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Course Outlines

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Hello Crispus

See the outlines & reference texts below. Try download the relevant books in PDF and share

Regards

Gachanja Muigai

EENG 242: ELECTRICAL MACHINES II**Prerequisites:** EENG 257 Electrical Machines I**Course purpose**

This course introduces learners to the operation of electrical machines in terms of controlling their speeds, their torque and power. It also gives a comprehensive study of three phase transformers and synchronous motors.

Expected learning outcomes

By the end of the course, the learner is expected to;

Describe the production of rotating fields, synchronous motors and operation of generators

Explain the three phase transformers and their operations

Explain the voltage regulations by electrical machines and torque speed characteristics

Describe how the speed of a machine is control.

Course content

Transformers: Equivalent Circuit, per unit system of measurement, voltage regulation and efficiency, three phase transformers, types of connections, testing, parallel operation. Synchronous Generators: Equivalent circuit and operations, Characteristics of Salient and Non-Salient poles, model parameters, Single and parallel operation, ratings. Synchronous Motors: Basic Principle, Equivalent Circuit, steady state operation: Torque speed characteristics, power factor correction, starting of synchronous motors, ratings, speed control. Induction Motors: Production of rotating field and torque, Construction, Synchronous speed, Slip and its effect on rotor frequency and voltage. Equivalent circuit. Power and torque. Losses, efficiency and power factor. torque-speed characteristic. Starting and speed control. Induction generator.

Teaching methodology and materials

Lecture, discussions, Laboratory experiments, Demonstrations and illustrations; Overhead projector, Power point, Flip charts, Hand-outs, Charts and Felt Pens.

Course assessment

Continuous Assessment 30%; Final Examinations 70%, Total 100%

References

Miller, R. and Miller, M.R.(2013). [Industrial Electricity and Motor Controls, Second Edition](#), McGraw-Hill Education. ISBN 0071818693.

Chapman, J.S.(2001). [Electric Machinery and Power System Fundamentals](#), · McGraw-Hill · ISBN 0071226206.

Bimbhra P.S. (2017). [Electric Machines 2 edition](#), Khanna Book Publishing Company (P) Limited. ISBN 9386173298.

EENG 445: ELECTRICAL MOTORS II**Course purpose**

The course equips learners with skills and knowledge on electrical drives, their speed and breaking are control and the pole changing.

Expected learning outcomes

By the end of the course the learner should be able to;

Describe how the induction motor drives, self controlled synchronous motor drive and electric drives incorporating flywheel under shock loading conditions.

Discuss the speed control of dc and ac motors and wound field brushless excitation.

Explain the heating and power ratings of electrical motors.

Explain the principles of electric traction and their applications in traction motor

Course content

Concept of electrical drives: group, individual and multimotor drives, quadrantal diagram speed torque characteristics under four quadrant operation of d.c. and induction motors. Speed control of D.C. motors: Ward Leonard, Buck-boost, series-parallel control, rectifier and chopper fed drives, up based controllers for D.C. drives. Induction motor drives: Pole changing, frequency variation, stator voltage variation, rotor resistance variation, slip power recovery, variable voltage - variable frequency control, (VVVF).P.W.M., inverter, cycloconverter control, non-sinusoidal voltage operation, A.C. regulators closed loop regulators. Synchronous Motor Drives: Wound field brushless excitation, voltage source inverter drive. Constant v/f, E/f and field weakening control. Cycloconverter control, self controlled synchronous motor drive. Starting and Braking: soft starts, regenerative and dynamic braking. Transients and dynamics of electric motors under starting and braking conditions. Heating and Power Ratings: Service conditions of electric drives and selection of motor capacities. Operation of electric drives incorporating flywheel under shock loading conditions. Motor Controllers: PL, Stepper Motor, Tachogenerator, Industrial application. Principles of Electric Traction: Traction motor, Traction motor control, EMU, DMU.

Teaching methodology and materials

Lecture, discussions, Laboratory experiments, Demonstrations and illustrations; Overhead projector, Power point, Flip charts, Hand-outs, Charts and Felt Pens.

Course assessment

Continuous Assessment 30%; Final Examinations 70%, Total 100%

References

Miller, R. and Miller, R.M (2013). [Industrial Electricity and Motor Controls, Second Edition](#), McGraw-Hill Education · Paperback · 512 pages · ISBN 0071818693.

Jim Cox, J (1988). [Electric Motors](#), Special Interest Model Books ISBN 1854862464

Hughes, A. and Drury, B. (2013). [Electric Motors and Drives: Fundamentals, Types and Applications](#), Newnes, ISBN 0080983324.

Petruszella, F.D, (2009). Electric Motors and Control Systems, McGraw-Hill Education, ISBN 0073373818.