BEA- 301 Mathematics-III

UNIT-I

Numerical Methods – Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

UNIT-II

Numerical Methods - Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.

UNIT-III

Numerical Methods – Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank- Nicholson methods), Finite difference explicit method for wave equation.

UNIT-IV

Transform Calculus - Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

UNIT-V

Concept of Probability - Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

References:
1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

AEA- 302 Elements of Aeronautics

UNIT- I
INTRODUCTION TO FLIGHT Brief history of Aviation-Hot air balloon and heavier than air flying machines-early airplane configurations-Modern Airplanes-Components of airplane and their functions-Rotary wing aircrafts Space vehicles.

UNIT-II
FUNDAMENTALS OF AERONAUTICS International Standard Atmosphere-Pressure, Temperature and Density altitude, Basic Aerodynamics - Continuity, Momentum and Energy equations, Bernoulli's equation-Mach number subsonic, transonic, sonic and supersonic flow regimes, Measurement of pressure and airspeed IAS,EAS and TAS. Airfoil geometry and nomenclature-infinite and finite wing sections-lift, drag and moment coefficients-angle of attack-aspect ratio-Reynolds number-induced drag and parasite drag airfoil characteristics, Elements of Aircraft performance, stability and control.

UNIT-III
AIRCRAFT STRUCTURE AND MATERIALS Structural components of an airplane-monocoque and semi- monocoque structure –materials for structural components – composite materials and their significance in Aviation Technology.

UNIT-IV
AIRCRAFT PROPULSION Propeller Engine – Gas Turbine Engine – Turbo prop, Turbo jet, Turbo fan Engines- specific fuel consumption-variation of thrust and power with speed and altitude – materials for engine components.

UNIT-V
SPACE VEHICLES & ASTRONAUTICS Basics of Rocket Technology-escape velocity-reentry vehicles-heat transfer problems of space vehicles-ablative cooling-Satellite technology– Hypersonic vehicles, Elements of Astronautics.

Reference Books :-
1.Kermode, A. C, Barnard, R. H and Philpott, D. R, Mechanics of Flight, Pearson education, 2012.
2.Shevell, R. C., Fundamentals of Flight., Prentice hall (2nd edition), 1989.
3.Steven, A. Brandt, Randall J. Stiles, John J. Bertin and Ray Whitford, Introduction to Aeronautics:A Design Perspective, AIAA Education series(2nd edition),2004.

AEA- 303 Fluid Mechanics

UNIT-I
INTRODUCTION Fluid –definition-Fluid properties-Newton's law of viscosity-Classification of fluids-fluid statics Hydrostatic forces on submerged surfaces- Stability of floating bodies.

UNIT-II
FLUID FLOW ANALYSIS AND FLOW MEASUREMENT Ideal and real flow-Concept of continuum-Eulerian and Lagrangian approaches-Velocity field Path line, Streak line, Streamline-Stream tube- Fluid acceleration-Continuity, momentum differential equations-Navier Stokes equation- Stream function – Vorticity –Irrotationality-Potential functionPotential flow-Laplace equation-Bernoulli's equation and its applications-Venturimeter-Orifice meter, Flow Rate and Velocity Measurement.

UNIT-III
DIMENSIONAL ANALYSIS Buckingham Pi Theorem-Non dimensional numbers and their significance-Flow similarity and model studies.

UNIT-IV
FLOW THROUGH PIPES Laminar and turbulent flow- Boundary layer flow – Boundary layer thickness - Reynolds number and its significance-Laminar fully developed pipe flow-Hagen-Poiseuille flow-Coefficient of frictionHead loss – Darcy-Wiesbach equation-Hydraulic gradient-Total energy lines-Moody's diagramTurbulent flow through pipes.

UNIT-V
FLUID MACHINERY Classification of fluid machines-Reciprocating and centrifugal pumps-impulse and reaction turbines Working principle of Pelton, Francis and Kaplan turbines-Velocity triangles-fans and blowers.

TEXT BOOKS
1.Frank M White, Fluid Mechanics, The McGraw Hill companies. 7th edition), 2011.
2.Rathakrishnan, E, Fundamentals of Fluid Mechanics, Prentice-Hall (3rd edition), 2012.
3.Yunus A. Cengel and John M Cimbala, Fluid mechanics: Fundamentals and Applications, Tata McGraw Hill (2nd edition), 2010.

Reference Books :-
1. Irving H Shames, Mechanics of Fluids, The McGraw Hill companies (4th edition), 2003.
2. Yuan, S.W, Foundations of Fluid Mechanics, Prentice-Hall, 1967.

List of Experiments :-
1. To determine the local point pressure with the help of pitot tube.
2. To find out the terminal velocity of a spherical body in water.
3. Calibration of Orifice meter and Venturi meter.
4. Determination of Cc, Cv, Cd of Orifices.
5. Calibration of Nozzle meter and Mouth Piece.

AEA-304 Thermodynamics

UNIT-I
BASIC THERMODYNAMICS Systems, Zeroth law, First law - Steady flow energy equation - Heat and work transfer in flow and non-flow processes - Second law, Kelvin-Planck statement - Clausius statement – Reversibility and irreversibility - Concept of Entropy, Clausius inequality, Principle of increase of entropy – Absolute entropy – Availability - Entropy change in non-flow processes.

UNIT-II
AIR POWER CYCLES Carnot, Otto, Diesel, Dual, Stirling and Ericsson cycle - Air standard efficiency – Mean effective pressure – Actual and theoretical PV diagram of two stroke and four stroke IC engines.

UNIT-III
VAPOUR POWER CYCLE Introduction – Rankine cycle – Means of increase of efficiency of the Rankin cycle – Ideal reheat and regenerative Rankine cycle – Second law analysis of vapour power cycles – Cogeneration.

UNIT-IV
REFRIGERATION AND AIR-CONDITIONING Principles of refrigeration and Psychometric - Vapour compression - Vapour absorption types - Co-efficient of performance, Properties of refrigerants – Basic Principle and types of Air conditioning.

UNIT-V
THERMODYNAMICS OF AIRCRAFT PROPULSION CYCLES Isentropic flow through passages – Brayton cycle – Brayton cycle with intercooling, reheat and
regeneration – Ideal jet propulsion cycles. Basics of heat transfer.

Reference Books :-
1. Holman.J.P, Thermodynamics, McGraw-Hill (3rd edition), 2007.
2. Gordon J. Van Wylen and Richard E. Sonntag and Claus Borgnakke, Fundamentals of Classical
Thermodynamics – Vol 1, Wiley Eastern, 1994.
3. Arora C.P., Thermodynamics, Tata McGraw-Hill, New Delhi, 2003.
4. Merle C Potter and Craig W Somerton., Thermodynamics for Engineers, Schaum's.

List of Experiments :-
1. To find mechanical equivalent of heat using Joules apparatus.
2. To study working of impulse and reaction steam turbine by models.
3. To study working of Gas turbines by models and to identify various processes of Brayton Cycle.

4. To calculate COP of vapor compression refrigeration system and to plot on T-S, P-H diagrams.
5. To plot specific fuel consumption versus rpm diagrams for diesel and petrol engine.

AEA- 305 Strength of Materials

UNIT-I
MOMENT OF INERTIA Moment of Inertia ,Mass Moment of Inertia , Area Moment Of Inertia, Parallel Axis theorem, Polar Moment of Inertia, Principal axes, Principal moment of inertia.

UNIT-II
STRESS AND STRAIN Definition, Stress- strain, uni-axial, bi-axial and tri-axial stresses, tensile & compressive stresses,shear stress-Elastic limit, Hooke's Law. Elastic Constants: Poisson's Ratio, Modulus of elasticity,Modulus of rigidity, Bulk modulus, Yield stress, Ultimate stress. Factor of safety, state of simple shear, relation between elastic constants, Volumetric Strain, Volumetric strain for tri-axial loading,Deformation of Tapering members, Deformation due to self-weight, bars of varying sections,composite sections, Thermal Stress.

UNIT-III
BEAMS Shear Force and Bending Moment in Beams: Axial force, shear force and bending moment diagrams for statically determinate beams including beams with internal hinges for different types of loading, relationship between rates of loading, shear force & bending moment. Deflection of Cantilever,simply supported and over hanging beams using. Double integration and Macaulay's Method for different type of loadings.

UNIT-IV
STRESSES IN BEAMS Theory of pure Bending, Assumptions, Flexural formula for straight beams, moment of resistance, bending stress distribution, Section moduli for different sections, beams for uniform strength, Flitched beams. Direct & Bending Stresses: Core of Section, Chimneys subjected to wind pressure Shear Stress in Beams: Distribution of shear stress, across plane sections used commonly for structural purposes, shear connectors.

UNIT-V
COLUMN & TORSION Buckling load, Types of end conditions for column, Euler's column theory and its limitations, Rankine- Gordon Formula, Torsion of circular shafts-solid and hollow, stresses in shafts when Transmitting power, shafts in series and parallel. Strain Energy: Resilience, proof Resilience, strain energy stored in the member due to gradually applies load, suddenly applied load, impact load. Strain energy stored due to Shear, Bending and Torsion.

Reference Books :-
1.Elements of Strength of Materials, Timoshenko and Young Affiliated East-West Press.
2. Mechanics of Materials, James M. Gere (5th Edition), Thomson Learning.

3. Strength of Materials, Subramanian, Oxford University Press, Edition 2005
4. Mechanics of Materials, B.C Punmia Ashok Jain, Arun Jain, Lakshmi Publications, New Delhi.

List of Experiments :-
1. Standard tensile test on MS and CI test specimen.
2. Direct/ cross Shear test on MS and CI specimen.
3. Transverse bending test on wooden beams to obtain modulus of rupture.
4. Fatigue test.
5. Brinell Hardness tests.

AEA- 306 Computer Programming

UNIT-I
BASICS C++ basics, loops and decisions, structures and functions, object and classes, object arrays, constructor and destructor functions.

UNIT-II
OPERATOR AND FUNCTION Operator and function overloading, pointers, pointers to base and derived classes inheritance, public and Private inheritance, multiple inheritance.

UNIT-III
POLYMORPHISM Polymorphism, virtual functions, abstract base classes and pure virtual function, friend function, early and late binding.

UNIT-IV
C++ I/O SYSTEM formatted I/O, creating insertors and extractors, file I/O basis, creating disk files and file manipulations using seekg(), seekp(), tellg() and tellp() functions, exception handling: try, catch and throw.

UNIT-V
UML CONCEPTS, object-oriented paradigm and visual modeling, UML diagrams, UML specifications, object model, object oriented design, identifying classes and object, object diagrams.

References Books :-
1. Hans Erit Eriksson "UML 2 toolkit" Wiley.
2. Balagurusawmy "Object Orienter Programming with C++".
3. B.G., Boach "Object Oriented Analysis & Design with Applications.

AEA-307 Self Study /GD Seminar

Objective of GD and seminar is to improve the mass communication and convincing / understanding skills of students and it is to give student an opportunity to exercise their rights to express themselves. Evaluation will be done by assigned faculty based on group discussion and power point presentation.