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Synopsis:

This course dealt with industrial aerodynamics where contents of learning include the physics of the air, wind energy, vehicle and building aerodynamics, and flow induce vibration.

Learning Outcomes: At the end of the course, students will be able to:

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| --- | --- | --- | --- |
| **No.** | **Course Learning Outcome** | **Programme Learning Outcome(s) Addressed** | **Assessment Methods** |
| 1.  2.  3.  4.  5.  6. | To attain knowledge on fundamental theories of industrial aerodynamics  To apply the industrial aerodynamic theories.  To analyze, apply and solve problems through all relevant analytical and approaches of industrial aerodynamics  To express and communicate knowledge and ideas effectively  Ability to work in a team  To continue life-long learning and manage information effectively. | PO1 (P1,P2,C1,C2,A1,A2)  PO2 (P1,P2,P3,P4, C1,C2,C3,C4,C5,A1,A2,A3)  PO3 (P1,P2,C1,C2,C3,C4,A1,A2)  PO4 (P1,P2,C1,C2,C3,C4,C5,A1,A2)  PO5 (P1,P2,C1,C2,A1,A2,A3)  PO7 (P1,P2,C1,C2,C3,C4,C5,A1,A2) | T, FE  P, T, FE  P, T, FE  P, Pr  P  P  (T-Test, P-Project, Pr-Presentation, FE-Final Exam) |
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Student Learning Time

|  |  |
| --- | --- |
| Teaching and Learning Activities | Student Learning Times (Hours) |
| 1. Direct Learning    * Lecture 2. Independent Study    * Independent Study    * Revision    * Preparation for Project    * Preparation for Assessment 3. Formal Assessment    * Continuous Assessment (1 tests)    * Individual Project Presentation    * Group Project Presentation    * Final Examination | **42**  42  **71**  10  15  28  18  **7**  2  1  1  3 |
| **Total** | 120 |

Weekly Schedule:

**ATMOSPHERE:** Week 1: Physics of the air, Types of winds, Causes of variation of winds

Week 2: Atmospheric boundary layer, Effect of terrain on gradient height

Week 3: Structure of turbulent flows

**WIND ENERGY:**  Week 4: Horizontal axis and vertical axis machines

Week 5: Power coefficient, Betz coefficient by momentum theory.

**VEHICLE AERO** Week 6: Power requirements and drag coefficients of automobiles

Week7. Introduction to passenger and race car aerodynamics

Week 8: SEMESTER BREAK

Week 9: Aerodynamics of trains and Hovercraft

**BUILDING AERO** Week 10: 10. Pressure distribution on low rise buildings, wind forces on buildings

Week 11. Environmental winds in city blocks, Special problems of tall buildings, Building codes,

Week 12. Building ventilation and architectural aerodynamics.

**FLOW INDUCED VIBRATIONS Week** 13. Effects of Reynolds number on wake formation of bluff shapes Week 14: Vortex induced vibrations

Week 15: Galloping and stall flutter

Week 16-18: Examination Weeks

Teaching Methodology:

The knowledge and skills are delivered to students through lecture sessions, problem-based learning, group project and discussions.

References:

References used for this subject are as follows:

1. M.Sovran (Ed), “Aerodynamics drag mechanisms of bluff bodies and road vehicles”, Plenum press, New York, 1978.

2. P. Sachs, “Winds forces in engineering”, Pergamon Press, 1978.

3. R.D. Blevins, “Flow induced vibrations”, Van Nostrand, 1990.

4. N.G. Calvent, “Wind Power Principles”, Charles Griffin & Co., London, 1979

5. Hucho W H, Ed., “Aerodynamics of Road Vehicles, from Fluid Mechanics to Vehicle Engineering”, 4th Ed. SAE International, Warrendale, PA. 1998

Assessment:

Assessment will be done through the following schema. A student must obtain at least 60% marks to pass this subject. **Attendants are compulsory**.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Assessment** | **Number** | **% each** | **% total** |
| 1 | Tests | 1 | 20% | 20% |
| 2 | Individual Project | 1 | 20% | 20% |
| 3 | Group Project | 1 | 20% | 20% |
| 4 | Final Examination | 1 | 40% | 40% |
|  | **Overall Total** |  |  | **100** |

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