SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3351	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
2.	AE3351	Aero Engineering Thermodynamics	PCC	3	0	0	3	3
3.	AE3352	Solid Mechanics	ESC	4	0	0	4	4
4.	CE3391	Fluid Mechanics and Machinery	ESC	3	1	0	4	4
5.	AE3301	Elements of Aeronautical Engineering	PCC	3	0	0	3	3
6.	AE3302	Aircraft Systems and Instruments	PCC	3	0	0	3	3
PRACTICALS								
7.	AS3361	Thermodynamics and Strength of Materials Laboratory	PCC	0	0	4	4	2
8.	CE3362	Fluid Mechanics and Machinery Laboratory	PCC	0	0	4	4	2
9.	GE3361	Professional Development[$]	EEC	0	0	2	2	1
			TOTAL	**19**	**2**	**10**	**31**	**26**

[$] **Skill Based Course**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3452	Vector Calculus and Complex Functions	BSC	3	1	0	4	4
2.	AE3401	Aerodynamics I	PCC	3	0	0	3	3
3.	AE3402	Air Breathing Propulsion	PCC	3	1	0	4	4
4.	AE3491	Mechanics of Machines	PCC	3	0	0	3	3
5.	AE3403	Aircraft Structures-I	PCC	3	0	0	3	3
6.	GE3451	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
7.		NCC Credit Course Level 2[#]		3	0	0	3	3
PRACTICALS								
8.	AE3411	Aerodynamics Laboratory	PCC	0	0	4	4	2
9.	AE3412	Propulsion Laboratory	PCC	0	0	4	4	2
			TOTAL	**17**	**2**	**8**	**27**	**23**

[#] **NCC Credit Course level 2 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.**

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi, 2018.
2. Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2016.

REFERENCES:

1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2015.
3. James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2016.
4. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
6. Wylie. R.C. and Barrett . L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

AE3351 AERO ENGINEERING THERMODYNAMICS

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To make the student understand the quantitative analysis of machine and processes for transformation of energy and between work and heat.
- To Make the student understand the Laws of thermodynamics would be able to quantify through measurement of related
- To Apply the thermodynamic properties, energies and their interactions in real tim,e problems
- To develop basic concept of air cycle, gas turbine engines and heat transfer.
- To analyse different types of Heat transfer
- To identify the different components of Jet Engines

UNIT I FUNDAMENTAL CONCEPT AND FIRST LAW **9**

Concept of continuum, macroscopic approach, thermodynamic systems – closed, open and isolated. Property, state, path and process, quasi-static process, work, internal energy, enthalpy, specific heat capacities and heat transfer, SFEE, application of SFEE to jet engine components, First law of thermodynamics, relation between pressure, volume and temperature for various processes, Zeroth law of thermodynamics.

UNIT II SECOND LAW AND ENTROPY **9**

Second law of thermodynamics – Kelvin Planck and Clausius statements of second law. Reversibility and Irreversibility, Thermal reservoir, Carnot theorem. Carnot cycle, Reversed Carnot cycle, efficiency, COP, Thermodynamic temperature scale - Clausius inequality, Concept of entropy, Entropy changes for various processes.

UNIT III AIR STANDARD CYCLES **9**

Otto, Diesel, Dual, Ericsson, Atkinson, Stirling and Brayton cycles - Air standard efficiency – Mean effective pressure.

UNIT IV FUNDAMENTALS OF VAPOUR POWER CYCLES **9**

Properties of pure substances – solid, liquid and vapour phases, phase rule, p-v, p-T, T-v, T-s, h-s diagrams, p-v-T surfaces, thermodynamic properties of steam - calculations of work done and heat transfer in non-flow and flow processes - standard Rankine cycle, Reheat and Regeneration cycle. Heat rate, Specific steam consumption, Tonne of refrigeration.

UNIT V BASICS OF PROPULSION AND HEAT TRANSFER **9**

Classification of jet engines - basic jet propulsion arrangement – Engine station number, thrust equation – Specific thrust, SFC, TSFC, specific impulse, actual cycles, isentropic efficiencies of jet engine components, polytropic efficiency, conduction in parallel, radial and composite wall, Basics of convective and radiation heat transfer.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, students should be able to:

CO1: Apply the laws of thermodynamics in real time problems.
CO2: Demonstrate the principal operation of piston engine and jet engines.
CO3: Demonstrate the efficiency of different air standard cycles.
CO4: Determine the heat transfer in different conditions of working medium.
CO5: Solve heat transfer problems in complex systems.
CO6: Solve problems related to conduction convention and radiation

TEXT BOOKS:

1. Nag.P.K., “Engineering Thermodynamics”, Tata McGraw-Hill, New Delhi, 2013.
2. Rathakrishnan E., “Fundamentals of Engineering Thermodynamics”, Prentice-Hall India, 2005.
3. Yunus A. Cengel and Michael A. Boles, “Thermodynamics: An Engineering Approach” McGraw-Hill Science/Engineering/Math; 7thedition 2010.

REFERENCES:

1. Arora C.P, “Thermodynamics”, Tata McGraw-Hill, New Delhi, 2003.
2. Holman.J.P., “Thermodynamics”, 3rd Edition, McGraw-Hill, 2007.
3. Merala C, Pother, Craig W, Somerton, “Thermodynamics for Engineers”, Schaum Outline Series,Tata McGraw-Hill, New Delhi, 2004.
4. Ramalingam K.K. “Thermodynamics”, Sci-Tech Publications, 2006
5. Venwylen and Sontag, “Classical Thermodynamics”, Wiley Eastern, 1987

MAPPING OF COS AND POS:

CO	Level of correlation of the COs with the relevant POs/PSOs														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	1	1	-	1	-	-		1	2	3	1	-
CO2	3	2	2	1	1	1	1	-	-	1	1	-	3	2	1
CO3	3	2	2	1	1	1	1	1	-	1	-	2	3	2	-
CO4	3	2	2	1	1	-	1	-	-	1	1	1	3	1	-
CO5	3	3	3	2	2	-	1	-	-	1	1	2	3	1	-
CO6	3	2	2	1	1	1	1	-	-	1	1	2	3	3	1
Overall Co-relation	3	2.2	2.2	1.2	1.2	1	1	1	-	1	1	1.8	3	1.2	1

AE3352	SOLID MECHANICS	L T P C 4 0 0 4

COURSE OBJECTIVES:

1. Ability to think, Analyse and solve Engineering Problems expected from the course.
2. Ability to understand stress and strain concepts related to deformable bodies.
3. To enable understanding of the behaviour and response of materials and to allow the student to carry out easy and moderate level structural analysis of basic structural members.
4. To familiarize with the different methods used for beam deflection analysis.
5. To impart knowledge to the students on how structural elements are sized and to enable the student to gain knowledge in how stresses are developed and distributed internally.

UNIT I CONCURRENT AND NON-CONCURRENT 12

Introduction, Concept of FBD, Coplanar Concurrent force system, Moments, Coplanar Non-Concurrent force system and Support Reactions – Application Problems.

UNIT II SHEAR FORCE AND BENDING MOMENT, SECOND AREA MOMENT PROBLEMS 12

Analysis of Simple Truss, Shear Force and Bending Moment Diagrams, C.G. and M.I of Plane areas.

UNIT III AXIAL BAR AND MATERIAL MODULUS 12

Simple stress and Strain, Mechanical Properties of Materials, Statically Determinate Problems and Elastic Constants, Tension, Compression, and Shear, Elasticity, Plasticity and Creep, Hooke's Law. Allowable stresses.

UNIT IV BEAM BENDING AND TORSION 12

Axially loaded members, Statically indeterminate structures, Thermal effects, misfits, and Pre-strains. Torsion of circular bar, Transmission of power by circular shafts. Stresses in beams, Pure bending and Nonuniform bending, Design of beams for bending stresses, Shear stresses in beams of rectangular cross section.

UNIT V STRESS TRANSFORMATION, DEFLECTION OF BEAM AND BUCKLING OF COLUMN 12

Plane stress, Principal stresses, Mohr's circle and Hooke's law for plane stresses. Spherical and Cylindrical pressure vessels. Deflection of beams, Column buckling.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Upon completion of the course, Students will be able to

CO1: Clear understanding of mechanical behaviour of materials.
CO2: Knowledge of different structural members and load types.
CO3: Design members under axial loading.
CO4: Design member under torsion loading.
CO5: Calculate beams deflections.

TEXT BOOKS:

1. Egor P Popov, Mechanics of Materials, Pearson, 2015.
2. James M. Gere, Mechanics of Materials, Sixth Edition, Thomson Learning, 2004.
3. Ferdinand Beer, E. Russell Johnston Jr., John Dewolf, David Mazurek, Mechanics of Materials, McGraw Hill Education,2014.
4. Russell C Hibbeler, Mechanics of Materials, Pearson, 2013.

REFERENCES:

1. William F. Riley, Leroy D. Sturges, Don H. Morris, Mechanics of Materials, John Wiley & Sons, 1998.
2. Advanced Mechanics of Materials, 6th Edition, authored by Arthur P. Boresi, Richard J. Schmidt, bearing ISBN: 978-81-947263-9-5, Published by Wiley India Pvt. Limited.
3. Mechanics of Materials, 5th Edition, authored by Timothy A. Philpot, Jeffery S. Thomas, bearing ISBN: 978-1-119-85997-0, Published by Wiley India Pvt. Limited.

MAPPING OF COS AND POS:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2.5	2	2.5	-	-	-	-	-	-	1	3	3	1	1
CO2	3	2.5	2	2.5	-	-	-	-	-	-	1	3	3	1	1
CO3	3	2.5	2	2.5	-	-	-	-	-	-	1	3	3	1	1
CO4	3	2.5	2	3	-	-	-	-	-	-	1	3	3	1	1
CO5	3	3	2.5	3	-	-	-	-	-	-	1	3	3	1	1
Avg.	3	2.6	2.1	2.7	-	-	-	-	-	-	1	3	3	1	1
Low (1) ; Medium (2) ; High (3)															

CE3391 FLUID MECHANICS AND MACHINERY **L T P C 3 1 0 4**

COURSE OBJECTIVES:

1. To introduce the students about properties of the fluids, behaviour of fluids under static conditions.
2. To impart basic knowledge of the dynamics of fluids and boundary layer concept.
3. To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on pipe bends.
4. To exposure to the significance of boundary layer theory and its thicknesses.
5. To expose the students to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 10+3

Properties of fluids – Fluid statics - Pressure Measurements - Buoyancy and floatation - Flow characteristics - Eulerian and Lagrangian approach - Concept of control volume and system - Reynold's transportation theorem - Continuity equation, energy equation and momentum equation - Applications.

UNIT II FLOW THROUGH PIPES AND BOUNDARY LAYER 9+3

Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation - friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 8+3

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV TURBINES 9+3

Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines.

UNIT V PUMPS 9+3

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps.

TOTAL: 60 PERIODS

OUTCOMES: On completion of the course, the student is expected to be able to

1. Understand the properties and behaviour in static conditions. Also to understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics
2. Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel. Also to understand the concept of boundary layer and its thickness on the flat solid surface.
3. Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies
4. Explain the working principles of various turbines and design the various types of turbines.
5. Explain the working principles of centrifugal, reciprocating and rotary pumps and design the centrifugal and reciprocating pumps

TEXT BOOKS:

1. Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 22nd edition (2019)
2. Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.
3. Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House(p) Ltd. New Delhi, 2016.

REFERENCES:

1. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore,
   2011.
2. Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016.
3. Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014.
4. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.
5. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co., 2010.

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	2	1	2	2	1	2	1	1	2	3	2	3
2	3	3	3	2	1	2	2	1	2	1	1	2	3	2	3
3	3	3	3	3	1	2	2	1	2	1	1	2	3	3	3
4	3	3	3	3	1	2	2	1	2	1	1	3	3	2	2
5	3	3	3	3	1	2	2	1	2	1	1	3	3	2	2
Low (1) ; Medium (2) ; High (3)															

AE3301 ELEMENTS OF AERONAUTICAL ENGINEERING

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To acquire the knowledge on the Historical evaluation of Airplanes
- To learn the different component systems and functions
- To know the concepts of basic properties and principles behind the flight
- To learn the basics of different structures & construction
- To learn the various types of power plants used in aircrafts

UNIT I HISTORY OF FLIGHT **9**

Balloon flight-ornithopter-Early Airplanes by Wright Brothers, biplanes and monoplanes, Developments in aerodynamics, materials, structures and propulsion over the years.

UNIT II AIRCRAFT CONFIGURATIONS AND ITS CONTROLS **9**

Different types of flight vehicles, Classifications-Components of an airplane and their functions-Conventional control, powered control- Basic instruments for Flying-Typical systems for control actuation.

UNIT III BASICS OF AERODYNAMICS **9**

Physical Properties and structures of the Atmosphere, Temperature, pressure and altitude relationships, Newton's Law of Motions applied to Aeronautics-Evolution of lift, drag and moment. Aerofoils, Mach number, Manoeuvres.

UNIT IV BASICS OF AIRCRAFT STRUCTURES **9**

General types of construction, Monocoque, semi-monocoque and geodesic constructions, typical wing and fuselage structure. Metallic and non-metallic materials. Use of Aluminium alloy, titanium, stainless steel and composite materials. Stresses and Strains-Hooke's law- stress-strain diagrams-elastic Constants-Factor of Safety.

UNIT V BASICS OF PROPULSION **9**

Basic ideas about piston, turboprop and jet engines – use of propeller and jets for thrust Production - Comparative merits, Principle of operation of rocket, types of rocket and typical applications, Exploration into space.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to
CO1: Illustrate the history of aircraft & developments over the years
CO2: Ability to identify the types & classifications of components and control systems
CO3: Explain the basic concepts of flight & Physical properties of Atmosphere
CO4: Identify the types of fuselage and constructions.
CO5: Distinguish the types of Engines and explain the principles of Rocket

TEXT BOOKS:

1. Anderson, J.D., Introduction to Flight, McGraw-Hill; 8th edition, 2015
2. E Rathakrishnan, "Introduction to Aerospace Engineering: Basic Principles of Flight", John Wiley, NJ, 2021
3. Stephen.A. Brandt, Introduction to aeronautics: A design perspective, 2nd edition, AIAA Education Series, 2004.

REFERENCES:

1. Sadhu Singh, "Internal Combustion Engines and Gas Turbine", SS Kataraia & Sons, 2015
2. Kermode, "Flight without Formulae", Pitman; 4th revised edition 1989.

MAPPING OF COS AND POS:

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	2	1	-
CO2	1	2	2	2	2	-	-	-	-	-	1		2	1	-
CO3	1	2	2	2	2	-	-	-	-	-	1		2	1	-
CO4	1	2	2	2	2	-	-	-	-	-	1		2	1	-
CO5	1	2	2	2	2	-	-	-	-	-	1		2	1	-
AVG	1	2	2	2	2	-	-	-	-	-	1		2	1	-

AE3302 AIRCRAFT SYSTEMS AND INSTRUMENTS **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To impart knowledge of the hydraulic and pneumatic systems components
2. To Study the types of instruments and its operation including navigational instruments.
3. Acquire the knowledge of essential systems of safe aircraft operation.
4. To learn the concepts of display systems
5. To study the various engine systems in aircraft

UNIT I AIRCRAFT SYSTEMS **9**

Hydraulic systems – Study of typical systems – components – Hydraulic systems controllers – Modes of operation – Pneumatic systems – Working principles – Typical Pneumatic Power system – Brake system – Components, Landing Gear Systems – Classification – Shock absorbers – Retractive mechanism.

UNIT II AIRPLANE CONTROL SYSTEMS 9

Conventional Systems – Power assisted and fully powered flight controls – Power actuated systems – Engine control systems – Push pull rod system – operating principles – Modern control systems – Digital fly by wire systems – Auto pilot system.

UNIT III ENGINE SYSTEMS 9

Piston and Jet Engines- Fuel systems – Components - Multi-engine fuel systems, lubricating systems – Starting and Ignition systems.

UNIT IV AIRCONDITIONING AND PRESSURIZING SYSTEM 9

Basic Air Cycle systems – Vapour Cycle Systems, Boot-strap air cycle system – Evaporative vapour cycle systems – Evaporation air cycle systems – Oxygen systems – Fire extinguishing system and smoke detection system, Deicing and anti-icing system.

UNIT V AIRCRAFT INSTRUMENTS 9

Flight Instruments and Navigation Instruments – Accelerometers, Air speed Indicators – Mach Meters – Altimeters - Gyroscopic Instruments– Principles and operation – Study of various types of engine instruments – Tachometers – Temperature and Pressure gauges.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

CO1: Demonstrate the ability to design a various system using pneumatic and hydraulic components.
CO2: Keep abreast knowledge on various flight control system and its recent advancements.
CO3: Demonstrate the fundamental understanding of the operation of engine auxiliary systems.
CO4: To understand the various cabin comfort system used in aircraft modern display systems.
CO5: Describe the principle behind the operation of various vital parameter displays and its uses in effective conduct of the flight.

TEXT BOOKS:

1. Mekinley, J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill, 1993.
2. Pallet, E.H.J. Aircraft Instruments & Principles, Pitman & Co, 1993.

REFERENCES:

1. Handbooks of Airframe and Power plant Mechanics, US dept. of Transportation, Federal, Aviation Administration, the English Book Store, New Delhi, 1995.
2. McKinley, J.L. and Bent R.D. Aircraft Maintenance & Repair, McGraw Hill, 1993.
3. Teager, S, “Aircraft Gas Turbine technology, McGraw Hill 1997.

MAPPING OF COS AND POS:

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	2	1	2	3	1	2	3	1	1
CO2	3	3	2	2	1	2	1	1	2	3	1	1	3	1	1
CO3	3	3	2	2	3	1	2	1	2	3	1	1	3	1	1
CO4	3	3	2	2	3	3	3	1	2	3	1	1	3	1	1
CO5	3	3	3	2	2	1	2	1	1	3	1	1	3	1	1
Avg	3	2.8	2.4	2	2.2	1.8	2	1	1.8	3	1	1.2	3	1	1

AS3361	THERMODYNAMICS AND STRENGTH OF MATERIALS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To study the mechanical properties of materials when subjected to different types of loading.
- To study how to improve the material properties.
- To understand the nature of materials under microscopic Examination

STRENGTH OF MATERIALS **30**

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminum rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
9. Effect of hardening- Improvement in hardness and impact resistance of steels.
10. Tempering- Improvement Mechanical properties Comparison
    (i) Unhardened specimen
    (ii) Quenched Specimen and
    (iii) Quenched and tempered specimen.
11. Microscopic Examination of
    (i) Hardened samples and
    (ii) Hardened and tempered samples

OUTCOMES:

- Analyse the Hardness and Tensile strength of the given material
- Examine the deformation and torsion strength of the given material
- Analyse the compression and shear strength of given materials

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Universal Tensile Testing machine with double 1 shear attachment –	1
2	Torsion Testing Machine(60 NM Capacity)	1
3	Impact Testing Machine (300J Capacity)	1
4	Brinell Hardness Testing Machine	1
5	Rockwell Hardness Testing Machine	1
6	Spring Testing Machine for tensile and compressive loads (2500N)	1
7	Metallurgical Microscopes	3
8	Muffle Furnace(800C)	1

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	1	2	3	3	2	2	3	2	2
CO2	3	2	2	-	2	1	1	2	3	3	2	2	3	2	2
CO3	3	3	2	1	2	1	-	2	3	1	1	1	2	1	2
	3.00	2.33	2.00	1.00	2.00	1.00	1.00	2.00	3.00	2.33	1.67	1.67	2.67	1.67	2.00

THERMODYNAMICS LABORATORY

OBJECTIVE:

- To study the engine types and its performance
- To understand the importance of heat transfer and its application.
- To understand the fuel properties.

LIST OF EXPERIMENTS

1. Performance test on a 4-stroke engine
2. Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine
3. Determination of effectiveness of a parallel flow heat exchanger
4. Determination of effectiveness of a counter flow heat exchanger
5. Determination of heating value of a fuel
6. Determination of specific heat of solid
7. Determination of thermal conductivity of solid.
8. Determination of thermal resistance of a composite wall.
9. COP test on a vapour compression refrigeration test rig
10. COP test on a vapour compression air-conditioning test rig

TOTAL: 60 PERIODS

OUTCOMES:

- Perform test on diesel/petrol engine
- Determine the properties of the fuels.
- Analyze the heat transfer properties of solid and composite walls

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

Sl.No	Details of Equipments	Qty Req.	Experiment No.
1.	4 stroke twin cylinder diesel engine	1	1
2.	Cut section model of 4 stroke diesel engine and cut section model of 2 stroke petrol engine	1	2
3.	Parallel and counter flow heat exchanger test rig	1	3,4
4.	Bomb Calorimeter	1	5
5.	Vapour compression refrigeration test rig	1	9
6.	Vapour compression air-conditioning test rig	1	10
7.	Conductive heat transfer set up	1	7
8.	Composite wall	1	8

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	2	-	-	1	1	1	1	1	3	1	1
CO2	3	2	2	-	2	-	-	1	2	2	1	1	2	1	2
CO3	3	2	2	1	2	1	1	2	3	3	2	2	3	2	1
	3.00	2.00	2.00	1.00	2.00	1.00	1.00	1.33	2.00	2.00	1.33	1.33	2.67	1.33	1.33

CE3362	FLUID MECHANICS AND MACHINERY LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices.
- Also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

LIST OF EXPERIMENTS

A. FLOW MEASUREMENT

1. Verification of Bernoulli's theorem
2. Flow through Orifice/Venturi meter
3. Friction factor for flow through pipes
4. Impact of jet on fixed plate

B. METACENTRE

5. Determination of metacentric height

C. PUMPS

6. Characteristics of Centrifugal pump
7. Characteristics of Gear pump
8. Characteristics of Submersible pump
9. Characteristics of Reciprocating pump

D. TURBINES

10. Characteristics of Pelton wheel turbine
11. Characteristics of Francis turbine

TOTAL : 60 PERIODS

COURSE OUTCOMES:

On completion of the course, the student is expected to be able to

CO1	Verify and apply Bernoulli equation for flow measurement like Orifice/Venturi meter.
CO2	Measure friction factor in pipes and compare with Moody diagram and verify momentum conservation law.
CO3	Determine the performance characteristics of Rotodynamic pumps.
CO4	Determine the performance characteristics of positive displacement pumps.
CO5	Determine the performance characteristics of turbines.

REFERENCES:

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2015.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. NewDelhi, 2017.
3. Subramanya K, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Edu. Pvt. Ltd., 2011

PO/PSO		Course Outcome					Overall Correlation of COs to POs
		CO1	CO2	CO3	CO4	CO5	
PO1	Knowledge of Engineering Sciences	M	H	H	H	H	H
PO2	Problem analysis	M	M	H	H	H	H
PO3	Design / development of solutions	L	L	M	M	M	M
PO4	Investigation	H	H	H	H	H	H
PO5	Modern Tool Usage	L	L	L	L	L	L
PO6	Individual and Team work	M	M	H	H	H	H
PO7	Communication	L	L	L	L	L	L
PO8	Engineer and Society	M	M	M	M	M	M
PO9	Ethics	L	L	L	L	L	L
PO10	Environment and Sustainability	M	M	M	M	M	M
PO11	Project Management and Finance	L	L	L	L	L	L
PO12	Life Long Learning	M	M	M	M	M	M
PSO1	Knowledge of Civil Engineering discipline	M	H	H	H	H	H
PSO2	Critical analysis of Civil Engineering problems and innovation	L	L	M	M	M	M
PSO3	Conceptualization and evaluation of engineering solutions to Civil Engineering Issues	L	L	L	L	L	L

L - Low, M – Medium, H - High

MA3452 VECTOR CALCULUS AND COMPLEX FUNCTIONS L T P C
3 1 0 4

OBJECTIVES:

- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.
- To make the student acquire sound knowledge of techniques in solving ordinary
- differential equations that model engineering problems.

UNIT I VECTOR CALCULUS 9+3

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.