Department of Production Engineering

Fr. Conceicao Rodrigues College of Engineering (CRCE)

Lesson plan

Subject:	**Fluid & Thermal Engineering**
Academic Year:	**2018-19**
Name of the Teacher:	**Mrs. Deepika Singh Singraur**
Class	**S. E. Production**
Credits	**04**

1. **Syllabus.**

Module	Contents	Hrs.
01	**Fluid Properties:** Concept of fluid and flow, continuum concept, Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton's Law of Viscosity, Dynamic Viscosity, Kinematics Viscosity, Surface Tension Capillarity, Compressibility, Vapour pressure. **Fluid Statics:** Pascal's law, Pressure at a point, Hydrostatic law, Total Pressure and Centre of pressure, Hydrostatic forces on a plane (Horizontal, Vertical, Inclined) surfaces, **Buoyancy and Flotation:** Archimedes' Principle, Buoyancy, Centre of Buoyancy, Metacenter, Metacentric height, Stability of floating and submerged bodies. (Only Theory on Buoyancy and Flotation)	10
02	**Fluid Kinematics:** Eulerian and Lagrangian description of fluid motion, Types of fluid flow, Types of flow lines, continuity equation in Cartesian co-ordinates, Velocity potential and stream function, **Fluid dynamics:** Euler's equation of motion along a stream line, Bernoulli's equation, Application of Bernoulli's equation to Venturi meter, Orifice meter and Pitot tube.(No derivation on rate of flow is required)	08
03	**Dynamics of Viscous Flow**: Introduction to Laminar and Turbulent flow, Flow of viscous fluid in circular Pipes - Hagen Poiseuille flow. **Flow Through Pipes:** Major and Minor losses in pipes, Pipes in series, Pipes in parallel and Equivalent pipe.	08
04	**Reciprocating Air Compressors**: Classification, Terminology, Work and power calculations with and without clearance for single and two stage compression, Volumetric efficiency and FAD, Intercooling and advantages of Multistage compression.	06
05	**Gas Turbines:** Classification, Application, open cycle and closed cycle gas turbine. Calculation of thermal efficiency. Methods for improvements of thermal efficiency of gas turbine plants (Numericals only on calculating thermal efficiency and work ratio).	06
06	**Heat Transfer:** Modes of heat transfer, Conduction: Fourier's Law of heat conduction thermal conductivity, heat transfer coefficient (convective and overall), 1D steady state heat conduction through composite wall and hollow cylinder. Convection: Free and Forced convection. Heat Exchangers: Classification, LMTD for parallel flow and Counter flow. (Numericals only on 1D heat conduction and LMTD of heat exchanger).	10

2. CO Statements.

Learner will be able to...

1. Illustrate the different properties of fluids along with the solution of related problems.
2. Solve problems on Bernoulli's equation with its application.
3. Determine energy losses due to friction and pipe fittings.
4. Apply thermodynamic and fluid mechanics principles to evaluate the performance of Compressors.
5. Apply thermodynamic and fluid mechanics principles to evaluate the performance of gas Turbines.
6. Apply heat transfer principles to solve problems related to composite wall and heat exchangers

3. CO-PO-PSO Mapping.

CO# / PO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEC402.1	3	3	-	-	-	-	-	-	-	-	-	-
PEC402.2	3	3	-	-	-	-	-	-	-	-	-	-
PEC402.3	3	3	-	-	-	-	-	-	-	-	-	-
PEC402.4	3	3	2	-	-	-	-	-	-	-	-	-
PEC402.5	3	2	-	-	-	-	-	-	-	-	-	-
PEC402.6	3	3	-									

CO# / PSO#	PSO1	PSO2
PEC402.1	-	-

PEC402.2	-	-
PEC402.3	-	-
PEC402.4	-	-
PEC402.5	-	-
PEC402.6	-	-

4. CO Assessment tools with target.

Co Statement #	Target for Assessment Tools		
	Unit Test	End Semester Exam	Course Exit Survey
PEC402.1	50%	40%	60%
PEC402.2	50%	40%	60%
PEC402.3	50%	40%	60%
PEC402.4	-	40%	60%
PEC402.5	-	40%	60%
PEC402.6	40%	40%	60%

5. Curriculum Gap/Content beyond syllabus (if any).

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6. Lecture/Lab/Mini Project/Assignment Plan.

Week No.	Topics	Module	Hours
Week1 (01/01/19 – 04/01/19)	**Concept of fluid and flow, continuum concept, Types of fluids, Mass Density, Specific Weight, Specific Gravity**	**1**	**2**
Week 2 (07/01/19 – 11/01/19)	**Newton's Law of Viscosity, Dynamic Viscosity, Kinematics Viscosity**	**1**	**2**

Week 3 (14/01/19 – 18/01/18)	**Surface Tension Capillarity, Compressibility, Vapour pressure.**	**1**	**1**
Week 4 (21/01/19 – 25/01/19)	**Pascal's law, Pressure at a point, Hydrostatic law**	**1**	**2**
Week 5 (28/01/19 – 01/02/19)	**Total Pressure and Centre of pressure, Hydrostatic forces on a plane (Horizontal, Vertical, Inclined) surfaces**	**1**	**2**
Week 6 (04/02/19 – 08/02/19)	**Unit Test 1 (Feb 4, 5 and 6) – FE, SE, TE.**		
Week 7 (11/02/19 – 15/02/19)	**Buoyancy and Flotation: Archimedes' Principle, Buoyancy, Centre of Buoyancy, Metacenter, Metacentric height, Stability of floating and submerged bodies.**	**1**	**2**
Week 8 (18/02/19 – 22/02/19)	**Fluid Kinematics: Eulerian and Lagrangian description of fluid motion, Types of fluid flow**	**2**	**1**
Week 9 (25/02/19 – 1/03/19)	**Types of flow lines, continuity equation in Cartesian co-ordinates, Velocity potential and stream function**	**2**	**2**
Week 10 (04/03/18 – 08/03/18)	**Fluid dynamics: Euler's equation of motion along a stream line, Bernoulli's equation,**	**2**	**2**
Week 11 (11/03/18 – 15/03/18)	**Application of Bernoulli's equation to Venturi meter, Orifice meter and Pitot tube.(No derivation on rate of flow is required)**	**2**	**2**
Week 12 (18/03/18 – 22/03/18)	**Dynamics of Viscous Flow: Introduction to Laminar and Turbulent flow,**	**3**	**2**
Week 13 (25/03/18 – 29/03/18)	**Flow of viscous fluid in circular Pipes - Hagen Poiseuille flow Major and Minor losses in pipes, Pipes in series, Pipes in parallel and Equivalent pipe..**	**3**	**2**
Week 14 (01/04/18 – 05/04/18)	**Major and Minor losses in pipes, Pipes in series, Pipes in parallel and Equivalent pipe.**		

Week 15 (08/04/18 – 12/04/18)	**Unit Test 2 (April 8, 9 and 10) – SE, TE.**	**3**	**2**
Week 16 (16/04/18 – 21/04/18)	**Term End (April 20)**		

Subject:	**Fluid & Thermal Engineering Lab**
Academic Year:	**2018-19**
Name of the Teacher:	**Mrs. Deepika Singh Singraur**
Class	**S. E. Production**
Credits	**01**

1. Syllabus.

Exp. No.	List of Experiments
01	To determine the Cd of Venturi meter/ Orifice meter.
02	To determine Metacentric Height of Ship Model.
03	To Verify Bernoulli's Theorem.
04	To determine types of flow by Reynolds's Experiment.
05	To determine Major losses/Minor in pipes.
06	To determine the thermal conductivity of a given metal rod.
07	To determine the overall heat transfer coefficient of a composite wall.
08	To determine the emissivity of the given surface.
09	To determine LMTD for Parallel flow and Counter flow heat exchanger.
10	To determine the performance of single stage / multi stage air compressor test rig.

2. CO Statements.

: Learner will be able to...

1. Apply Bernoulli's theorem to determine the Cd / flow rate by using Orifice meter and Venturi meter.
2. Illustrate the floatation characteristics.
3. Determine metacentric height of ship model.
4. Determine critical Reynolds number for laminar, transition and turbulent flow of fluids.
5. Determine Major/Minor losses in piping systems.
6. Determine thermal conductivity and heat transfer coefficient of materials.
7. Improve effectiveness of heat exchangers.
8. Improve effectiveness of reciprocating compressor systems.
9. Determine the emissivity of the surface.

3, CO-PO-PSO Mapping.

Laboratory												
CO# / PO#	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
PEL402.1	3	3	-	-	-	-	-	-	-	-	-	-
PEL402.2	3	3	-	-	-	-	-	-	-	-	-	-
PEL402.3	3	3	-	-	-	-	-	-	-	-	-	-
PEL402.4	3	3	-	-	-	-	-	-	-	-	-	-
PEL402.5	3	3	-	-	-	-	-	-	-	-	-	-
PEL402.6	3	3	-	-	-	-	-	-	-	-	-	-

CO# / PSO#	PSO1	PSO2
PEL402.1	-	-
PEL402.2	-	-
PEL402.3	-	-
PEL402.4	-	-
PEL402.5	-	-
PEL402.6	-	-

4. **CO Assessment tools with target.**

Co Statement #	Target for Assessment Tools			
	Assignments	Experiments	Oral Exam	Course Exit Survey
PEL402.1	-	70%	60%	60%
PEL402.2	-	70%	60%	60%
PEL402.3	-	-	60%	60%
PEL402.4	70%	-	60%	60%
PEL402.5	70%	70%	60%	60%
PEL402.6	-	-	60%	60%

6. Curriculum Gap/Content beyond syllabus (if any).

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7. Lab Plan.

Week No.	Topics	Hours (Per Batch)
Week 3 (14/01/19 – 18/01/19)	Bernoullis Equation	**2**
Week 4 (21/01/19 – 25/01/19)	Compressors	**2**
Week 5 (28/01/19 – 01/02/19)	Assignment on Fluid properties	**2**
Week 6 (04/02/19 – 08/02/19)	**Unit Test 1 (Feb 12, 14 and 15) – FE, SE, TE.**	**-**
Week 7 (11/02/19 – 15/02/19)	Venturimeter	**2**
Week 8 (18/02/19 – 22/02/19)	Impact of Jet	**2**

Week 9 (25/02/19 – 1/03/19)	Thermal Conductivity of metal rod	**2**
Week 10 (4/03/19 – 08/03/19)	Heat Exchanger	**2**
Week 11 (11/03/19 – 15/03/19)	Assignment on air compressors	**2**
Week 12 (18/03/19 – 22/03/19)	Assignment on fluid kinematics and dynamics	**2**
Week 13 (25/03/19 – 29/03/19)	Assignment on Flow through pipes	**2**
Week 14 (1/04/19 – 05/04/19)	Assignment on heat exchangers	**2**
Week 15 (08/04/18 – 12/04/18)	**Unit Test 2 (April 2, 3 and 4) – SE, TE.**	**--**
Week 16 (15/04/19 – 19/04/19)	**Term End (April 15)**	**--**