Subject Number: ANTE 223
Subject : Fluid Mechanics I
Units:6
Weekly Hours : Theoretical :2
Experimental:2
Tutorial:

Week	Contents
1	**Fluid properties** - General definitions - Newton's law of Viscosity - Kinematic viscosity
2	- Bulk Modulus of elasticity - Surface tension
3	**Fluid Statics** - Definitions - Pressure at a point
4	- Variation of Pressure in a static fluid - Hydrostatic laws - Units and scales of Pressure measurement
5	- Manometers (Pressure Measurement)
6	- Force on plane surfaces
7	- Force on curved surfaces
8	- Buoyant force
9	- Stability of floating and submerged bodies
10	- Relative equilibrium (linear acceleration)
11	- Relative equilibrium (uniform rotation)
12	**Fluid flow concepts and** **Basic Equations**
13	- Definitions
14	- Continuity equation - Euler's equation of motion along streamline
15	- Bernoulli equation
16	- Steady-state energy equation
17	- Flow Measurement (Pitot tube)
18	- Flow Measurement (orifice meter)
19	- Flow Measurement (Venturi meter)
20	- Flow Measurement (nozzle)

21 **22** **23**	- Resistance to flow in open and closed conduits - Flow in pipes (laminar and Turbulent flow) - Losses in pipes (major and miner losses) (Moody chart)
24 **25**	**Liner momentum equation and its Application** - Open system (fixed and moving blades) - Closed system (bend pipes)
26	**Introduction to pumps and Turbines Application** - Types of pumps and Turbines and application
27 **28** **29** **30**	**Dimensional analysis and Dynamic similitude** - Dimensional analysis (the π-theorem) - Dimensionless parameters (Reynolds no. , Froude no.) - Dimensionless parameters (Euler no. , Weber no. , Mach no.) - Similitude (model studies)

Subject Number: ANTE 215
Subject : Manufacturing processes
Units:5
Weekly Hours : Theoretical :2
Experimental:1
Tutorial: 1

Week	Contents
1	**Iron and steel making** - Iron ores - Pig iron making - Blast furnace
2	**Steel making** - Process of steel making
3	**Casting fundamentals** - Casting processes characteristics - Casting techniques
4 5	**Sand casting** - Molding sand - Sand testing - Patterns - Molding machines - Foundry furnaces - Cleaning and inspection of casting
6	**Die casting methods** -Pressure die casting methods
7	**Other casting methods** - Centrifugal casting - Lost-wax casting - Shell molding process - Continuous casting
8	**Metal forming** - Hot working of metal - Cold working of metal
9	**Hammering / Forging** - Types of forging processes - Hand forging tools - Automatic hammer forging - Die forging machines

10	**Rolling** - Types of Rolling machines - Calculation the angle of contact - Hot and cold Rolling processes
11	**Extrusion** - Methods of Extrusion - Tube Extrusion - Impact Extrusion
12	**Drawing** - Wire drawing machines - Tube drawing machines - Metal preparation for drawing
13	**Sheet metal work** - Processes of sheet metal forming - Joining of sheet metal - Soldering
14	**Metal cutting** - Chiseling steel metal - Filing steel metal - Sawing steel metal
15	**Turning operations** - Types of turning machines - Parts of turning machines - The lath as a general purpose machine
16	**Shaping operations** - Classification of shapers
17	**Milling operations** -Types of milling machines
18	**Drilling operations** - Drills - Reamers - Drilling machines - Boring machines
19	**Grinding operations** - Types of grinding machines - Grinding tools
20	**Welding** - Electric Arc Welding - Metal Arc Welding - Tungsten and Metal Inert gas welding - Plasma welding

21 22	**Fusion welding** - Oxy acetylene welding - Thermit welding - Electron beam welding - Laser welding - Ultrasonic welding - Diffusion welding - Projection welding - Flash welding
23	**Soldering and Brazing** - Brazing and Soldering metals and alloys - The factors that the process depends on
24	**Solid-state welding and other types of welding** - Electric resistance welding - Friction welding - Explosion welding
25 26 27	**CNC machines** - NC definition and comparison - Traditional tool machines and CNC machines comparison - Financial advantages and disadvantages of CNC - DNC- Direct numerical control CAD/CAM-Hierarchical NC
28 29 30	**Non Traditional machining** - Ultrasonic machining - Chemical machining - Electro chemical machining - Electro spark machining - Electron beam machining - Laser machining - Electron grinding machining

Subject Number: MATH 252
Subject : Mathematics II
Units:6
Weekly Hours : Theoretical : 3
Experimental:
Tutorial:

Week	Contents
1	**Ordinary Linear Differential Equations** - 1st order differential equations - Separable - Homogeneous
2	- Exact - Linear - Bernoulli
3	- 2nd Order Differential Equations - Reducible to 1st order - Homogeneous
4	- Non Homogeneous
5	- Higher Order Differential Equations - Homogeneous - Non Homogeneous - Applications
6	**Sequences and Series** - Sequence - Series - Geometric Series - Tests of Convergence
7	- Definition - The General Term Test - The Integral Test - The Comparison Test - The Limit Comparison Test - The Ratio Test - The Root Test
8	- Alternating Series - Power Series - Interval of Convergence
9	- Taylor Series - Maclaurin Series - Applications
10	**Fourier Series** - Periodic Function - Even and Odd Functions - Half Range Expansion Function

11 12 13 14 	**Partial Differentiation** - Definition - Mechanism of Differentiation - Functions of Two Variables - Functions of Higher Variables - Transformation - Chain Rule - Total Differential -Gradient, Divergence, and Curl of Vector - Equation of Normal Line and Tangent Plane - Directional Derivative - Maxima, Minima and Saddle Points - Lagrange Theorem
15	**General Applications**
16 17 18 19 	**Vector** - Vector in Space - Parallel Vectors - Triple Product - Volume of Box - Projection of Two Vectors - Applications - Equation of Line in Space - Equation of Plane in space - Applications - Vector Valued Functions - Curvature - Motion of Particle
20 21 22 	**Applications of Double and Triple Integrals** - Sketching of Geometric Shapes - Double Integrals - Triple Integrals - Applications - Jacobian Transformation - Area in Polar Curve - Surface Area
23	**Special Functions** - Gama Function - Beta Function
24 25 	**Polar Coordinates** - Polar Curve Representation - Sketching of Polar Curve - General Curve

26	- Special Curve (Line, Circle, Conic Section)
27	- Rotation of Axis
28	- The Arc Length of Polar Curve - Surface Area of Rotation - The Angle Between The Tangent Line and Radius Vector For a Polar Curve
29	- Slope of Tangent - Asymptotes - Plane Area
30	**General Applications**

Subject Number: CREQ 246
Subject :Mechanical Drawing
Units:4
Weekly Hours : Theoretical :1
Experimental:3
Tutorial:

Week	Contents
1 2	**Screws** - Classifications of Screws - Joining by bolts or screws
3	**Application on computer** - Using AutoCAD to draw an example of joining by bolts
4	**Keys** - Classifications of Keys
5	**Pins & Rivets** - Classifications of Pins & Rivets
6	**Application on computer** - Using AutoCAD to draw joining of keys or pins
7	**Springs** - Classifications of Springs
8	**Tolerances** - Basic size - Limits of size - Deviation
9 10	**Fits** - Classes of fit / clearance - Transition - Interference - Calculation of fits & tolerance
11	**Surface finishing** - Application of surface finishing symbols
12	**Application on computer** - Using AutoCAD drawing to represent the fits & surface finishing

13 14 15 16	**Assembly Drawing** - Draw a sectional front view & a side view for general assembly - Draw a sectional front view for general assembly - Draw a sectional front view for general assembly - Draw a sectional front view for general assembly
17 18	**Application on computer** - Using AutoCAD to draw general assembly - Using AutoCAD to draw general assembly
19 20	**Welding** - Types of welding - Gas welding - Arc welding - Resistance welding - Basic symbols for welding gas & arc welding
21	**Application on computer** - Using AutoCAD to draw welding assembly
22 23	**Gears : Spur Gear** - Classification of gears - Applications - Drawing of spur gear - Spur gears assembly Drawing
24	**Application on computer** - Using AutoCAD to draw spur gears assembly
25 26	**Bevel gear** - Drawing of bevel gear - Bevel gears assembly drawing
27	**Application on computer** - Using AutoCAD to draw bevel gears assembly
28	**Worm and worm wheel** - Drawing of warm and worm wheel
29	**Application on gears** - Drawing of sluice valve operating gear
30	**Detailed drawing** - Detailed drawing

Subject Number: ANTE 213
Subject : Mechanics II
Units:6
Weekly Hours : Theoretical : 3
Experimental:-
Tutorial:1

Week	Contents
1	**Rectilinear motion**
2	**Curvilinear motion** -x-y coordinates
3	-Normal – tangential coordinates
4	-Polar – coordinates
5	**Relative motion** -Motion relative to a frame in translation
6	**Kinetics of particles** -Newton's 2nd law - rectilinear motion
7	- curvilinear motion
8	**Work and energy of particles** -Work of a force
9	**Work and energy** -Kinetic energy of a particle
10	-Potential energy
11	**Impulse and momentum of particles** -Impulsive motion
12	-Angular momentum of a particle
13	**Conservation of liner momentum** -liner impact
14	**Conservation of momentum** -Conservation of angular momentum
15	-impact
16	-Impulse and momentum of particles
17	**Angular momentum** -Rate of changed of angular momentum
18	-Conservation of angular momentum

19	**Kinematics of rigid bodies** -Translation of rigid bodies
20	-Rotation of rigid bodies
21	**Absolute motion** -General motion
22	-Absolute and relative velocity in plane motion -Instantaneous center of rotation
23 24	-Absolute and relative acceleration
25	**Moment of inertia** -Mass moment of inertia
26	**Force/mass/acceleration** -Force/mass/acceleration for rigid bodies
27	**Work and energy** -Work for rigid bodies
28	-Energy for rigid bodies
29	**Impulse and momentum** -Impulse for rigid bodies
30	-Momentum for rigid bodies

Subject Number: ANTE 214
Subject : Strength of Materials
Units:6
Weekly Hours : Theoretical :2
Experimental:2
Tutorial:1

Week	Contents
1	**Stress and Strain** -Study and analysis of simple stress and simple strain
2	**Material Behavior** -Study the behavior of material under load (tensile test)
3	**Hooke's Law** -To know where the Hooke's law apply
4 5	**Statically indeterminate Problem** -Basic principles for solving Statically indeterminate Problem -Method of solution concern statically indeterminate Problem
6 7	**Thermal Strain and Stress** -Study the strain and stress induced due to temperature changes -Solve statically indeterminate problems due to temperature changes
8	**Pressure Vessels** -Stresses in pressure vessels
9	**Stress Concentration** -Study where the stresses rising due to section changes
10 11 12	**Torsion of Circular Shaft** -Study the pure torsion for solid and hollow circular shafts -Study the stress induced due to torsion -Study the angular deformation induced due to torsion
13	**Beams: Shear force and Bending Moment** -Introduction to beams and loading types and the resulted shear and moment

14	**Beams: S.F. and B.M. Diagrams** -Draw the Shear force and Bending Moment in beams
15 **16**	**Stress in Beams** -Study the stress induced in beams due to lateral loads -Economic section and how to calculate and reduce the induced stresses at beams
17 **18**	**Double integration method** -Learn how to find the equation of elastic curve -Learn how to find the equation of elastic curve
19 **20**	**Moment-Area method** -Basic principles concern using Mohr's area method -Study how to find deflection and slope at a certain point
21	**Statically indeterminate beams** -Solving beams statically indeterminate problems
22	**Stresses at a point** -Study the stresses at a point
23	**Stresses at a point** -Basic principles for calculating the combined stresses at a point
24 **25**	**Mohr's Circle** -Graphical representation of stress at a point using Mohr's circle -Systematic procedure of graphical representation of stresses at a point using Mohr's circle
26 **27**	**Bending with Torsion** -Study the stress due to combined bending and torsion loads -Practical cases of the stresses induced due to combined bending and torsion loads
28	**Short Columns** -Study the stress induced in Short Columns
29	**Euler's Column Equation** -Study the stress induced in relatively long Columns
30	**Euler's Column Equation** -Buckling for medium columns using Rankine method… etc.

Subject Number: ANTE 231
Subject: Theory of Flight
Units: 4
Weekly Hours: Theoretical: 2
Experimental:
Tutorial : 1

Week	Contents
1	**Standard atmosphere (ISA)** - What is the atmosphere - Physical properties of gases in atmosphere
2	**Aerodynamic forces and moments on aircraft** - The airplane as a rigid body - Airplane axis system - Forces and moments
3	**Lift- Lift coefficient- Lift curves characteristics** - Introduction - Change of lift coefficient with the angle of attack - Lift curves
4	**Drag-Drag Estimation** - Drag - Drag estimation at low speeds - Drag estimation at high speeds
5	**Types of drag** - Parasite drag - Induced drag - Wave drag
6	**Stalling** - Wing stall - Control of wing stall - High lift equipment in airplane
7	**Subsonic and supersonic wings and sections characteristics** - Types of subsonic airfoils - Types of supersonic airfoils - Modern airfoils
8	**Aerodynamic forces on steady level flight** - Lift force - Drag force - Gravity force - Thrust force
9	**Level flight Performance** - Steady level flight - Typical steady level flight - Cruse flight

10	**The wing loading** - Types of loads - Straight wing - Swept wing
11	**Performance curves in terms of thrust** - Change of required thrust with Mach Number - Change of required thrust with altitude - Change of available thrust with airspeed and altitude
12	**Performance curves in terms of power** - Change of required power with Mach number - Change of required power with altitude - Change of available power with airspeed and altitude
13	**Climbing and Drift-Down performance** - Climbing performance - Rate of climb - Steady rate of climb
14	**Gliding performance** - Gliding performance without power - Gliding decent performance
15	**Range and Endurance (Piston a/c)** - Derivation of range and endurance relation ships and specific fuel combustion
16	**Range and Endurance (Jet a/c)** -Range and endurance of jet airplanes -Range and endurance of propeller airplanes
17	**Take – off** - Take off run way - Run way time of take off
18	**Landing** - Landing run way - Run way time at landing
19	**Acceleration in climb** - Energy theory - Unsteady flight
20	**Steady level turning performance** - Turn radius - Rate of turn - Thrust in steady turn
21	**Design performance** - Load factor - Structure limitation

22 **23**	**Rotary – Wing aerodynamics** - Balance of forces - Relative wind - Rotational velocity - Airflow during hovering - Hovering
24	**Aerodynamic of helicopter** - Airflow in forward flight - Lift- Drag
25	**Required power** - Thrust - Power - Change of thrust and power with altitude and airspeed
26	**Available power** - General - Change of power available with altitude and airspeed
27	**Flight range** - Forward flight - Max. speed - Range
28	**Range of climbing** - Maneuvering flight - Best range of climb airspeed
29	**Flight ceiling** - Max. endurance airspeed
30	**Optimum air speed** - Best-rate-of-climb airspeed - Optimum airspeed

Subject Number: ANTE 222
Subject : Thermodynamics II
Units:6
Weekly Hours : Theoretical : 2
Experimental:2
Tutorial:

Week	Contents
1	**Introduction** - What is thermodynamics II. Fundamentals
2	**Properties of pure substance**. -Pure substance phases -Phase-change processes -Diagrams of and $(p-T)$.
3	**Steam tables**. -Saturated vapor tables, superheated vapor tables. -Illustrative example.
4	**Steam properties**. -Determine parameters of state of steam -Basic relations and dryness fraction.
5	**Steam diagrams**. -Study diagrams $(p-v)$, and $(h-s)$.
6	**Steam reversible non-flow processes** -Constant volume process. -Constant pressure process. -Isothermal process. -Isentropic process. -Polytropic processes. -Illustrative example.
7	**Throttling process. Separation- throttling calorimeter.** -Throttling process. -Throttling calorimeter. -Separation-throttling calorimeter. -Illustrative example.
8	**Unsteady flow energy equation** -Derivation, applications. -Illustrative example.

9	**Application of steady state energy equation** -Boiler -Condenser -Compressor -Turbine -Diffuser and nozzle. -Illustrative example
10 **11** **12** **13** **14** **15**	**Steam cycles** -Carnot cycle. -Ideal Rankine cycle. -Illustrative example. -The effect of steam conditions on thermal efficiency and steam specific consumption. -Overall efficiency. -Rankine cycle with superheat. -Illustrative example -Rankine cycle with reheat. -Illustrative example. -Regenerative Rankine cycle with open feed water heaters. -Illustrative example. -Regenerative Rankine cycle with closed feed water heaters. -Illustrative example
16 **17** **18**	**Gas turbine cycles** -Simple gas turbine (Brayton) cycle. -Illustrative example -Brayaton cycle with regeneration. -Illustrative example -Brayaton cycle with intercooling and reheating. -Illustrative example
19	**Reciprocating Positive displacement air compressors** -Introduction -Definitions -Components -Indicated work. -Steady flow analysis. -Illustrative example.

20 **21** **22** **23** **24**	-The condition of minimum work -Isothermal efficiency. -Illustrative example. -Effect of clearance volume. -Volumetric efficiency. -Actual indicator diagram. -Illustrative example. -Multi-stage compression. -Inter-cooling effect on Multistage compression. -Illustrative example. -The ideal intermediate pressure. -Energy balance of a two stage machine with intercooling. -Illustrative example. -Roots air blower. -Van air compressors. -Illustrative example.
25	**Rotary air compressors** -Radial compressors. -Axial compressors. -Illustrative example.
26 **27** **28**	**Gas-vapor mixtures.** -Specific and relative humidity of air. -Dew point temperature. -Illustrative example. -Adiabatic saturation and wet-bulb temperature. -Illustrative example. -Psychometric chart. -Illustrative example.
29 **30**	**Refrigeration cycles** -Idea vapor-compression refrigeration cycle. -Illustrative example. -Idea gas refrigeration cycle. -Illustrative example.

Subject Number: CREQ 245
Subject : Programming II
Units:4
Weekly Hours : Theoretical :1
Experimental:2
Tutorial:

Week	Contents
1 **2**	**Introduction to programming using (Matlab)** **Conditional commands** - if end If elseif else function
3 **4** **5** **6**	**loops** - for - while - Program control - Example - Problems
7 **8** **9** **10**	**Matrix construction** - Extracting Bits of a matrix - Dot product of matrices - Tabulating Functions - Matrix-Vector product - Matrix-Matrix product - Logical commands - Comparison tests - Examples - Problems
11 **12** **13**	**Plotting by Matlab** - plotting a matrix (Plot) - subplot(m,n,p) - Two dimensional plot - Three dimensional plot
14 **15**	**Graphical User Interface**

16	Identify the software environment and different components of screen AutoCAD
17	Prepare a paper drawing, open a new file, limits painting, drawing units, grid, snap, save as and save.
18 **19**	Identify different drawing commends : point , line , arc , circle , pline , multiline …etc
20	Identify editing commends : editing , mirror , offset , copy , move …etc
21	Precision drawing : Osnap
22	Adding dimensions Control properties drawing p:
23	Layer , properties , line types
24	Block and Attributes : Block , wblock , explode , divide , measure
25 **26** **27**	introduce to the three-dimensional drawing : ucs , vports , elev. , thickness
28 **29** **30**	Create 3D surfaces