UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2022/2023
MASTER'S DEGREE (MSC)	ELECTRICAL ENGINEERING
SUBJECT	DESIGN OF ELECTRICAL MACHINES
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50363-Ingegneria elettrica
CODE	22273
SCIENTIFIC SECTOR(S)	ING-IND/32
HEAD PROFESSOR(S)	DI TOMMASO ANTONINO OSCAR Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**DI TOMMASO ANTONINO OSCAR** Monday 15:00 16:00 Laboratorio "EDALab" (all'interno della sala macchine) - Edificio nr. 9, ex DEIM. E' gradito un contatto (telefono o e-mail) almeno un giorno prima. Tuesday 15:00 16:00 Laboratorio "EDALab" (all'interno della sala macchine) - Edificio nr. 9, ex DEIM. E' gradito un contatto (telefono o e-mail) almeno un giorno prima. Wednesday 15:00 16:00 Laboratorio "EDALab" (all'interno della sala macchine) - Edificio nr. 9, ex DEIM. E' gradito un contatto (telefono o e-mail) almeno un giorno prima. Thursday 15:00 16:00 Laboratorio "EDALab" (all'interno della sala macchine) - Edificio nr. 9, ex DEIM. E' gradito un contatto (telefono o e-mail) almeno un giorno prima. Friday 15:00 16:00 Laboratorio "EDALab" (all'interno della sala macchine) - Edificio nr. 9, ex DEIM. E' gradito un contatto (telefono o e-mail) almeno un giorno prima.

DOCENTE: Prof. ANTONINO OSCAR DI TOMMASO

PREREQUISITES	Basic skills of mathematics, physics and electrotechnics are needed. In addition, the student must own adequate knowledge and application skills in electrical machines, electric and magnetic fields, magnetic materials, conductors and insulators.
LEARNING OUTCOMES	- Knowledge and understanding skills At the end of the class the student will have acquired the knowledge of the working principles and construction of electrical machines, of the mathematical models, of the calculation and design issues related to the main electrical machines. Particularly, the student will be able to choice materials and to design, basing on specific requirements, a transformer, a synchronous, an asynchronous or a direct current machine. The student will be aware of some advanced topics in the field of construction of static, rotating and linear electrical machines. - Ability in applying knowledge and understanding The student will be able to use the mathematical, physical and engineering instruments for the investigation, the design, sizing and the realization of electrical machines or parts of them. He will be able to pose or hold reasonings dealing with the study, the application, the design and the setting up of electrical machines. - Autonomy of judgement The student will be able to know and interpret the main electromechanical data and parameters of electrical machines; he will be able to collect the data in order to carry out the correct sizing, to interpret their operation and to evaluate their correct operation during service. He will be able even to acquire a sufficient general knowledge of many aspects dealing with the electromechanical constructions. - Communication skills The student will acquire skills to communicate information and ideas and to express issues related to the course topics. In addition, he will be not only able to hold discussions on topics concerning the electrical machines design, but also to highlight problems on the choice and on the adequate use of electrical machines within power systems, proposing possible solutions. - Learning skills The student will gain learning skills on further comprehension of electrical machines, their design and their operating principles. He will acquire the ability to synthesize information and to judge the interactions between different topics and between the fundamental branches of knowledge regarding electrical engineering. These abilities will allow the student to continue the study with higher autonomy and discernment.
ASSESSMENT METHODS	The assessment is performed by means of an oral exam, with the presentation and discussion of the numeric exercises carried out during the course (30 minutes of average duration) which consists of: • at least 3 essay questions chosen from the whole course program; • the discussion of the reports on the tests carried out during the course. During the exam it will be evaluated: • knowledge and understanding of the course program; • ability to apply the knowledge for problem solving within the course or related contexts; • concepts reinterpretation, critical aptitudes and connection skills in disciplinary or interdisciplinary contexts; • correct use of language and writing, clearness, fluency. Marks are out of 30 and the minimum mark for passing the test is 18/30. The mark is awarded considering to what extent the student has achieved the learning outcomes. The following scheme can be assumed for reference: 28-30 with distinction Full contents mastery; no errors; self-corrections/integrations of inaccuracies/ omissions; correct and rigorous approach to problems; correct, complete and effective solutions; some originality evidence; effective concepts reworking, coherent and autonomous approaches and judgments, disciplinary/ interdisciplinary connections; very clear presentation, structured arguments, correct use of language. 24-27 Good knowledge and understanding of course contents; few minor errors, partially fostered self-corrections or integrations; good approach to problems, essentially correct solutions; good coherence in linking concepts and

	approaching disciplinary or related subjects; good presentation, adequate use of language. 18-23 Sufficient knowledge of contents; feasible approach to problems although with limited autonomy, acceptable solutions; errors or omissions not serious; sufficient concepts links within disciplinary contexts, although tentative and guided; basic presentation and use of language. Below 18 Learning outcomes are not sufficiently met.
EDUCATIONAL OBJECTIVES	Goal of this course is to enhance the knowledges relative to electrical machines operation, both rotating and linear, in connection with the performances required within electrical power systems, and to give general criteria for their design, based on the optimal exploitation of the materials employed in their construction. The achievement of such goal requires the development of the following student's capabilities: - knowledge of the application context and the design constraints of electrical machines; - knowledge of functional design principles and technical specifications of electrical machines; - knowledge of different technological options according to required performances; - knowledge of the dynamic behaviour of electrical machines and of the estimation of the limiting conditions of their exploitation within the application context.
TEACHING METHODS	Lectures and numeric exercises.
SUGGESTED BIBLIOGRAPHY	Educational material used during the course will be placed at student's disposal by means of the website "portale studenti". Il materiale didattico impiegato durante le lezioni ed esercitazioni sara' reso disponibile on-line agli studenti tramite il "portale studenti". For detailed study the following text is recomended: Per approfondimenti si raccomanda il testo (in lingua inglese): - Juha Pyrhonen, Tapani Jokinen, Valeria Hrabovcova: "Design of Rotating Electrical Machines", John Wiley & Sons Ltd, February 2009, 538 pages, ISBN: 978-0-470-74008-8.

SYLLABUS

Hrs	Frontal teaching
6	1. Main laws and methods for electrical machines design.
10	2. Windings of electrical machines.
6	3. Design of magnetic circuits.
4	4. Determination of leakage flux components.
2	5. Calculation of stator and rotor winding resistances.
3	6. Dimensions of an electrical machine and of its main parts.
6	7. Design procedures and properties of electrical machines.
2	8. Insulation of electrical machines.
1	9. Hints on heat transmission in electrical machines. Cooling systems.

Hrs	Practice
4	3. Design of magnetic circuits.
2	4. Determination of leakage flux components.
2	5. Calculation of stator and rotor winding resistances.
1	6. Dimensions of an electrical machine and of its main parts.
5	7. Design procedures and properties of electrical machines.