MUZAFFARPUR INSTITUTE OF TECHNOLOGY, Muzaffarpur

COURSE FILE

OF

Machine I

(031342)

Faculty Name:

Dr. R. S. Singh

ASSOCIATE PROFESSOR, DEPARTMENT OF ELECTRICAL ENGINEERING

Content

VISION STATEMENT OF ELECTRICAL ENGINEERING DEPARTMENT

To produce cutting edge Electrical Engineers, innovators, researchers, and entrepreneurs with high human values to serve society, industry, nation and the world.

MISSION STATEMENT OF ELECTRICAL ENGINEERING DEPARTMENT

M1. To create state-of-the-art facilities for under-graduate, post- graduate and R&D work.

M2. To cater the needs of society with recent technologies, innovative ideas and inculcate ethical responsibilities.

M3. To develop strong collaborative links with premier industries, institutions and the government agencies.

Program Educational Objectives (PEOs) of Electrical Engineering Department:

- **PEO 1.** Students will be able to engage in life-long learning and research including supportive and responsible roles on multi-disciplinary tasks.
- **PEO 2.** Students will acquire, use and develop skills as required for effective professional and societal practices and leadership quality.
- **PEO 3.** Students will be able to create a new dimension of innovation and entrepreneurship.

Program Outcomes (POs) based on Program Educational Objectives (PEOs) of Electrical Engineering Department:

- **PO 1.** Students will be able to apply knowledge of applied mathematics & science in electrical engineering problems.
- **PO 2.** Students will be able to identify, formulate and solve society and industries related problems.
- **PO 3.** Students will be able to apply knowledge to design a system, component or process to meet desired needs within realistic constraints.
- **PO 4.** Students will be able to conduct laboratory experiments and to critically analyze and interpret experimental data.
- **PO 5.** Students will be able to use the recent techniques, skills, and modern tools necessary for engineering practices.
- **PO 6.** Students will be able to understand the impact of engineering problems, solutions in a global and societal context.
- **PO 7.** Students will be able to demonstrate professional and ethical responsibilities.
- **PO 8.** Students will be able to apply leadership quality to work with team in the area of electrical engineering towards the solution of multi-disciplinary tasks.
- **PO 9.** Students will be able to communicate effectively through verbally, technical writing, reports and presentation.
- **PO 10.** Students will be able to develop confidence for self-education and ability to engage in life-long learning.

COURSE OBJECTIVE AND COURSE OUTCOMES:

Institute/college Name	Muzaffarpur Institute of Technology, Muzaffarpur
Program Name	B.E. Electrical (III semester)
Course Code/course credits	031342 (4)
Course Name	Machine I
Lecture/ Sessional (per week)	3/1
SEE duration	4 hours
Course Coordinator Name	Dr. R. S. Singh

Course objective:

Understand the principle of operation and performance of DC generators. Learn the speed control and testing methods of DC motors

Course outcomes (CO):

CO1	Explain the operation of Generator, armature reaction and its applications.
CO2	Interpret principle, torque equation, speed control and different types of tests of DC motors.
CO3	Analyze the operation and performance of single phase and three phase transformer.
CO4	Analyze the operation and performance of three phase induction motor and induction generator.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Cxxx.1	3	3	3	3	-	-	-	-	-	-	-	3
Cxxx.2	3	3	2	2	1	-	-	-	2	-	-	3
Cxxx.3	3	3	2	2	1	-	-	-	2	-	-	3
Cxxx.4	3	3	3	3	-	-	-	-	-	-	-	3

CO-PSO mapping:

CO/PSO	PSO1	PSO2	PSO3
Cxxx.1	3	-	1
Cxxx.2	3	-	-
Cxxx.3	3	1	1
Cxxx.4	3	2	-

SYLLABUS

Topics	No of lectures	Weightage
Constructional Feature and types of D.C. Machines, Types of armature winding, Action of Commutator,	3	10%
Principle of D.C. generator, Induced EMF, Armature reaction, Commutation, Compensating Winding and Inter Poles	2	10%
External & Internal Characteristics of D.C. Generator, Critical Resistance, Critical Speed.	5	10%
Principle of D.C. Motors , Back EMF, Torque and Speed of D.C. Motors, Losses	5	5%
Efficiency, Characteristics, Starting and Speed Control of Various types of D.C. Motors	5	10%
Basic Principle, Types and Construction of Single Phase Transformer, EMF equation, Equivalent Circuits, Phasor Diagram, Losses and efficiency Testing	5	5%
Voltage Regulation, per unit system, Losses and Efficiency, Parallel Operation of Single Phase Transformer	5	10%
Working Principle, Saving of Conductor, Advantage and Disadvantage of Auto Transformer	5	10%
Introduction, Types, Phasor Group, Parallel Operation of three Phase Transformer, Cooling of Transformer	3	10%
Construction, Types and Principle of three Phase Induction Motors, Production of rotating field, slip, Equivalent Circuit and Phasor Diagram	5	10%
Mechanical Power Developed, Maximum torque, Torque-Slip Characteristics, Losses and efficiency, Starting, Testing and speed control of Induction Motor	6	10%

Time Table:

ELECTRICAL 3RD SEM.

ROOM NO.: 33

DAY/TIME	9:00-10:00	10:0-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00
MONDAY	OOP (RK)	M-III (T-1)	THDM (MKS)	EL. MC-I (RSS)	LUNCH	WEEKLY TESTS (30 MIN. EACH PAPER)		
						M-III / EL. MC-I / BE / SSPD / THDM / OOP		
TUESDAY	SSPD (RK)	THDM (MKS)	M-III (T-1)	BE (UF)		BE LAB (UF+PKJ)		
						OOP LAB (RK+SS) (I-WAY, GROUND FLOOR)		
WEDNESDAY	M-III(T1)(T-1)	OOP (RK)	THDM (MKS)	SSPD (RK)		SSPD LAB(RK+RAK)/MC-I LAB(RSS+YNS)		
THURSDAY	THDM (T3) (MKS)	BE (UF)	EL. MC-I (RSS)	M-III (T2) (T-1)		BE LAB (UF+PKJ)		
						OOP LAB (RK+SS) (I-WAY, GROUND FLOOR)		
FRIDAY	THDM (T1) (MKS)	BE (UF)	M-III (T-1)	BE (T1) (SR)		THDM (T4) (MKS)	SSPD (RK)	BE (T2) (UF)/ BE (T3) (RK) 50
SATURDAY	THDM (T2) (MKS)/ BE (T4) (SK) 50	SSPD LAB(RK+RAK)/MC-I LAB (RSS+YNS)				EL. MC-I (RSS)		

ROLL NO. [17E01 – 17E16 (T1) 17E17 – 17E32 (T2) 17E33 – 17E48 (T1) E49 – 17E65, 16E47 (T1)]

SUBJECT NAME		FACULTY NAME	
OOP	OBJECT ORIENTED PROGRAMMING	**RK**	RAJIV KUMAR
M-III	MATHEMATICS-III	**MKS**	MANAHAR KR. SHAH
THDM	THERMODYNAMICS	**UF**	UMAR FAROOQUE
BE	BASIC ELECTRONICS	**RK**	RAVI KUMAR
SSPD	SOLID STATE PHYSICS AND DEVICES	**RSS**	DR. RAM SAGAR SINGH
EL. MC-I	ELECTRICAL MACHINE-I	**SR**	SHAHDAB RABBANI

Student list:

NAME LIST OF B. TECH. 3rd SEMESTER 2017 BATCH

ELECTRICAL BRANCH

SL. NO.	ROLL NO.	AKU REG. NO.	NAME
1	16E47	16103107020	SHUBHAM KUMAR
2	17E01	17103107001	SHIVANGI
3	17E24	17103107002	PRAGYA KUMARI
4	17E04	17103107003	KANNU PRIYA
5	17E08	17103107004	VIDYA KUMARI
6	17E07	17103107005	APARNA SINGH
7	17E13	17103107006	KHUSHBOO ANAND
8	17E09	17103107007	VIVEK KUMAR
9	17E03	17103107008	SHIVAM DUBEY
10	17E17	17103107009	VANDANA BHARTI
11	17E16	17103107010	SANDHYA KUMARI
12	17E19	17103107011	NEHA SINGH
13	17E10	17103107013	ABHIJEET KUMAR
14	17E12	17103107014	NIRAJ KUMAR
15	17E02	17103107015	SAURAV SINHA
16	17E22	17103107016	ABHINAV KISHORE
17	17E25	17103107017	GAUTAM KUMAR
18	17E11	17103107018	UTPAL KANT
19	17E26	17103107019	ASHUTOSH KUMAR
20	17E21	17103107020	DEPAK KUMAR
21	17E42	17103107021	RAVI PRAKASH CHOUDHARY
22	17E06	17103107022	SAURAV KUMAR
23	17E34	17103107023	PAVAN KUMAR
24	17E23	17103107024	SINTU KUMAR
25	17E55	17103107025	GHANSHYAM KUMAR
26	17E18	17103107026	SATYA PRAKASH
27	17E48	17103107027	ASHISH KUMAR
28	17E20	17103107028	MOHAMMAD EHSHANULLAH

29	17E30	17103107029	MASYOOD AHMAD
30	17E60	17103107030	ABHIMANYU KUMAR SINGH
31	17E29	17103107031	SUMIT KUMAR
32	17E44	17103107032	PRIYA KUMARI
33	17E32	17103107033	NELSHAN RANI
34	17E47	17103107034	VIKASH KUMAR
35	17E51	17103107035	ROHIT KUMAR
36	17E31	17103107036	VANISHA SHARMA
37	17E58	17103107037	MANISH KUMAR
38	17E61	17103107038	SWETA KUMARI
39	17E38	17103107039	ABHISHEK RAJ
40	17E33	17103107040	SANDEEP KUMAR SINHA
41	17E36	17103107041	ANAMIKA BHARTI
42	17E41	17103107042	RAVISHANKAR KUMAR
43	17E53	17103107043	MITHUN KUMAR
44	17E63	17103107044	NAVNEET NAYAN
45	17E28	17103107045	KUMAR ARYAN
46	17E64	17103107046	AMIT KUMAR
47	17E37	17103107047	TAMANNA CHOUDHARY
48	17E56	17103107048	ASHWINI KUMAR
49	17E39	17103107049	PRAVEEN KUMAR SAFI
50	17E35	17103107050	NAVIN PUSHKAR
51	17E52	17103107051	PREM BHARTI
52	17E59	17103107052	SANTOSH KUMAR RAM
53	17E40	17103107053	ANAMIKA KAUSHIK
54	17E43	17103107054	BUNTY KUMAR PASWAN
55	17E50	17103107055	AMAN RAJ
56	17E15	17103107056	RAJ KAMAL
57	17E45	17103107057	RAMBABU BAITHA
58	17E62	17103107058	RAJSHEKHAR KUMAR GOKUL
59	17E57	17103107059	RAHAT ARAFAT
60	17E54	17103107060	SUSHIL KUMAR

Lecture Plan:

Lecture Number	Topics	Text Book / Reference Book / Other reading material
1	Different parts in modern DC machine	T1 ,T2
2	Over view on DC machines	T1 ,T2
3	E.M.F equation	T1 ,T2
4	Armature windings – lap type	T1 ,T2
5	Armature windings –wave type	T1 ,T2
6	Armature reaction –cross magnetizing	T1 ,T2
7	Armature reaction –de-magnetizing	T1 ,T2
8	Commutation process	T1 ,T2
9	Open circuit characteristics	T1 ,T2
10	Critical field resistance-critical speed	T1 ,T2
11	Principle of operation DC motor	T1 ,T2
12	Back E.M.F - torque equation	T1 ,T2
13	Characteristics of shunt motor	T1 ,T2
14	Characteristics of series motor	T1 ,T2
15	Characteristics of compound motor	T1 ,T2
16	Armature reaction	T1 ,T2
17	Speed control by armature voltage control	T1 ,T2
18	Speed control by armature field flux control	T1 ,T2
19	Testing of DC machines	T1
20	Brake test on DC machine	T1
21	Swinburne's method	T1
22	Problems on Swinburne's and brake tests	T1
23	Principle of regenerative or Hopkinson's method	T1
24	Basic Principle, Types and Construction of Single Phase Transformer	T1
25	EMF equation, Equivalent Circuits	T1
26	Phasor Diagram, Losses and efficiency Testing	T1
27	Voltage Regulation, per unit system	T1

28	Losses and Efficiency	T1
29	Parallel Operation of Single Phase Transformer	T1
30	Auto transformer	T1
31	Parallel Operation of three Phase Transformer	T1
32	Cooling of transformer	T1
33	Construction, Types and Principle of three Phase Induction Motors	T1
34	Production of rotating field, slip	T1
35	Equivalent Circuit and Phasor Diagram	T1
36	Mechanical Power Developed, Maximum torque	T2
37	Torque slip characterstics	T2
38	Losses and efficiency	T2
39	Starting methods	T2
40	Testing methods	T1
41	speed control of Induction Motor	T1

Assignments:

Assignment I

1. Distinguish between self-excited and separately excited DC generators. How self-excited generators are classified? Give their circuit diagrams.
2. a) Explain why external characteristics of a DC shunt generator is more drooping than that of a separately excited generator. Discuss their applications.
   b) What is a critical field resistance of a DC shunt generator? Explain
3. .A d.c. motor connected to a 460-V supply has an armature resistance of 0.15 Ω. Calculate
   (a) The value of back e.m.f. when the armature current is 120 A.
   (b) The value of armature current when the back e.m.f. is 447.4 V.

Assignment II

1. A 4-pole d.c. motor takes an armature current of 150 A at 440 V. If its armature circuit has a resistance of 0.15 Ω, what will be the value of back e.m.f. at this load ?

2. A 4-pole, d.c. shunt motor has a wave-wound armature with 65 slots each containing 6 conductors. The flux per pole is 20 mWb and the armature has a resistance of 0.15 Ω. Calculate the motor speed when the machine is operating from a 250-V supply and taking a current of 60

3. Explain different types of losses occurred in DC motors.

Assignment III

1. a) Derive the emf equation of transformer
   b. Define efficiency and derive the condition for maximum efficiency of transformer

2. Draw the phasor diagram of transformer

3. Explain the operation of induction motor.

Assignment IV

1. Discuss, in brief, the constructional details of a DC machine.
2. a) Derive the e.m.f equation of a DC generator.
   b) An 8-pole generator has 500 armature conductors and has a useful flux per pole of 0.5 Wb. What will be the e.m.f generated if it is lap connected and runs at 600 rpm.

3. a) Describe in detail about the methods of speed control of for D.C motors?

b) A 230V D.C shunt motor runs at 800 r.p.m and take an armature current of 55A. Find the resistance to be added to the field circuit to increase speed to 1000 r.p.m at an armature current of 80A. Assume the flux is proportional to field current. Armature resistance is 0.25ohm and the field winding resistance is 215 ohms?