SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Electrical and Electronics Engineering	LP: **EE18003**
B.E : Electrical & Electronics Engineering Regulation: 2018A	Rev. No: 00
Sub. Code / Sub. Name : **EE18003- Design of Electrical Apparatus**	
Unit : **I. Introduction**	Date: 11-07-2023

Unit Syllabus: Major considerations in Electrical Machine Design- Electrical Engineering Materials – Design of Magnetic circuits–Magnetizing current–Calculation of MMF–Rating of machines – Standard specifications.

Objective: To determine rating of various types of electrical machines

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction,Principles of design	1,2	PPT
2	Major considerations, Design factors in Electrical Machine Design	1,2	PPT
3	Electrical Engineering Materials	1,2	PPT
4	Electrical and Magnetic loadings	1,2	PPT
5	Fundamentals of magnetic circuit, Calculations of MMF for air gap-Carter's coefficients, Gap contraction factors for slots and ducts	1,2	PPT
6	Net length of Iron, MMF for Teeth (Graphical, Simpson's rule and $Bt_{1/3}$ Method)	1,2	PPT
7	Problems in MMF calculations for Air gap	1,2	BB/PPT
8	Rating of machines Selection of motor power ratings,Motor Ratings based on duty types	1,2	PPT
9	Standard specifications	1,2	PPT

Content beyond syllabus covered (if any):

* Session duration: 50 minutes

Sub. Code / Sub. Name: **EE18003- Design of Electrical Apparatus**

Unit : **II. DC MACHINES**

Unit Syllabus: Output Equations – Main Dimensions – Choice of Specific Electric and Magnetic Loading –Magnetic Circuits Calculations - Carter's Coefficient - Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes

Objective: To design armature and field systems for D.C. machines.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Introduction to DC machines,Output Equations of DC Machines	1,2	PPT
11	Main Dimensions- Separation of D and L for DC Machines, Problems in output equations- Separation of D and L	1,2	PPT
12	Problems in output equations- Separation of D and L	1,2	BB/PPT
13	Calculations of Real and Apparent flux densities	1,2	PPT
14	Problems in Real and Apparent flux density calculations.	1,2	BB/PPT
15	Selection of number of poles	1,2	PPT
16	Design of Armature – Limiting value of Core Length, Diameter and Pole Proportions	1,2	BB/PPT
17	Design of commutator-Diameter, Length of the commutator, Dimensions of Brushes	1,2	BB/PPT
18	Problems in selection of no of poles, commutator and brush design	1,2	BB/PPT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

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COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: **EE18003- Design of Electrical Apparatus**

Unit : **III. TRANSFORMERS**

Unit Syllabus: Output Equations – Main dimensions - KVA output for single and three phase transformers –Window space factor – Design of core and winding – Overall dimensions – Operating characteristics – No load current – Temperature rise in transformers – Design of tank -Methods of cooling of Transformers.

Objective: To design core, yoke, windings and cooling systems of transformers.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Output Equations (KVA) of single and three phase transformers	1,2	PPT
20	Problems in output equations of single and three phase transformers.	1,2	PPT
21	Window space factor, Design of core-Net core area, grass core area for Square and Stepped cores.	1,2	BB/PPT
22	Problems in design of Transformer Core & winding dimensions	1,2	PPT
23	Design of Yoke problems, Overall dimensions of single and three phase transformers	1,2	BB/PPT
24	Estimation of operating characteristics- No load current, Temperature rise	1,2	BB/PPT
25	Cooling methods of transformer	1,2	BB/PPT
26	Design of tanks with cooling tubes	1,2	BB/PPT
27	Problems based on Design of tanks with cooling tubes	1,2	PPT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: **EE18003- Design of Electrical Apparatus**

Unit : **IV. INDUCTION MOTORS**

Unit Syllabus: Output equation of Induction motor – Main dimensions – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings –Design of wound rotor – Magnetic leakage calculations – Leakage reactance of poly phase machines- Magnetizing current - Short circuit current – Operating characteristics- Losses and Efficiency

Objective: To design stator and rotor of induction machines.

Session No *	Topics to be covered	Ref	Teaching Aids
28	Output equation of Induction motor, Main dimensions (separation of D and L for various design features), Net iron length	1,2	PPT
29	Problems in output equation of three phase induction motor.	1,2	BB/PPT
30	No of stator slots, Stator turns/phase, Stator conductor area, conductor/stator slot, Area of stator slots, Length of mean turn,	1,2	PPT
31	Problems in Main dimensions and stator design	1,2	BB/PPT
32	Calculations of length of air gap, rules for selecting rotor slots, Design of rotor bars & slots	1,2	BB/PPT
33	Design of End rings, Problems based on squirrel cage rotor design	1,2	PPT
34	Problems based on squirrel cage rotor design	1,2	BB/PPT
35	Design of wound rotor, problems based on slip ring rotor design	1,2	BB/PPT
36	Losses and efficiency, Dispersion co-efficient-Problems	1,2	BB/PPT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code : Sub. Name: **EE18003- Design of Electrical Apparatus**

Unit : **V. SYNCHRONOUS MACHINES**

Unit Syllabus: Output equations –Output equations – choice of Electrical and Magnetic Loading – Design of salient pole machines –Short circuit ratio – shape of pole face – Armature design – Armature parameters –Estimation of air gap length – Design of rotor – Design of damper winding – Determination of full load field mmf –Design of field winding – Design of turbo alternators – Rotor design.

Objective: To design stator and rotor of synchronous machines.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Output equations and limiting values of 'Bav' and 'ac'. Main dimensions. Run away speed	1,2	PPT
38	Design of salient pole machines. Problems in output equation	1,2	BB/PPT
39	Short circuit ratio. Length of air gap. Shape of pole face. Problem in Main dimensions	1,2	BB/PPT
40	Armature design-No of armature slots. coil span. Turns/phase. Area of cross section of armature conductors. Length of mean turn. Depth of the armature core and outer diameter of the stator	1,2	PPT
41	Estimation of Air gap length.Problems in Armature design and estimation of air gap length	1,2	PPT
42	Design of Rotor. Design of Damper winding.Problems in Rotor and Damper winding design	1,2	BB/PPT
43	Determination of full load field MMF. Design of Field winding	1,2	PPT
44	Design of turbo alternators- Main Dimensions. Length of air gap and stator design.	1,2	BB/PPT
45	Problems in Design of Turbo Alternator rotor.	1,2	PPT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

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TEXT BOOKS

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 2016.
2. M.V.Deshpande "Design and Testing of Electrical Machine Design" Wheeler Publications, 2010.

REFERENCES

1. A.Shanmuga Sundaram, G.Gangadharan, R.Palani 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint, 2007.
2. R.K.Agarwal " Principles of Electrical Machine Design" S K Kataria and Sons; Reprint 2012 edition (2012).
3. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 2006

	Prepared by	Approved by
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Date	11-07-2023	11-07-2023
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD