NIRMA UNIVERSITY
Institute of Technology
B. Tech. in Electrical Engineering
Semester – V

L	T	P	C
3	0	2	4

Course Code	**2EE501**
Course Title	**Rotating AC Machines**

Course Outcomes (COs):

At the end of the course, students will be able to-

1. illustrate constructional features and operating principle of induction machine and synchronous machine
2. analyze characteristics of induction machine and synchronous machine for different operating conditions
3. test induction machine & synchronous machine and calculate its performance parameters
4. analyze and select machine for specific application

Syllabus: **Teaching Hours: 45**

Unit-1: Polyphase Induction Machines **16**

Rotating magnetic field, motor construction, motor specifications, types of motors, principle of operation, basic equations, vector diagram, equivalent circuit, torque and power equations, torque/slip characteristics, performance calculations, circle diagram, manual and automatic starting methods, speed control – conventional and v/f control, crawling and cogging, applications of induction motor, Construction, operation and various classes of energy efficient induction motor, Construction, operating principle and applications of induction generator

Unit-2: Single-phase AC Motors **05**

Types, double field revolving theory, equivalent circuit, determination of motor parameters, methods of starting, applications, single-phase ac series motor, universal and repulsion motors

Unit-3: Alternator **15**

Principle of operation, constructional features and types, emf equation, distributed ac windings, distribution and coil span factors, effect of harmonics on emf and its elimination, armature reaction in cylindrical and salient pole machines, two reaction theory, equivalent circuit of cylindrical and salient pole machines, voltage equation, output equations, vector diagrams, voltage regulation by synchronous impedance, MMF and Zero Power Factor (ZPF) method, Short Circuit Ratio (SCR), concept of reactive power control through excitation system, condition for maximum power, synchronizing power and torque, synchronizing conditions and methods, operational aspects of alternators on infinite bus, concept of AVR, governing system in relation with power system

Unit-4: Synchronous Motor **09**

Principle of reversibility, voltage equation, phasor diagram, torque and power equations, steady state operating characteristic, 'V' and inverted 'V' curves, starting, hunting, damper windings and its effect, synchronous condenser, working principle of auto synchronous motor

Self-Study:
The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:
This shall consist of at least 10 laboratory experiments / simulations based on the syllabus.

Suggested Readings:

1. P. S. Bhimbra, Electrical Machinery, Khanna Publishers.
2. I. J. Nagrath and D. P. Kothari, Electrical Machines, Tata McGraw-Hill.
3. M. G. Say, Performance and Design of Alternating Current Machines, CBS Publishers.
4. B. L. Theraja, Electrical Technology, Vol. – II, S. Chand & Co.
5. E. Fitzgerald, Electric Machinery, Tata McGraw-Hill.
6. Refer NEMA, IEC and IS Standards.
7. Recent literature in renowned journals.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2020-21 and onwards