**Maulana Abul Kalam Azad University of Technology, West Bengal**
*(Formerly West Bengal University of Technology)*
**Syllabus for B. Tech in Electrical Engineering**
(Applicable from the academic session 2018-2019)

| Name of the course | ELECTRICAL MACHINE DESIGN |
|---|---|
| **Course Code: PE-EE-601C** | **Semester: 6th** |
| **Duration: 6 months** | **Maximum Marks: 100** |
| | |
| **Teaching Scheme** | **Examination Scheme** |
| Theory: 3 hrs/week | Mid Semester Exam: 15 Marks |
| Tutorial: 0 hr/week | Assignment & Quiz: 10 Marks |
| Credit Points: 3 | Attendance: 05 Marks |
| | End Semester Exam: 70 Marks |
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| **Objective:** | |
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| 1. | To understand the baisc principle of design of Electric machines. |
| 2. | To understand basics of design of Transformer, Induction machine and Synchronous machines. |
| 3. | To understand different factors that influence design of Electric machines. |
| 4. | To undertand the need and use software tools for design of Electric machines |
| 5. | To solve numerical problems on the topics studied |
| **Pre-Requisite** | |
| 1. | Electric Machine-I (PC-EE-401) |
| 2. | Electric Machine-II (PC-EE-501) |

| Unit | Content | Hrs | Marks |
|---|---|---|---|
| 1 | **Introduction:** Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings - Thermal considerations - Heat flow – Temperature rise and Insulating Materials - Rating of machines – Standard specifications. | 04 | |
| 2 | **Transformer:** 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. | 10 | |
| 3 | **Induction motors:** Output equation of Induction motor – Main dimensions – Choice of Average flux density – 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 polyphase machines- Magnetizing current - Short circuit current – Operating characteristics- Losses and Efficiency. | 10 | |
| 4 | **Synchronous machines:** 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. | 10 | |
| | **Computer aided Design (CAD):** Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid | 05 | |

| | methods, design optimization methods, variables, constraints and objective function, problem formulation. | | |
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**Text book:**
1. A Course in Electrical Machine Design, A.K. Sawhney, Dhanpat rai and sons.
2. Electrical machine design, V. rajini, V.S. Nagarajan, Pearson India education services Pvt. Ltd.
3. Computer Aided Design of Electrical Machine, K. M. V. Murthy, B.S. Publications.

**Reference books**

1. Design and Testing of Electrical Machines, M.V.Deshpande, PHI
2. Principles of Electrical Machine Design, 3rd Edition, S.K. sen, Oxf-Ibh
3. Computer Aided Design of Electrical Equipment, M. Ramamoorthy, East-West Press.

**Course Outcome:**

After completion of this course, the learners will be able to
1. specify the rating of electrical machines with standard specifications.
2. explain the principles of electrical machine design and carry out basic design of an ac machine
3. determine the various factors which influence the design of electrical, magnetic and thermal loading of electrical machines
4. explain the construction and performance characteristics of electrical machines.
5. use software tools to do design calculations.

**Special Remarks (if any)**

The above-mentioned outcomes are not limited. Institute may redefine outcomes based their program educational objective.