Principle of Electrical Engineering

INTRODUCTION TO CURRICULUM

Prepared By Er. Bibek Dahal

Year: I Part: II

Teaching Schedule			Mode					DISTRIBUTION OF MARKS							Remark
								Theory			Practical			Total Marks	
SN	Course Code	Course Title	L	T	P	Lab	Total Hour	Asst. Marks	Final Marks	Time Hours	Asst. Marks	Mark Final	Time Hrs.		
1	EG 1201 SH	Engineering Mathematics II	3	1			4	20	80	3	0	0		100	
2	EG 1202 SH	Engineering Physics II	3	1		2	6	20	60	3	10	10	1.5	100	
3	EG 1103 SH	Engineering Chemistry II	3	1		2	6	20	60	3	10	10	1.5	100	
4	EG 1204 ME	Engineering Drawing II			4		4				60	40	4	100	
5	EG 1209 ME	Applied Mechanics	3	1			4	20	80	3				100	
6	EG 1212 EE	Safety Rules and Regulation	2				2	10	40	1.5				50	
7	EG 1213 EE	Electrical Workshop	1		6		7				90	60	6	150	
8	EG 1215 EE	Principles of Electrical Engineering	4			3	7	20	80	3	30	20	3	150	
		Total =	**19**	**4**	**10**	**7**	**40**	**110**	**400**		**200**	**140**		**850**	

Principles of Electrical Engineering

EG 1215 EE

Year: I
Semester: II

Total: 7 hours /week
Lecture: 4 hours/week
Tutorial: hours/week
Practical: hours/week
Lab: 3 hours/week

Course Description:

This course provides a basic framework for understanding the fundamental concept of Electric circuits. The course deals with circuit fundamentals and Electrostatics and electromagnetic phenomena.

Course Objectives:

After completing this course the students will be able to:

1. understand the fundamental concept of electric circuits
2. understand the fundamental principles of electricity, magnetism
3. understand the electromagnetic phenomena and its applications.

Course content:

Unit 1: Basic Concept of Electricity **[10]**

1.1. Matter, molecule and atom
1.2. Electric charge and current
1.3. Conventional versus electron flow
1.4. Potential difference and electromotive force
1.5. Conductors, insulators and electron flow
1.6. Resistance and its variation with temperature
1.7. Direct and alternating current

Unit 2 Electric Circuit Fundamentals **[12]**

2.1 Definitions of Electric current and voltage
2.2 Circuit elements: Resistor, Inductor, Capacitor
2.3 Voltage and current sources
2.4 Independent and dependent sources
2.5 Series and parallel circuits
2.6 Ohm's law
2.7 Voltage divider circuits and Kirchhoff's Voltage Law (KVL)
2.8 Current divider circuits and Kirchhoff's Current Law (KCL)
2.9 Electric power and energy

Unit 3 Electrostatics **[10]**

3.1 Laws of electric forces
3.2 Electric field and electric field intensity
3.3 Electric fluxes and flux density
3.4 Dielectrics, permittivity and relative permittivity
3.5 Electrostatic induction phenomena
3.6 Electric potential, potential difference and potential gradient
3.7 Capacitors and capacitance
3.8 Series and parallel connection of capacitors
3.9 Factors affecting capacitance
3.10 Some constructional examples of practical capacitors

	3.11 Energy stored in charged capacitor	
	3.12 Charging and discharging of capacitor, time constant for charging/discharging	
Unit 4	**Magnetism and Electromagnetism**	**[12]**
	4.1 Definition of magnetic field, magnetic flux, flux density, filed intensity and permeability of magnetic material, domain theory of magnetism	
	4.2 Permanent magnets and electro-magnets	
	4.3 Permeability and relative permeability of magnetic material	
	4.4 Dia-magnetic, para-magnetic and ferro-magnetic materials	
	4.5 Magnetic field due to current carrying conductor, force on a current carrying conductor	
	4.6 Hysteresis loop for magnetic material, hard and soft magnetic material	
Unit 5	**Electro Magnetic Induction**	**[8]**
	5.1 Relation between electricity and magnetism, production of induced emf & current	
	5.2 Faraday's Laws of Electromagnetic induction, direction of induced emf & current.	
	5.3 Lenz's law, dynamically induced emf, statistically induced emf.	
	5.4 Self inductance, coefficient of self inductance (L), Mutual inductance, coefficient of mutual inductance (M), coefficient of coupling.	
	5.5 Energy stored in a current carrying inductor	
	5.6 Inductance in series, inductance in parallel.	
	5.7 Magnetic circuit concept, analogy to electric circuit	
Unit 6	**Electrolysis and its Application**	**[8]**
	6.1 Faraday's law of electrolysis and its applications	
	6.2 Primary and secondary cells: definitions and examples, internal resistance of cell	
	6.3 Lead acid cell: construction, chemical reaction during charging and discharging, methods of charging (constant voltage and constant current charging)	
	6.4 Dry cell, Mercury cell, Ni-Cd cell, Li-ion cell	
	6.5 Series and parallel connection of cells	

Practical Exercises: **[3x15 hrs]**

1. Use of Ammeter and Voltmeter to measure current and voltage. Identify and scale and range settings of such meters.
2. Verification of Ohm's law
3. Verification of Kirchhoff's current and voltage laws
4. Resistance and resistivity of wire
5. Wheatstone bridge
6. Charging and discharging of capacitor
7. B-H Curve for hard and soft magnetic materials
8. Basic application of electromagnets
9. Electromagnetic induction
10. Inductance and capacitance in DC circuits
11. Measurement of internal resistance of batteries
12. Charging and discharging of lead acid battery

References:

1. *A textbook of Electrical Technology* by B.L Theraja and A.K. Theraja
2. *Fundamentals of Electrical Engineering* by J. B. Gupta
3. *Principles of Electrical Engineering* by Vincent Del Toro
4. *Foundations of Electrical Engineering* by R.J. Cogdell