



Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology
 Second Year Bachelor of Engineering (EE) – Semester III
 With effect from: Academic Year 2018-19

| | |
|----------------------|-------------------------------------|
| EE303-N | D.C machines and Transformer |
| Pre-requisite | |

Teaching Scheme (Credits and Hours)

| Teaching scheme | | | | Total Credit | Evaluation Scheme | | | | | Total |
|-----------------|-----|-----|-------|-----------------|-------------------|-------|-------------|--------------|-----------------|-------|
| L | T | P | Total | | Theory | | IE Marks | CIA Marks | Pract. Marks | |
| Hrs | Hrs | Hrs | Hrs | | Hrs | Marks | | | | |
| 04 | 00 | 02 | 06 | 05 | 03 | 70 | 30 | 20 | 30 | 150 |

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. To Realization concept of magnetic circuits.
2. To Realization concept of dc machines.
3. Analyses the differences in operation of different dc machine configurations.
4. Analyses single phase and three phase transformers circuits.

Outline of the Course:

| Sr. No | Title of the Unit | Minimum Hours |
|-----------|--------------------------------------|------------------|
| 1 | DC machines | 15 |
| 2 | DC machine - motoring and generation | 15 |
| 3 | Single Phase Transformer: | 15 |
| 4 | Three Phase Transformer: | 15 |
| | Total | 60 |

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90



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| Sr. No | Title | Lecture Hours | Weightage (%) |
|--------|--|---------------|---------------|
| 1 | <p>DC machines Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.</p> | 15 | 25% |
| 2 | <p>DC machine - motoring and generation Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.</p> | 15 | 25% |
| 3 | <p>Single Phase Transformer: Construction and principle, Types & Classification, operation at no load and on load, vector diagrams, equivalent circuit, losses, efficiency and regulation, determination of regulation and efficiency by direct load test and indirect test methods, Sumpner's test, parallel operation, auto transformer, condition for maximum efficiency, all day efficiency.</p> | 15 | 25% |
| 4 | <p>Three Phase Transformer: Construction and principle ,Star/star, Star/delta, Delta/delta, Delta/Star, delta/zigzag, terminal marking, Nomenclature, Vector diagram, Phase groups, Parallel operation of 3-phase Transformer, Scott connection, V-Vconnections, tertiary winding, - voltage regulation off load and on load tap changers, Cooling of transformers</p> | 15 | 25% |

INSTRUCTIONAL METHOD AND PEDAGOGY:



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- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weight age should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

LEARNING OUTCOME:

- The student can be acquired the basic knowledge of electric circuits, electrical fundamentals, thus being prepared to pursue any area of engineering spectrum in depth as desired.
- The students will be able to effectively employ electrical systems and lead the exploration of new applications and techniques for their use.

Text / References Book:

1. Electrical Machines. By Nagarath &Kothari, TMH Publications
2. Electrical Technology Vol II. B. L. Theraja, S .Chand Publications
3. Performance and Design of A.C. machines by M. G. Say
4. Electrical Machines by P S Bhimbra
5. Electrical Machines by J. B. Gupta, Kataria Pub
6. Electrical Machine Design by A.K.Shawhney, Dhanpatrai& Sons.

List of experiments:



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| Sr. No. | Name of experiment |
|---------|--|
| 1. | To obtain magnetization characteristic of D.C. generator |
| 2. | To Obtain internal and External characteristics of a D.C. Shunt generator. |
| 3. | To Obtain internal and External characteristics of a D.C. Series generator. |
| 4. | To Obtain internal and External characteristics of a D.C. Compound generator. |
| 5. | To perform the speed control of D.C. Shunt motor by (a) Armature control method (b) Field control method |
| 6. | To perform open circuit & short circuit test on 1- ϕ transformer and obtain efficiency and regulation. |
| 7. | To perform load test on 1- ϕ transformer and obtain efficiency and regulation. |
| 8. | To perform parallel operation on transformers. |
| 9. | Three phase transformer connections. |
| 10 | To determine the efficiency and regulation of two identical single phase transformers by Sumpner's test (Back to back test). |
| 11 | To obtain two phase supply from three phase supply using Scott connection. |
| 12 | To operate two single phase transformers in open delta and supply three phase load through them and compare closed delta and open delta connections. |