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| Discipline : **MECHANICAL ENGG** | Semester : **4TH** | Name of the Teaching Faculty: **SANTOSH KUMAR JENA** |
| Subject: **FLUID MECHANICS AND HYDRAULIC MACHINES** | No. of days/per week class allotted:**05** | Semester From date : **02.01.2019** To Date:**15.04.2019**  No. of Weeks: **15** |
| Week | Class Day | Theory / Practical Topics |
| 1ST | 1ST | **1.0** Introduction about fluid mechanics and hydraulic machines |
|  | 2ND | Definitions and Units of Density, Specific weight |
|  | 3RD | Definitions and Units of specific gravity, specific volume |
|  | 4TH | Definitions and Units of Dynamic viscosity, kinematic viscosity |
|  | 5TH | Definitions and Units of surface tension , Capillary phenomenon |
| 2ND | 1ST | **2.0** Definitions and units of fluid pressure, pressure intensity and pressure head |
|  | 2ND | Concept of atmospheric pressure, gauge pressure |
|  | 3RD | Concept of vacuum pressure and absolute pressure |
|  | 4TH | Describe about Pressure measuring instruments |
|  | 5TH | Describe about Manometers: Simple and differential |
| 3RD | 1ST | Describe about Bourden tube pressure gauge |
|  | 2ND | Simple problems of Simple and differential manometer |
|  | 3RD | Simple problems of Bourden tube pressure gauge |
|  | 4TH | **3.0** Definition of hydrostatic pressure |
|  | 5TH | Discuss about Total pressure and centre of pressure on immersed bodies |
| 4TH | 1ST | Numerical solved of Total pressure and centre of pressure on immersed bodies |
|  | 2ND | Discuss about Archimedis’ principle |
|  | 3RD | Discuss about concept of buoyancy |
|  | 4TH | Discuss about metacentre |
|  | 5TH | Discuss about metacentric height |
| 5TH | 1ST | Discuss about the Concept of floatation |
|  | 2ND | **4.0** Define fluid flow and Types of fluid flow |
|  | 3RD | Discuss about Continuity equation (Statement and proof for one dimensional flow) |
|  | 4TH | State & proof Bernoulli’s theorem |
|  | 5TH | Applications and limitations of Bernoulli’s theorem |
| 6TH | 1ST | Discuss about Venturi meter |
|  | 2ND | Simple numerical solved |
|  | 3RD | Discuss about pitot tube |
|  | 4TH | Simple numerical solved |
|  | 5TH | Definition of orifices, Orifice coefficients |
| 7TH | 1ST | Discuss Cc, Cv, Cd and relation among them |
|  | 2ND | **5.0** Definition of pipe |
|  | 3RD | Discuss Flow through pipe |
|  | 4TH | Define laws of fluid friction |
|  | 5TH | Head loss due to friction: Darcy’s formula |
| 8TH | 1ST | Continued |
|  | 2ND | Head loss due to friction: Chezy’s formula |
|  | 3RD | Continued |
|  | 4TH | Problem solved |
|  | 5TH | Define Hydraulic gradient |
| 9TH | 1ST | Define total gradient line |
|  | 2ND | **6.0** Define impact of jets |
|  | 3RD | Discuss about various types of impact of jets |
|  | 4TH | Discuss about Impact of jet on fixed and moving vertical flat plates |
|  | 5TH | Discuss about derivation of work done on series of vanes |
| 10TH | 1ST | Discuss about condition for maximum efficiency |
|  | 2ND | Discuss about Impact of jet on moving curved vanes |
|  | 3RD | Discuss about illustration using velocity triangles |
|  | 4TH | Discuss about derivation of work done, efficiency |
|  | 5TH | Problem solved |
| 11TH | 1ST | Problem solved |
|  | 2ND | **7.0** Discuss about turbine and power plant |
|  | 3RD | Layout and features of hydroelectric power plant |
|  | 4TH | Definition and classification of hydraulic turbines |
|  | 5TH | Construction and working principle of Impulse turbine (Pelton wheel) |
| 12TH | 1ST | Continued |
|  | 2ND | Velocity triangle of a single bucket, work done and efficiency in Pelton wheel (Numerical Problems) |
|  | 3RD | Problem solved |
|  | 4TH | Problem solved |
|  | 5TH | Construction and working principle of Reaction turbine (Francis turbine) |
| 13TH | 1ST | Velocity triangle, work done and efficiency (Numerical Problems) |
|  | 2ND | Problem solved |
|  | 3RD | Construction and working principle of Kaplan turbine |
|  | 4TH | **8.0**  Definition and classification of pumps |
|  | 5TH | Construction and working principles of Centrifugal Pumps |
| 14TH | 1ST | Discuss velocity diagram of a single impeller |
|  | 2ND | Work done and efficiency (Numerical Problems) of Centrifugal Pumps |
|  | 3RD | Problem solved |
|  | 4TH | Concept of multistage centrifugal pumps |
|  | 5TH | Discuss about Cavitation-Causes and its effect |
| 15TH | 1ST | Construction and working principle of single acting |
|  | 2ND | Construction and working principle of double acting reciprocating |
|  | 3RD | Continued |
|  | 4TH | Concept of slip and negative slip |
|  | 5TH | Previous year questions discussion |

**Learning Resources:**

**Text** Title of Book Author

**Books:**

Fluid Mechanics and Hydraulic Machines R K Bansal

Hydraulics, Fluid mechanics and Fluid machines S Ramamurthan

**Reference** Hydraulics and fluid mechanics including hydraulic machines Modi and Seth

Fluid Mechanics and Machinery C S P Ojha

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| Discipline : **MECHANICAL** **ENGG** | Semester : **4TH** | Name of the Teaching Faculty: **SANTOSH KUMAR JENA** |
| Subject: **FLUID MECHANICS AND HYDRAULIC MACHINES LAB** | No. of days/per week class allotted: **06** | Semester From date : **02.01.2019** To Date: **15.04.2019**  No. of Weeks: **15** |
| Week | Class Day | Theory / Practical Topics |
| 1ST | 1ST | **1.**Study of pressure measuring devices (manometer, Bourdon tube pressure gauge) |
|  | 2ND | Study of pressure measuring devices (manometer, Bourdon tube pressure gauge) Contd. |
| 2ND | 1ST | Study of pressure measuring devices (manometer, Bourdon tube pressure gauge)contd. |
|  | 2ND | Verification of Bernoulli’s theorem |
| 3RD | 1ST | Verification of Bernoulli’s theorem contd. |
|  | 2ND | Verification of Bernoulli’s theorem contd. |
| 4TH | 1ST | Determination of Cd from venturimeter |
|  | 2ND | Determination of Cd from venturimeter contd. |
| 5TH | 1ST | Determination of Cd from venturimeter contd. |
|  | 2ND | Determination of Cc, Cv, Cd from orifice meter |
| 6TH | 1ST | Determination of Cc, Cv, Cd from orifice meter contd. |
|  | 2ND | Determination of Cc, Cv, Cd from orifice meter contd. |
| 7TH | 1ST | Determine of Darcy’s coefficient from flow through pipe |
|  | 2ND | Determine of Darcy’s coefficient from flow through pipe contd. |
| 8TH | 1ST | Determine of Darcy’s coefficient from flow through pipe contd. |
|  | 2ND | Performance test in impulse turbine |
| 9TH | 1ST | Performance test in impulse turbine contd. |
|  | 2ND | Performance test in impulse turbine contd. |
| 10TH | 1ST | Study of dissected models of turbines and pumps |
|  | 2ND | Study of dissected models of turbines and pumps contd. |
| 11TH | 1ST | Study of dissected models of turbines and pumps contd. |
|  | 2ND | Performance test in centrifugal pump |
| 12TH | 1ST | Performance test in centrifugal pump contd. |
|  | 2ND | Performance test in centrifugal pump contd. |
| 13TH | 1ST | Performance test in reciprocating pump |
|  | 2ND | Performance test in reciprocating pump contd. |
| 14TH | 1ST | Performance test in reciprocating pump contd. |
|  | 2ND | Performance test in reaction turbine |
| 15TH | 1ST | Performance test in reaction turbine contd. |
|  | 2ND | Performance test in reaction turbine contd. |