Topics
				Note- PDF File page number and the page number of the scanned document may be different. The student need to check both as necessary
Pre-readings				
em01.pdf	1		All	Electric field
em02.pdf	2		All	Electrostatic potential
em03.pdf	3		All	Dipole and quadrature pole movements
em04.pdf	4		All	Batteries, resistors, ohm laws
em05.pdf	5		All	Capacitors
em06.pdf	6		All	Magnetic effect of an electric current
em07.pdf	7		All	Force on current in a magnetic field
em08.pdf	8		All	Electro-dynamics of moving bodies
em09.pdf	9		All	Magnetic potential
em10.pdf	10		All	Electro-magnetic Induction
em11.pdf	11		All	Dimensions
em12.pdf	12		All	Properties of magnetic materials
em13.pdf	13		All	Alternating current
em14.pdf	14		All	Laplace transform
em15.pdf	15		All	Maxwell Equation
em16.pdf	16		All	CGS Electricity & Magnetism
em17.pdf	17		All	Magnetic dipole movement
Highlight Points				
Lecture1.pdf			All	Outlines
Lecture 2.pdf			All	Electric field
Lecture 3.pdf			All	Electrostatic Energy

Lecture 4.pdf			All	Laplace's equation (1)
Lecture 5.pdf			All	Laplace's equation (2)
Lecture 6.pdf			All	Remarks on units
Lecture 7.pdf			All	Green's functions
Lecture 8.pdf			All	Multipole expansion
Lecture 9.pdf			All	Electro-static in matter
Lecture 10.pdf			All	Boundary condition
Lecture 11.pdf			All	Magneto statics (1)
Lecture 12.pdf			All	Magneto statics (2)
Lecture 13.pdf			All	Macroscopic magneto statics
Lecture 14.pdf			All	Maxwell's equation
Lecture 15.pdf			All	DISC movement
Lecture 16.pdf			All	Electro-magnetic plane waves
Lecture 17.pdf			All	Reflection & refraction
Lecture 18.pdf			All	Casual relation between D & E
Lecture 19.pdf			All	Wave guides and load cavities
Lecture 20.pdf			All	Electromagnetic radiation and scattering (1)
Lecture 21.pdf			All	Electromagnetic radiation and scattering (2)
Lecture 22.pdf			All	Scattering by small di-electric sphere
Lecture 27.pdf			All	Electro-magnetism
Lecture 28.pdf			All	Electro magnetic fields and moving charges
Formulas				
CW950212_1.pdf			All	Multipole expansion
CW950320_1.pdf			All	Magnetic constants and materials
CW950329_1.pdf			All	Ampere law
CW950128_3.pdf			All	Brief history of electro magnetism
CW950219_2.pdf			All	Gauss's law
CW950313_2.pdf			All	Numerical solutions to Laplace's equation
CW960430_2.pdf			All	Small current loop
CW970129_3.pdf			All	Curvilinear co-ordinate system
CW970210_1.pdf			All	Problems
CW970303_1.pdf			All	Dielectric tensors and constants
CW970317_2.pdf			All	Analytic solution to Laplace equation
CW970606_1.pdf			All	Magnetostatic boundary condition
CW970606_1.pdf			All	Electrostatic boundary condition
Symbols				
CW970606_3.pdf			All	Electromagnetic field
CW980205_2.pdf			All	The gradient vector
Di-electric.pdf			All	Maxwell's equation
Propagation.pdf			All	Electro-magnetic wave propagation
Exercise	Q436	to	477	of Assignment (28)

PART (2)
REFERENCE TEXT BOOKS & WEEKLY –LESSONS AT
ASSOCIATE DEGREE LEVEL (SELF STUDY)

TEXT BOOK- Textbooks can be copied from USBs & DVD.

Prescribed Texts:

Wildi, T 2006, *Electrical Machines, Drives and Power Systems* 6th or latest edition. Pearson
Prentice Hall, Australia