BE-301 ENGINEERING MATHEMATICS – I

Unit I

Numerical analysis: Errors& Approximations, Solution of Algebraic &Trancedental Equations (RegulaFalsi ,Newton-Raphson, Secant Method), Solution of simultaneous linear equatins by GaussElimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Definite Integrals : Definite Integrals as a limit of a sum, its application in Summation of Series.

Unit II

Calculus : Expansion of functions by Maclaurin's and Taylor's theorem. Partial differentiation, Euler'stheorem and its application in approximation and errors, Maxima and Minima of function oftwo variables, Curvature : Radius of curvature.

Unit III

Differential Equations : Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-KuttaMethod,Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).Linear Differential Equations withConstant Coefficients, Cauchy's Homogeneous differential Equation, Simultaneousdifferential Equations, Method of Variation of Parameters

Unit IV

Matrices : Rank, Nullity, Solution of Simultaneous equation by elementary transformation, Consistency of System of Simultaneous Linear Equation, Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem and its Application to find the inverse.

Unit V

Graph Theory : Graphs, Subgraphs, Degree and Distance, Tree, cycles and Network, Algebra of Logic, Boolean Algebra, Principle of Duality, Basic Theorems, Boolean Expressions and Functions. Elementary Concept of Fuzzy Logic

References:

1)Higher Engineering Mathematics by B.S. Grewal, Khanna Publication.
2)Engineering Mathematics volume I & III by D.K. Jain
3)Engineering Mathematics volume I by D.C.Agrawal

AE-302 ELEMENTS OF AERONAUTICS

UNIT I-

HISTORICAL EVALUATION

History of aviation, History of space flight, History of Indian space experience, Pre Wright Brothers era,Wright Flyer, Conventional airplane, progress in airplane design and applications, Current status. Early airplanes, biplanes and monoplanes. Structures and propulsion over the years.

UNIT II-

AIRCRAFT CONFIGURATIONS

Components of an airplane and their functions. Different types of flight vehicles,classifications. Conventional control, Powered control, Basic instruments for flying, typical systems for control Actuation.

UNIT III –

INTRODUCTION TO PRINCIPLES OF FLIGHT

Physical properties and structure of the atmosphere, Nomenclature used in Aerodynamics, different parts of airplane. Wing as lifting surface, Types of wing plan forms, Aerodynamic features like Aerofoil pressure distribution, Aerodynamic forces and moments, Lift and Drag, Mach number, Manoeuvres.

UNIT IV –

INTRODUCTION TO AIRPLANE STRUCTURES

General types of construction, Monocoque, semi-monocoque and geodesic construction,

Typical wing and fuselage structure. Metallic and non-metallic materials, Use of aluminium alloy, titanium, stainless steel and composite materials

UNIT V –

POWER PLANTS USED IN AIRPLANES

Basic ideas about piston, Jet engine, turbo-prop, turbo-fan, turbo-shaft, Prop-fan ,Possible locations of power plant on airplane, Rocket Propulsion, Classification of rockets like liquid and solid propellant rockets.

TEXT BOOKS

1. Anderson, J.D., *"Introduction to Flight",* McGraw-Hill, 1995.
2. Fundamentals of Flight; By Dr. O. P. Sharma and Lalit Gupta.

REFERENCE

1. Kermode, A.C., *"Flight without Formulae*", McGraw-Hill, 1997.
2. Jet Aircraft Power Sysytem : Jack V.Casamassa & Ralph D.Bent

AE/ME-303 Thermodynamics

UnitI

Fundamental Concepts and Definitions :
Thermodynamics,Property,Equilibrium,State,Process,Cycle,Zerothlawof thermodynamics, statement and significance, concept fan Ideal gas, Gas laws , Avogadro ' hypothesis, Heatandworktransfer.Firstlawof thermodynamics-Statementoffirstlawof thermodynamics,firstlaw appliedtoclosedsystem,firstlawappliedtoaclosedsystemundergoingacycle,processesanalysisof closed system ,flowprocess,flowenergy,steady flow process , Relations for flow processes ,limitations of first law of thermodynamics.

UnitII

Second lawof thermodynamics :heat engine, heat reservoir, Refrigerator ,heat pump ,COP ,EPR, Available energy ,Carnot' stheorem, Carnot's cycle, efficiency Carnot'scycle,statementofsecondlaw Reversibleand irreversibleprocesses,consequenceof secondlaw,Entropy,Entropychangeforideal gas, T-S diagrams,Availabilityand Irreversibility.Gibbs andHelmholtzfunctions

UnitIII

Real gas :Deviationwith ideal gas,Vander-wall'sequation,evaluationof itsconstants, limitationsoftheequation.Thelawofcorrespondingstates Compressibility factor,Generalized compressibilitychart, P-V-Tsurface of aReal gas, Thermodynamicsrelations,Maxwell relationsand thereapplications.

UnitIV

PureSubstance :Phase,Phase-transformations,formationof steam,propertiesof steam,PVTsurface, HS,TS,PV,PH,TVdiagram,processesof vapormeasurementof drynessfraction,Useof steamtableand Mollierchart.

UnitV

Airstandard cycles :Carnot,Otto,Diesel,Dual cyclesandtherecomparison,twostrokeand fourstroke engines,Braytoncycle,nonreactive gasmixture,PVTrelationship,mixtureofidealgases,propertiesof mixtureof ideal gases,internalenergy,Enthalpyandspecificheatofgasmixtures,Enthalpyofgas-mixtures.

References:

1. P.K.Nag;EngineeringThermodynamics; TMH
2.CengelY;Thermodynamics; TMH
3.AroraCP;Thermodynamics;TMH
4. Thermal EngineeringbyRYadav
5.EngineeringThermodynamicsbyOmkarSinghNewAge International.
6. Basic EngineeringThermodynamics,Joel,Pearson
7.EngineeringThermodynamicsbyM.Achuthan,PHI India.

ListofExperiments(Pl.expandit):

1. To findmechanicalequivqlentofheatusingJoules apparatus
2. Tostudyworkingofimpulseandreactionsteamturbine.
3. Tostudyworkingof Gasturbines .
4. To calculateCOPof vapourcompression refrigerationsystemandtoplotonT-s,p-Hdiagrams.

AE-304 Control Systems & Engineering

Unit-I : Control system & Component

Open loop and close loop control systems. Block diagram algebra and transfer function. Differential equations, Determination of transfer function by block diagram reduction technique & signal flow graph method. Mason gain formula and calculation of transfer function. Basic component of electrical control system, Armature and field control methods for Speed control

Unit-II : Time response analysis

Transient and steady state response analysis. Steady state error & error constants. Dynamic error and dynamic error coefficient, Performance Indices. Effects of pole and zero addition on transient and steady state response.

Unit-III : stability analysis

Absolute stability and relative stability. Routh's and Hurwitz criterion of stability. Root locus method of analysis. Polar plots,

Unit-IV : Approaches to system design

Design problem, types of compensation, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and PID compensation.

Unit-V Digital control systems

System with digital controller, difference equations, the z-transform, pulse transfer function, inverse ztransform, the s and z domain relationship.

References:

1. Nagrath and Gopal: Control System Engineering, New Age International Publishers.
2. Manke: Linear Control System, Khanna Publishers.
3. Ogata: Modern Control Engineering, PHI Learning.

List of Practical :

1. Designing of transfer function for different type of control system
2. Designing and modeling of different control system.
3. Determination of stability with Root Local, Nyquest Criteria, Bode Plot etc.
4. Transient and steady state analysis of control system.
5. To implement a PID controller for temperature control of a pilot plant.
6. To study behavior of 1 order,2 order type 0,type 1 system.
7. To study control action of light control device.
8. Determine transpose, inverse values of given matrix.
9. Plot the pole-zero configuration in s-plane for the given transfer function.
10. Plot unit step response of given transfer function and find peak overshoot, peak time.
11. Plot unit step response and to find rise time and delay time.

AE/CE/ME-305Strength ofmaterials

UNITI
Simple Stress andstrain:stressesinmembersof astructure,axial loading,normal stress,shearstress,bearing stress, analysisof simplestructures,steppedrods,membersinseriesandparallel:stressstraindiagram, Hooke's law,modulusofelasticity, Poisson's ratio, Rotation between the elastic modulii, Thermal stress and strain,

UNITII
Compound stressandstrain:principal stresses and principal planes,normal andshearstress, Graphical method-Mohr'scircle, Mohr's circle construction for like stresses, unlike stresses, two perpendicular direct stresses as the state of simple shear,ductileandbrittlefailures,

UNITIII
Deflection of beam: purebending,symmetricmember,deformationand stress,bendingof compositesections, eccentric axial loading,shearforceand BMdiagram,relationshipamongload,shearand BM,shear stressesin beams,strain energy inbending,deflectionofbeams,equationofelastic curve,Macaulay's method.

UNITIV
Torsioninshafts: stressesinashaft,deformationin circularshaft,angleof twist,stepped-hollow,thin walled-hollowtransmissionshafts, comparison of solid and hollow shaft, shafts in series, shaft in parallel, combined bending and torsion,

UNITV
Theoriesoffailures:maximum normal stress&shearstresstheory;maximum normal andshearstrain energytheory;maximum distortionenergytheory; applicationof theoriestodifferentmaterials and loadingconditions.
Columns: stabilityof structures,Euler'sformulaforcolumnswithdifferentend conditions,Rankin'sformula.

References:
1.Er. R.K.Rajput; Strength of materials; S.Chand& Company PVT.LTD.
2. Rattan;Strengthofmaterials;TMH
3.Nash William;Schaum'sOutlineSeries;Strengthof Materials; TMH.
4.Negi;strengthofmaterials;TMH
5. SinghArbind K;Mechanicsof Solids;PHI
6. Sadhu Singh;Strengthof Materials;KhannaPub.
7.Kamal KandGhaiRC;AdvancedMechanicsof Materials;KhannaPub.

Listofexperiments(Pl.expandit):
1. StandardtensiletestonMSandCI testspecimen
2.Direct/crossSheartestonMSandCI specimen
3. Transversebendingtestonwoodenbeamstoobtainmodulusofrupture 4. Fatiguetest
5.Brinell Hardnesstests
6.Vickerhardnesstest
7. Rockwell *hardness test*
8.Izod/Charpyimpacttest