(3rd SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMATH4-301	Applied Mathematics – III	2	0	0	40	60	100	2
BANES1-301	Basics of Aeronautics	3	0	0	40	60	100	3
BANES1-302	Aerodynamics	3	0	0	40	60	100	3
BANES1-303	Basics of Thermodynamics	3	1	0	40	60	100	4
BANES1-304	Strength of Materials	3	1	0	40	60	100	4
BANES1-305	Aerodynamics Lab.	0	0	2	60	40	100	1
BANES1-306	Strength of materials lab	0	0	2	60	40	100	1
BANES1-307	Training–1 : 4 weeks Summer Training (Manufacturing practices)	-	-	-	60	40	100	2
Total 5 Theory & 2 Lab. Courses		**14**	**2**	**4**	**380**	**420**	**800**	**20**

(4th SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BANES1-401	Aircraft performance	3	1	0	40	60	100	4
BANES1-402	Aircraft Structures	3	1	0	40	60	100	4
BANES1-403	Aircraft Propulsion	3	1	0	40	60	100	4
BANES1-404	Aircraft Systems and Instrumentation	3	0	0	40	60	100	3
BANES1-405	Aircraft Structures Lab.	0	0	2	60	40	100	1
BANES1-406	Aircraft Propulsion Lab.	0	0	2	60	40	100	1
	Management (Select any One)	3	0	0	40	60	100	3
BHSMC0-018	Introduction to Industrial Management							
BHSMC0-014	Fundamentals of Management for Engineers							
	Mandatory Course							
BMNCC0-002	EnvironmentalSciences	3	0	0	--	--	--	0
Total 6 Theory & 2 Lab. Courses		**18**	**3**	**04**	**320**	**380**	**700**	**20**

NOTE: Students will go on Industrial training after 4th Semester

(5th SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BANES1-501	Aircraft Structural analysis	3	1	0	40	60	100	4
BANES1-502	High Speed Aerodynamics	3	1	0	40	60	100	4
BANES1-503	Aircraft Materials and Processes	3	1	0	40	60	100	4
BANES1-504	Aircraft Structural analysis Lab	0	0	2	60	40	100	1
BANES1-505	Training-II	-	-	-	60	40	100	3
	Humanities (Select Any One)	3	0	0	40	60	100	3
BHSMC0-005	Effective Technical Communication							
BHSMC0-016	Organizational Behavior							
	Departmental Elective-I (Select One)	3	1	0	60	40	100	4
BANED1-511	Numerical Methods							
BANED1-512	Finite element Methods							
	Mandatory Courses* (Any One)	-	-	-				0
BMNCC0-001	Constitution of India							
BMNCC0-006	Essence of Indian Knowledge Tradition							
Total 6 Theory &1 Lab. Courses		**15**	**4**	**02**	**340**	**360**	**700**	**23**

(6th SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BANES1-601	Computational Fluid Dynamics	3	0	0	40	60	100	3
BANES1-602	Helicopter Engineering	3	1	0	40	60	100	4
BANES1-603	Aircraft stability and control	3	1	0	40	60	100	4
BANES1-604	Computational Fluid Dynamics Lab	0	0	2	60	40	100	1
	Departmental Elective-II(Select One)	3	0	0	40	60	100	3
BANED1-611	Aircraft Maintenance							
BANED1-612	Automatic flight control							
BANED1-613	Aero engine Design							
	Departmental Elective-III(Select One)	4	0	0	60	40	100	4
BANED1-621	Vibration and Aero Elasticity							
BANED1-622	Optimization Techniques							
XXXX	Open Elective-I	3	0	0	40	60	100	3
Total 6 Theory & 1 Lab. Courses		**19**	**2**	**02**	**320**	**380**	**700**	**22**

(7th SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BANES1-701	Avionics	3	0	0	40	60	100	3
BANES1-702	Aircraft design	3	1	0	40	60	100	4
BANES1-703	**Project-I	0	0	8	60	40	100	4
BANES1-704	*Training-III	-	-	-				3
	Departmental Elective-IV(Select One)	3	1	0	40	60	100	4
BANED1-711	Jet Propulsion							
BANED1-712	Rocket Propulsion							
BANED1-713	Rockets and Missiles							
	Departmental Elective-V(Select One)	3	0	0	40	60	100	3
BANED1-721	Air Transportation and Operation							
BANED1-722	Aircraft Composite Material							
BANED1-723	Aircraft Modelling and Simulation							
XXXX	**Open Elective-II**	3	0	0	40	60	100	3
Total 5Theory and 01 Lab		**15**	**2**	**08**	**260**	**340**	**600**	**24**

(8th SEMESTER)

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
	Departmental Elective-VI(Select One)							
BANED1-801	Boundary Layer Theory	3	1	0	40	60	100	4
BANED1-802	Advanced Aerodynamics							
BANED1-803	Experimental Aerodynamics							
BANED1-804	Project-II	0	0	08	60	40	100	4
XXXX	Open Elective-III	3	0	0	40	60	100	3
XXXX	Open Elective--IV	3	0	0	40	60	100	3
Total 3 Theory and 01 lab		**9**	**1**	**08**	**180**	**220**	**400**	**14**

NOTE: Choose any one subject fromlist of Open Elective subjects provided by MRSPTU, Bathinda.

BASICS OF AERONAUTICS

Subject Code –BANES1-301 **L T P Cr** **Duration:45 Hours**
3 0 0 3

COURSE OBJECTIVES

- To enable the student to understand prominent design features of Flight vehicle structures
- To enable the student to understand basic principles of flight along with historical developments.
- To enable the student to find basic flight performance and stability parameters of aircrafts.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Distinguish different components of aircrafts based on design features.
- Estimate aerodynamic performance of various Aerodynamic Shapes.
- Estimate basic flight parameters of aircrafts.
- Estimate power of propulsive devices of aircrafts.
- Distinguish different components of aircrafts navigation and communication systems.

DETAILED CONTENTS

UNIT –I (08 Hrs.)

1. **Basics of flight vehicles:** Classification of Flight Vehicles along with prominent design features, Importance of Strength/Weight Ratio, Loads on different parts of the Vehicle, detailed description of the Fuselage, Wing & Tail Surfaces, Wing Surfaces, Wing Fuselage Joining Methods, different types of Under Carriages, of Manned & Unmanned Space Vehicles Airplanes, Hovercraft, Helicopter & other V/STOL Machines along with examples. Historical Note: Very Early Flight vehicle Development, Sir George Caley, Otto Lilienthal, Percy Pilcher, Wilber and Orville Wright, The Aeronautical Triangle-Langley, the Wright and Glenn Curtiss.

UNIT-II (12 Hrs.)

2. **Airfoils, wings and other aerodynamic shapes:** Airfoil Nomenclature, Lift, Drag, and Moment, Airfoil Data, Infinite versus Finite wings, Pressure Coefficient, Lift coefficient from pressure coefficient, Compressibility Correction, Drag-Divergence Mach No., Wave Drag, Finite Wings, Calculation of Induced Drag, Change in the Lift Slope, Swept Wings, High Lift Flaps, Aerodynamics of cylinder and spheres, alternate explanation of Lift, Historical Note: Airfoils and Wings, The Wright Brothers, British and United States Airfoils(1910 to1920), 1920 to 1930, NACA series Digital Airfoils, Later Airfoils, Modern Airfoil , Finite Wings.

UNIT III (13 Hrs.)

3. **Basics of flight mechanics:** Equations of Motion, Thrust required for level Flight, Thrust available and Maximum velocity, Power required for level Flight, Power available and Maximum Velocity, Rate of Climb, Gliding Flight, Absolute and service Ceilings, Historical Note: Drag Reduction- Early Prediction of Airplane Performance.

   Definition of Stability and Control, Moments on the airplane, Criteria for Longitudinal Static Stability, Wing Contribution, tail Contribution, Static Stability equations, Neutral Point, Static Margin, Historical Note: Drag Reduction- Early Prediction of Airplane Performance, Wright Brothers versus the European philosophy on Stability and Control, The Development of Flight controls, Airplane Design-Evolution and Revolution.

UNIT-IV (12 Hrs.)

4. **Basics of aircraft propulsion:** Propeller, Reciprocating Engine, Jet Propulsion-The thrust Equations, Turbojet, Turbofan, Ramjet and Rocket Engine, Historical Note: Early Development of the Internal Combustion Engine for Aviation, Inventors of the Early Jet Engines, Early History of the Rocket Engine, Solid & liquid Propellant.

5. **Navigation & communication:** Different Navigation Methods, Dead Reckoning, Astronavigation, Ratio Aids, Positive Fixing, Related modern instruments. Instruments landing system, HF& VHF System, Simple Description of Communication Systems using Earth Station & Satellites.

INSTRUCTIONAL STRATEGY

Session Plan / course-material uploading, Visit to Aircraft Hanger, Class-room teaching associated with assignments, presentations, Videos, quiz, in-class tests, viva-voce and evaluation.

RECOMMENDED BOOKS

1 “Introduction to Flight”, J. D. Anderson, 8th Edition, 2015
2 “Flight without Formulae”, A. C. Kermode, Pitman Publishing; 4th revised edition, 1970
3 “Aerodynamics”, L. J. Clancy, Wiley &Sons, 1975

VIDEOS

1. “Aerodynamics: Airfoil Camber, Flaps, Slots-Slats & Drag”, Youtube Video
2 “How Airplanes Fly 1968 FAA Basic Aerodynamics ,“ Youtube Video
3 ”Jet Engines, How it works?” ,“ Youtube Video
4 “Basic Aerodynamics”-CG and Stability,” Youtube Video

AERODYNAMICS

Subject Code –BANES1-302 **L T P Cr** **Duration:45 Hours**
3 0 0 3

COURSE OBJECTIVES

- Differentiate between various types of fluid flow.
- Understand physical significance of Bernoulli's equation, momentum equation and Naiver-Stokes equations.
- Apply concepts of viscous flow to calculate laminar and turbulent boundary layer.

LEARNING OUTCOME

At the end of the course, the student will be able to:

- Classify flow in different categories on the basis of various parameters.
- Develop understanding of various significant non-dimensional numbers used in fluid dynamics.
- Evaluate aerodynamic properties of different planer bodies in inviscid flow theoretically.
- Develop governing equations of flow properties using different conservation principles.
- Find lift force over Joukowsky airfoils by Kutta-Joukowskytheorem.

DETAILED CONTENTS

UNIT – I (10 Hrs.)

1. **Introduction:** Dimensional analysis, units of measurements, similarity parameters, Buckingham-pi theorem, classifications of flow- Continuum and free molecular flows, inviscid and viscous flows, incompressible and compressible flows. Newtonian and Non-Newtonian flows. Streamlines, Pathlines, Streaklines, Pitot static tube, measurement of air-speed, pressure coefficient. Aerodynamic force and moments. Reynolds number.

UNIT – II (18 Hrs.)

2. **Kinematics and Dynamics of Fluid Flow:**Lagrangian and Eulerian methods, Description of properties in a moving fluid, Gradient of a scalar field , Divergence and Curl of a vector field, Line, Surface and Volume integrals and their relationship ,Finite control volume and molecular approach, Divergence of velocity.

   Equation of conservation of mass for control volume, special form of equation of conservation of mass, differential form of equation of conservation of mass, Euler's and Naiver-Stoke equations. Derivation of Bernoulli's equation for inviscid and viscous flow fields. Momentum equation in integral form. Application of momentum equation.

UNIT – III (10 Hrs.)

3. **Inviscid-Incompressible Flow:** Incompressible flow in a duct, Condition on velocity for incompressible flow. Laplace's equations. Vorticity and circulation, Potential function, stream function. Basic elementary flows: Uniform flows, source flow, Doublet flow and Vortex flow. Superimposition of elementary flows. Non-lifting and lifting flow over a circular cylinder, comparison with real flow over circular cylinder. Kutta-Joukowski theorem, generation of lift.

UNIT – IV (07Hrs.)

4. **Viscous flow:** Boundary layer concept, boundary layer properties, derivation of Prandtl's boundary layer equations, Blasius solution, Karman's Integral equation. Turbulent boundary layer over a plate, skin friction drag, boundary layer control.

INSTRUCTIONAL STRATEGY

Videos and images may be referred to explain basic concepts in a better way.

RECOMMENDED BOOKS

1. "Fundamentals of Aerodynamics", John D.Anderson(Jr.), McGraw Hill
2. "Fluid Mechanics", Frank M.White 2nd Edition., McGraw Hill
3. "Aerodynamics for Engineering Students", E.L.Houghton and P.W.Carpenter, 4th Edition., CBS Publishers , India

BASIC OF THERMODYNAMICS

Subject Code –BANES1-303	**L T P Cr**	**Duration:60 Hours**
	3 1 0 4	

COURSE OBJECTIVES

- Explain thermodynamic terminology and concepts appropriately
- Define appropriate system boundaries for analyzing a variety of thermodynamic components and systems
- Determine and calculate the appropriate energy transfers and system properties to analyze closed system processes and cycles
- Determine and calculate the appropriate mass and energy transfers and properties to analyze steady-state control volume applications with any number of heat, work, or mass flows crossing the system boundary
- Determine and calculate appropriate mass and energy transfers and properties to analyze selected transient control volume applications
- Use tables, charts, equations, and software, in conjunction with appropriate property diagrams, to fix states of a pure substance and determine relationships among pressure, temperature, specific volume, internal energy, enthalpy and entropy

LEARNING OUTCOME

At the end of the course, the student will be able to:

- demonstrate that they can apply the principles of conservation of mass, conservation of energy, and the second law of thermodynamics to thermodynamic cycles.
- demonstrate the ability to analyze the performance of vapor and gas power cycles.
- demonstrate the ability to analyze the performance of vapor and gas refrigeration and heat pump cycles.
- Calculate states and performance parameters for vapor power cycles based on the Rankine cycle with superheat, reheat, and regeneration
- Use analytical techniques and/or computer tools (e.g. Matlab) to solve problems and display the results in graphical forms

UNIT – I (13Hrs.)

Fundamental Concepts & Definitions:

Thermodynamic definition and scope, Microscopic and Macroscopic approaches.Some practical applications of engineering thermodynamic Systems, Characteristics of system boundary and controlsurface, examples. Thermodynamic properties; definition and units, intensive , extensive properties, specific properties,pressure, specific volume Thermodynamic state, state point, state diagram, path and process, quasi-static process,cyclic and non-cyclic; processes;Thermodynamic equilibrium; definition, mechanical equilibrium; diathermic wall,thermal equilibrium, chemical equilibrium, Zeroth law of thermodynamics, Temperature; concepts, scales, internationalfixed points and measurement of temperature. Constant volume gas thermometer, constant pressure gasthermometer, mercury in glass thermometer

Work and Heat:

Mechanics, definition of work and its limitations. Thermodynamic definition of work; examples, signconvention. Displacement work; as a part of a system boundary, as a whole of a system boundary, expressions fordisplacement work in various processes through p-v diagrams. Shaft work; Electrical work.Other types of work.Heat;definition, units and sign convention. Problems

UNIT – II (16Hrs.)

First Law of Thermodynamics:

Joules experiments, equivalence of heat and work. Statement of the First law ofthermodynamics, extension of the First law to non - cyclic processes, energy, energy as a property, modes of energy,Extension of the First law to control volume; steady flow energy equation(SFEE), important applications.

Second Law of Thermodynamics:

limitations of first law of thermodynamics Devices converting heat to work; (a) in athermodynamic cycle, (b) in a mechanical cycle. Thermal reservoir,Direct heat engine; schematic representation andefficiency. Devices converting work to heat in a thermodynamic cycle; reversed heat engine, schematic representation,coefficients of performance. Kelvin - Planck statement of the Second law of Thermodynamics; PMM I and PMM II,Clausius statement of Second law of Thermodynamics, Equivalence of the two statements; Carnot cycle, Carnotprinciples. Problems

Reversibility:
Definitions of a reversible process, reversible heat engine, importance and superiority of a reversible heatengine and irreversible processes; factors that make a process irreversible, reversible heat engines. Unresistedexpansion, remarks on Carnot's engine, internal and external reversibility, Definition of the thermodynamic temperaturescale. Problems

Entropy:
Clasius inequality, Statement- proof, Entropy- definition, a property, change of entropy, entropy as aquantitative test for irreversibility, principle of increase in entropy, calculation of entropy using Tds relations, entropyas a coordinate.

UNIT – III (16Hrs.)

Availability, Irreversibility and General Thermodynamic relations.
Introduction, Availability (Exergy), Unavailable energy(anergy), Relation between increase in unavailable energy and increase in entropy.Maximum work, maximum usefulwork for a system and control volume, irreversibility, second law efficiency (effectiveness). Gibbs and Helmholtzfunctions, Maxwell relations, Clapeyron equation, Joule Thomson coefficient, general relations for change in entropy,enthalpy, internal energy and specific heats.
Pure Substances:
P-T and P-V diagrams, triple point and critical points. Sub-cooled liquid, saturated liquid, mixture ofsaturated liquid and vapor, saturated vapor and superheated vapor states of pure substance with water as example.Enthalpy of change of phase (Latent heat).Dryness fraction (quality), T-S and H-S diagrams, representation of variousprocesses on these diagrams.Steam tables and its use.Throttling calorimeter, separating and throttling calorimeter.

UNIT – IV (15Hrs.)

Ideal gases:
Ideal gas mixtures, Daltons law of partial pressures, Amagat's law of additive volumes, evaluation ofproperties of perfect and ideal gases,Air- Water mixtures and related properties, Psychrometric properties, Construction and use of Psychrometric chart.
Real gases –
Introduction , Air water mixture and related properties, Van-der Waal\'s Equation of state, Van-der Waal\'sconstants in terms of critical properties, Redlich and Kwong equation of state Beattie-Bridgeman equation , Law ofcorresponding states, compressibility factor; compressibility chart.Difference between Ideal and real gases.

RECOMMENDED BOOKS

1. **An Introduction to Thermodynamics,** Y.V.C. Rao, University Press (India) Private Limited, Revised Edition, 2004).

2. **Thermodynamics: an Engineering Approach**, Y.A.Cengal and M.A.Boles, McGraw Hill (Fifth edition).
3. **Fundamentals of Classical Thermodynamics**, G.VanWylen, R.Sonntag and C.Borgnakke, John Willey & Sons (Fourth edition).

APPLIED MATHEMATICS-III

Subject Code: BMATH4-301	L T P C 2 0 0 2	Contact Hrs. 30

(No. of lectures shown within brackets)

Transform Calculus

Unit-I

Module 8a: *Transform Calculus* -1
Polynomials – Orthogonal Polynomials – Lagrange's, Chebysev Polynomials; Trigonometric Polynomials, 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 and PDEs by Laplace Transform method. (6)

Module 8b:*Transform Calculus*-2
Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications. (4)

Discrete Mathematics

Unit-II

Module 9a:*Sets, relations and functions*:

Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. (4)

Module 9b:*Propositional Logic:*

Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, Decision problems of propositional logic, Introduction to first order logic and first order theory. (3)

Unit-III

Module 9c:*Partially ordered sets:*

Complete partial ordering, chain, lattice, complete, distributive, modular and complemented lattices, Boolean and pseudo Boolean lattices.
(3)

Module 9d:*Algebraic Structures:*

Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebraic structures with two binary operations-ring, integral domain, and field. Boolean algebra and boolean ring (Definitions and simple examples only). (3)

Unit-IV

Module 9e:*Introduction to Counting:*

Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.

(4)

Module 9f:*Introduction to Graphs:*

Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.

(3)

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
5. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
6. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
7. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed., Addison-Wesley, 1994.
8. K. H. Rosen, Discrete Mathematics and its Applications, 6th Ed., Tata McGraw-Hill, 2007.
9. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Ed., Jones and Bartlett, 2010.
10. N. Deo, Graph Theory, Prentice Hall of India, 1974.
11. S. Lipschutz and M. L. Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 1999.
12. J. P. Tremblay and R. P. Manohar, Discrete Mathematics with Applications to Computer Science, Tata McGraw-Hill, 1997.

STRENGTH OF MATERIALS

Subject Code –BANES1-304	L T P Cr	Duration:60 Hours
	3 1 0 4	

COURSE OBJECTIVES

- This course will make the students understand the concept of stress and strain in different types of structure/ machine underdifferent loading conditions.

- The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

LEARNING OUTCOME

At the end of the subject, the student will be able to:

- Model and analyze the behaviour of structural and machine components subjected to various loading and support conditions based on principles of equilibrium and material constitutional relationships.
- Understand and apply the concept of stress and strain to analyze and design structural members and machine parts under axial load, shear load, bending moment and torsional moment.
- Solve practical problems through evaluating the relationship between stress and strain.
- Analyse composite beams and shafts
- Determine the deflections and deformations of loaded flexural members.
- Analyze a structural member and machine part when loaded beyond elastic limit (inelastic and plastic cases).

DETAILED CONTENTS

UNIT –I (16Hrs.)

1. Simple stresses and strains : Concept of stress and strain; St. Vernants principle, stress and strain diagram, Hooke's law, Young's modulus, Poisson ratio, stress at a point, stress and strains in bars subjected to axial loading. Modulus of elasticity, stress produced in compound bars subject to axial loading. Temperature stress and strain calculations due to applications of axial loads and variation of temperature in single and compound bars. Compound stress and strains, the two dimensional. system; stress at a point on a plane, principal stresses and principal planes; Mohr's circle of stress; ellipse of stress and their applications. Generalized Hook's Law, principal stresses related to principal strains

UNIT –II (16 Hrs.)

2. Bending moment and shear force diagrams: S.F and B.M definitions. BM and SF diagrams for cantilevers, simply supported beams with or without overhangs and calculation of maximum BM and SF and the point of contra-flexure under the following loads:

a) Concentrated loads
b) Uniformity distributed loads over the whole span or part of span
c) Combination of concentrated loads (two or three) and uniformly distributed loads
d) Uniformity varying loads
e) Application of moments
f) Relation between rate of loading, shear force and bending moment

3. Theory of bending stresses in beams due to bending: assumptions in the simple bending theory, derivation of formula: its application to beams of rectangular, circular and channel, I & T-sections,: Combined direct and bending stresses in aforementioned sections, composite / flitched beams.

UNIT –III (16 Hrs.)

4. Torsion: Derivation of torsion equation and its assumptions. Applications of the equation to the hollow and solid circular shafts, torsional rigidity, combined torsion and bending of circular shafts principal stress and maximum shear stresses under combined loading of bending and torsion, analysis of close-coiled-helical springs.

5. Thin cylinders and spheres : Derivation of formulae and calculation of hoop stress, Longitudinal stress in a cylinder, effects of joints, change in diameter, length and internal volume; principal stresses in sphere and change in diameter and internal volume

UNIT –IV (12 Hrs.)

6. Columns and struts : Columns and failure of columns : Euler's formulas; Rankine- Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications.

7. Slope and deflection: Relationship between moment, slope and deflection, Moment area method; method of integration; Macaulay's method: Use of all these methods to calculate slope and deflection for the following :

a) Cantilevers

b) Simply supported beams with or without overhang

c) Under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed loads

INSTRUCTIONAL STRATEGY

The course pedagogy will include lectures, numerical practice, seminars and presentations. It also includes discussion on real life problems related to design of mechanical components which includes all types of stresses. The teachers should demonstrate the following experiments to the students in the Strength of Materials Lab:-

Tensile Test (MS), Compression Test (CI), Brinell Hardness No., Izod Impact, Rockwell Hardness Tester, Spring Stiffness (Spring Compression Testing Machine), Torsion Testing Machine.

RECOMMENDED BOOKS

1. Introduction to Solid Mechanics by D.H Shames, Prentice Hall Inc. 2010
2. Elements of strength of Materials by Timoshenko and Young 2010
3. Strength of Materials by DS Bedi; Khanna book Publishing Company, 2014
4. Strength of materials by R.S Lehri and A.S. Lehri, S.K Kataria and Sons. 2014
5. Strength of Materials by Ferdinand P Singer and Andrew Pytel,Harper and Row H. Kogakusha Publishers, New York
6. Mechanics of Materials by SI Version, end edition by Ferdinand P. Beer and E Russel Johnston (Jr); McGraw Hill, India
7. Mechanics of Materials-SI Version 2nd Edition by EP Popov, Prentice Hall India

AERODYNAMICS LAB

Subject Code –BANES1-305 **L T P Cr** **Duration:30 Hours**

0 0 2 1

COURSE OBJECTIVES

- Select appropriate experimental techniques to study the aerodynamic characteristics of any body.
- Interpret experimental result.

DETAILED CONTENTS

1. Visualization and plotting streamlines of flow field around Symmetric Airfoil and cambered airfoil at subsonic speed in smoke tunnel. Repeat the experiment for three different angles of attack.
    a. Negative angle of attack (say -5^{o})
    b. Zero lift angle of attack
    c. Positive angle of attack of small value, say 5^{o}
    d. Stall angle of attack (i.e. > 15^{o})
2. Identification and plotting different flow structure (wing tip vortices, downwash region, up-wash region, trailing edge wake) around finite wing using smoke at subsonic speed in wind tunnel.
3. Visualization of flow using smoke at subsonic speed around delta wing in wind tunnel.
4. Obtain vortex shedding frequency vs speed plot for Von-Karman vortex around circular non-rotating cylinder in smoke tunnel at subsonic speed.
5. Calculating rotational speed of cylinder for fixed incoming freestream velocity at which
    a. Two stagnation points are obtained
    b. One stagnation point is obtained
    c. No stagnation point is obtained on the surface of cylinder

    Use smoke tunnel for this experiment. Repeat this experiment for at least three different velocity.
6. Calculating angle of attack at which flow separates over the surface of aircraft using tufts in wind tunnel. Identify the regions over the aircraft surface where flow remains separated at relatively low angles of attack.
7. Visualization and plotting of flow separation process and wing tip vortices around 3D wing at different angle of attack using tufts in wind tunnel.
8. Plotting the flow field, using oil pattern, around airfoil at different angle of attack in wind tunnel.

RECOMMENDED BOOKS

1. "Low speed wind tunnel testing", Jewel B. Barlow, John Wiley & sons
2. "Experimental Aerodynamics", Henry Christensen, Pavian,Pitman Publishing
3. "Wind Tunnels: Aerodynamics, Models & Experiments (Engineering Tools, Techniques and Tables)", Justin D. Pereira.

MEANS OF ASSESSMENT

Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce.

STRENGTH OF MATERIALS LAB

Subject Code –BANES1-306 L T P Cr Duration:30 Hours

0 0 2 1

OBJECTIVES

To supplement the theoretical knowledge gained in Strength of Materials with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness

LIST OF EXPERIMENTS

1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium 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
    a) Unhardened specimen
    b) Quenched Specimen and
11. Quenched and tempered specimen. Microscopic Examination of
    a) Hardened samples and
    b) Hardened and tempered samples.

MEANS OF ASSESSMENT

Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce.

*NOTE: Workshop Training will be imparted in the Institution at the end of 2nd semester for Four (04) weeks duration (Minimum 36 hours per week).students will learn manufacturing practices. Students will also undergo training of 3D CAD modeling software (SOLIDWORKS). Students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective institutions; contribution at incubation/ innovation /entrepreneurship cell of the institute; participation in conferences/ workshops/ competitions etc.

AIRCRAFT PERFORMANCE

Subject Code –BANES1-401 **L T P Cr** **Duration:60 Hours**
3 1 0 4

COURSE OBJECTIVES

- The course enables students to learn various concepts related to atmosphere, aerodynamic characteristics, performance parameters and energy methods.
- The course enables students to analyze and estimate performance parameters of different types of aircraft for steady and accelerated flights.

LEARNING OUTCOME

After undergoing the subject, the student will be able to:
- Analyze atmosphere and estimate atmospheric properties.
- Analyze drag for 2D and 3D cases for subsonic and supersonic aircrafts.
- Analyze aerodynamic characteristics of different types of aircrafts.
- Estimate performance parameters for steady flight.
- Estimate performance parameters for accelerated flight.
- Analyze maneuvers and Energy methods.

DETAILED CONTENTS

UNIT – I (11Hrs.)

1. Atmosphere: Standard atmosphere, Relation between geo-potential and geometric altitudes, Pressure, temperature and density altitudes. Relations for isothermal and gradient atmospheric regions, Stability of atmosphere, Measurement of air-speed: Indicated airspeed, Calibrated airspeed, Equivalent airspeed and True airspeed, Airspeed indicator.

UNIT – II (20Hrs.)

2. Drag: Drag, Causes of drag, Types of drag, Factors affecting drag. Drag polar, Compressibility drag, Design for minimum drag, Estimation of drag of complete airplane for subsonic and supersonic cases, Terminal velocity.

3. Aerodynamic characteristics: Force and Moment coefficients from dimensional analysis and their variation with angle of attack, Lift, Drag and moment coefficients, Relations between lift and drag, Aerodynamic center, Center of pressure, Pressure distribution over 2-D airfoil, Estimation of aerodynamic characteristics from measured pressure distribution, Variation of aerodynamic coefficients with Reynold's Number and Mach number, Effect of span, aspect ratio, plan form, sweep, taper and twist on aerodynamic characteristics of a lifting surface, Delta wing aerodynamics.

UNIT – III (16Hrs.)

4. High lift devices: Maximum lift coefficient of airfoils, Leading and trailing edge devices, Deep stall, Propulsive lift, V/STOL configurations.

5. Aircraft performance in steady flight: Straight and Level flight, Variation of drag with flight speed, Minimum drag conditions, Variation of power with flight speed, Minimum power conditions, Gliding flight, Shallow and steep angles of glide, Sinking speed, Minimum sinking speed, Time of descent, Climbing flight at shallow angles, Correction for steep angles, Time to flight, Maximum rate of climb.

UNIT – IV (13Hrs.)

6. Aircraft performance in accelerated flight: Take-off and landing, Calculation of take-off ground run and take off distances, Minimum ground run, Assisted take-off, Calculation of landing ground run and landing distances, Range and endurance, Numerical problems.

7. Maneuvers and energy method: Maneuvering performance, Introductory comments on spins and stalls, Analysis of Spin, Various types of stalling behavior of wings, Turning flight, Maneuvers in 3-D space, Karman's method of JATO, Energy method of performance calculations

INSTRUCTIONAL STRATEGY

The course consists of conceptual and numerical contents for which a combination of LCD projector and black/white boards can be used as teaching aids.

RECOMMENDED BOOKS

1. Aircraft Performance and Design: J. D. Anderson Jr., TATA McGraw-Hill, 2010.
2. Aerodynamics for Engineering Students: E.L. Houghton and N.B. Carruthers, Butterworth Heinemann, 1982.
3. Introduction to Flight: J. D. Anderson Jr., TATA McGraw-Hill, 8th Edition, 2015.

AIRCRAFT STRUCTURES

Subject Code –BANES1-402 **L T P Cr** **3 1 0 4** **Duration:60 Hours**

COURSE OBJECTIVES

- To enable the student to explain basic principles of elasticity.
- The student should be able to calculate loads acting on the aircraft.
- The student should also be able to do stress analysis of statically determinate and indeterminate structures by matrix method and Finite Element methods.
- To enable the student to find buckling loads of columns and plates

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Perform stress analysis of beams, columns and trusses by applying various methods.
- Calculate deflection of structures by various methods..
- Perform stress analysis of statically determinate and indeterminate structures.

- Estimate loads acting on an aircraft.
- Estimate buckling loads of columns and plates.

DETAILED CONTENTS

UNIT –I (12 Hrs.)

1. **Basics of elasticity:** Equations of equilibrium, plane stress, stresses on inclined planes, principal stresses ,compatibility equations ,plane strain ,principal strains, stress-strainrelationship**,** numerical problems, temperature effects, experimental measurement of surface strains,2- D problems, stress functions, St. Venant's principle, bending of end loaded cantilever.

UNIT-II (20 Hrs.)

2. **Statically determinate and indeterminate structures:** Statically determinate and indeterminate trusses. Truss analysis by method of joints, Truss analysis with single and double redundancy, other structures with single redundancy, shear center, principle of superposition, Maxwell reciprocal theorem, numerical problems.

3. **Matrix methods:** Introduction to flexible and stiffness methods, choice of method ,stiffness matrix for elastic springs, analysis of pin jointed framework, stiffness matrix for uniform beams. Finite Element Method for continuum structures

UNIT-III (18 Hrs.)

4 **Elastic buckling of columns and plates:** Buckling load of Euler columns with different end conditions, beam columns, effect of initial imperfections, pure bending of thin plates, plates subjected to bending and twisting, plates subjected to distributed transverse loads, numerical problems.

5 **Loads on aircraft:** Pure translation, inertia forces on rotating bodies, load factors for translational acceleration, load factors for angular acceleration, numerical problems.

UNIT IV (10 Hrs.)

6. **Analysis of aircraft components:** Loads on structural components, functions of structural components, fabrication of structural components, connections, V-n diagram, Gust loads, crack propagation, stress concentration factor, crack tip plasticity, crack propagation rates

INSTRUCTIONAL STRATEGY

Aircraft Structures being fundamental course, teachers are expected to lay emphasis explain the basic concepts, principles and their applications to aircraft structures. For this purpose teachers are expected to give simple problems and provide tutorial exercises. The teachers are expected to show the actual parts of aircraft wing and fuselage.

RECOMMENDED BOOKS:

1 "Aircraft Structures for Engineering Students", T.H.G.Megson ,4th Edition,Elsevier Ltd., 2012

2 "Aircraft structures", D.J.Peery and J.J.Azhar, 2nd Edition., McGraw Hill, 1996

3 "Structural stability of Columns and Plates", N G R Iyengar, John Wiley & sons, 1988

Ocw.mit.edu/courses/aeronautics-and-astronautics

AIRCRAFT PROPULSION

Subject Code –BANES1-403 **L T P Cr** **Duration:60 Hours**
3 1 0 4

COURSE OBJECTIVES

- The basic knowledge and governing laws of various modes of heat transfer, aero- and thermodynamic aspects of propulsive devices, such as, propellers, piston type and turbine type aero engines, their performance parameters and the essential knowledge of fuel combustion, standard ratings of aviation fuels and propellants used in rocket engines.

- With this basic knowledge, the student can move on to studying the advance propulsion systems.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Define governing laws of various IC Engines, cycles and modes of heat transfer; thermodynamic aspects of aerospace propulsion systems and their performance parameters
- Describe fuel combustion and flame-stability.
- Examine and analyze compressors and turbines.
- Estimate performance of various types of engines

DETAILED CONTENT

UNIT I: (17 Hrs.)

1. **Heat Transfer and Propellers:** Heat transfer process, Heat conduction, thermal conductivity, general equations of heat conduction with source, conduction problems in 1D and 2D with and without source; Convective heat transfer fundamentals, Introduction to radiative heat transfer, Coupled heat transfer problems.

   Ideal momentum theory and blade element theory and their relative merits, numerical problems on the performance of propellers using propeller charts, selection of propellers, fixed, variable and constant speed propellers, prop-fan, material for propellers, shrouded propellers helicopter rotor in hovering performance.

UNIT II: (16 Hrs.)

2. **Aircraft Piston Engines**: Brief historical sketch of S.I. and C.I. engines, 4-stroke and 2-stroke engines, thermodynamics of engine analysis, combustion process, air standard cycles, various type of arrangements or multi-cylinder aircraft engines, their merits and operational efficiencies, intake and exhaust manifolds, cooling and lubrication systems, valve timing and arrangements, I.H.P., B.H.P and F.H.P, engine performance, effect of altitude, power required and power available, supercharging, preliminary design of aircraft piston engine.

UNIT III: (14 Hrs.)

3. **Fuels and Combustion:** Liquid fuels, hydrocarbons, gasoline, starting mixtures and temperatures, vapor lock, other liquid fuels and blends, combustion knock and knock rating, carburetion and fuel injection, ignition of the charge, ignition system, and gas turbine fuels, solid and liquid propellants

UNIT IV: (13 Hrs.)

4. **Aircraft Gas Turbine Engines:** Air-standard Brayton cycle, actual gas turbine engine cycle, compressor and turbine efficiencies, compressor work and turbine work, centrifugal and axial type of compressor, their comparative action, relative merits in operations, combustion chambers: various arrangements, simplex and duplex burners.

INSTRUCTIONAL STRATEGY

Session plan/course-material uploading, class-room teaching associated with assignments, quiz, viva-voce and evaluation.

RECOMMENDED BOOKS

1. Holman J.P., “Heat Transfer”, 2nd Edition, McGraw Hill.

2. Gebhart B., "Heat Transfer", 2nd Edition, McGraw Hill.
3. Dommasch, Sherby and Connolly, "Airplane Aerodynamics", Pitman.
4. Litchy L.C., "I C. Engines", McGraw Hill.
5. Mattingly J.D., "Elements of Gas Turbine Propulsion", McGraw Hill 1st Ed.1997.
6. Cohen Rogers and Sarvanmattoo, "Gas Turbine Theory", John Wiley.
7. P. G. Hill and C. R. Peterson, "Mechanics and Thermodynamics of Propulsion", Addison Wesley, 1970.
8. J.L Kereebrock, "Aircraft Propulsion System Technology and Design", MIT Press, 1991.

AIRCRAFT SYSTEMS AND INSTRUMENTATION

Subject Code –BANES1-404	**L**	**T**	**P**	**Cr**	**Duration:45 Hours**
	3	**0**	**0**	**3**	

COURSE OBJECTIVES

- To enable the student to describe control systems of aircraft.
- The student should be able to describe working principle of Flight instruments
- The student should be able to apply the knowledge of digital system to covert and acquire data from various subsystems.

LEARNING OUTCOMES

After undergoing the subject, student will be able to:

- Illustrate various types of aircraft control systems mechanisms.
- Design Hydraulic and Pneumatic Systems for aircraft subsystems.
- Use Gyroscope and Accelerometer for effective navigation and guidance of aircraft.
- Explain the role of cockpit instruments and system of aircraft.
- Use digital system to confined and acquire data from various subsystems.

UNIT –I (10 Hrs)

1. **Flight control systems:** Conventional Systems, Power assisted and Fully Powered Flight Controls, Power Actuated Systems, Engine Control Systems, Push Pull Rod System, Flexible Push Full Rod System, Components, Modern Control Systems, Digital Fly by Wire Systems, Auto Pilot System, Active Control Technology.

2. **Communication and navigation system:**Introduction to Communication and navigation system of aircraft, Instrument Landing Systems, VOR, CCV Case Studies.

UNIT –II (10 Hrs.)

3. **Aircraft systems:** Hydraulic Systems: Study of Typical Workable System components, Hydraulic System Controllers, Modes of Operation, Pneumatic Systems: Advantages, Working Principles, Typical Air Pressure System, Brake System, Typical Pneumatic Power SystemComponents, Landing Gear Systems: Classification, Shock Absorbers, Retraction Mechanism.

UNIT –III (13 Hrs.)

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4. **Engine systems:** Fuel Systems for Piston and Jet Engines, Components of Multi Engines, Lubricating Systems for Piston and Jet Engines, Engine Starting and Ignition Systems, Typical examples for Piston and Jet Engines.

5. **Auxiliary system:** Basic Air Cycle Systems, Vapor Cycle Systems, Boot-Strap Air Cycle System, Pressurization system, Oxygen Systems, Fire Protection Systems, Deicing and Anti Icing Systems.

UNIT –IV (12 Hrs)

6. **Gyroscopic instruments:** Gyroscope and its properties, gyro system, Vertical gyroscope-Horizon, Direction gyro-direction indicator, Rate gyro-rate of turn and slip indicator, acceleration and turning errors.

7. **Measurements and instrumentation:** Pressure measurement, temperature measurement, fuel quantity measurement, engine power and control instruments-measurement of RPM, manifold pressure, torque, exhaust gas temperature, EPR, fuel flow, engine vibration, monitoring. Data acquisition and Handling systems: Introduction-signal conditioners-Instrumentation amplifiers-filters. Data conversion -multiplexers-A/D-D/A conversion. Telemetry-Airborne and ground system-PC based telemetry system. Introduction to telemetry flight data testing. Application of telemetry in UAVs and Satellites.

INSTRUCTIONAL STRATEGY

Session Plan/course-material uploading, Aircraft Hanger Visit, Class-room teaching associated with assignments, presentations, Videos of animation of aircraft systems and Flight Instruments working, quiz, in-class tests, viva-voce and evaluation.

RECOMMENDED BOOKS

1 Electrical and Electronics measurements and instruments. Author, A.K. Shawney, 2010

2 Aircraft flight instrumentation by Pallett, 1988

3 Advanced Aircraft Systems by David A. Lombardo, 1993

Airframe and Powerplant MECHANICS (Airframe Book), FAA, 1976

Note: Select any one subject for Management-I

MANAGEMENT –I (Introduction to Industrial Management)

SubjectCode-BHSMC0-018	L T P Cr 3 0 0 3	Duration – 45 hrs

COURSE OBJECTIVES

- Ability to communicate effectively with a range of audiences
- Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- Ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- Ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- Ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

LEARNING OUTCOMES

- Understand the theories and principles of modern management and apply the concepts to the management of organisations in private and public sector.
- Understand how managers can effectively plan in today's dynamic environment, be familiar with the design of organisation structure and describe how environmental uncertainty affects organisation design.
- Identify what strategies organisations might use to become more customer oriented and be more innovative. Identify the characteristics of effective teams and understand why teams have become so popular in organisations.
- Describe contemporary theories of motivation and discuss the challenges managers face in motivating unique group of workers.

UNIT –I (10 Hrs.)

Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Social responsibilities of Management, Introduction to Human resources management: Nature of HRM, functions and importance of HRM.

UNIT –II (13 Hrs.)

Introduction: Concept and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership. Cost

Classification: Prime Cost, Overhead Cost, Selling & Distribution Cost, Fixed Cost, Variable Cost, Implicit and Explicit Cost, Opportunity Cost , Marginal Cost, Sunk Cost

UNIT –III (12 Hrs.)

Work Study: Introduction, definition, objectives, steps in work study, Method study: definition, objectives, steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations — work sampling, Production Planning and Control Inventory Control: Inventory, Cost, Models of inventory control: EOQ, ABC, VED

UNIT –I (10 Hrs.)

Quality Control: statistical quality control, Control charts for variables and attributes, Acceptance Sampling- Single sampling- Double sampling plans, Introduction to TQM. Project Management: Project network analysis, CPM, PERT and Project crashing and resource Leveling

Reference Books

1. Engineering Management (Industrial Engineering & Management)/ S.C. Sharma & T.R. Banga, Khanna Book Publishing Co. (P) Ltd., Delhi (ISBN: 978-93-86173-072)
2. Industrial Engineering and Management/ P. Khanna, Dhanpatrai publications Ltd.
3. Production & Operation Management /PaneerSelvam /PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning
5. Industrial Engineering Management I RaviShankar/ Galgotia

MANAGEMENT –I (Fundamentals of Management for Engineers)

SubjectCode-BHSMC0-014	**L T P Cr 3 0 0 3**	**Duration – 45 hrs**

COURSE OBJECTIVES

- To help the students gain understanding of the functions and responsibilities of managers.
- To provide them tools and techniques to be used in the performance of the managerial job.
- To enable them to analyze and understand the environment of the organization.
- To help the students to develop cognizance of the importance of management principles.

LEARNING OUTCOMES

- Understand the concepts related to Business.
- Demonstrate the roles, skills and functions of management.
- Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
- Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.

UNIT – I (10 Hrs)

Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach

UNIT – II (13 Hrs)

Planning and Decision Making: General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Creativity and Innovation in Managerial Work.

UNIT – III (12 Hrs)

Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization. Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal

Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Handling Employee and Customer Complaints

UNIT – IV (10 Hrs)

Team Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls,

Recommended Books

1. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.
3. Essentials of Management, Koontz Kleihrich, Tata McGraw Hill
4. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012

ENVIRONMENTAL SCIENCES

Subject Code- BMNCC0-002 **L T P Cr 3 0 0 0** **Duration – 45 hrs**

Course Objectives:

- To identify global environmental problems arising due to various engineering/ industrial/ and technological activities and the science behind these problems
- To realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- To identify the major pollutants and abatement devices for environmental management and sustainable development.
- To estimate the current world population scenario and thus calculating the economic growth, energy requirement and demand.
- To understand the conceptual process related with the various climatologically associated problems and their plausible solutions.

UNIT-I (10 Hrs.)

The Multidisciplinary nature of environmental studies, Definition, Scope and importance, Need for public awareness.

UNIT-II (12 Hrs.)

1. Natural Resources: Renewable and non-renewable Resources: Natural Resources and AssociatedProblems.
2. Forest Resources: Use and Over-exploitation, Deforestation, Case Studies. Timber Extraction,Mining,DamsandtheirEffectsonForestsandTribalPeople.
3. Water Resources: Use and over-Utilization of surface and ground water, floods, drought, conflicts and water, dams-benefits andproblems.
4. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, casestudies.
5. Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
6. EnergyResources:Growingenergyneeds,renewableandnon-renewableenergysources, use of alternate energy sources. Casestudies.

7. Land Resources: Land as a resource, land degradation, man induced landslides, soil erosion anddesertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainablelifestyles.

UNIT-III (12 Hrs.)

Ecosystems: Concept of an Ecosystem, Structure and Function of an Ecosystem, Producers, Consumers and Decomposers, Energy Flow in The Ecosystem, Ecological Succession, Food Chains, Food Webs and Ecological Pyramids, Introduction, Types, Characteristic Features,

Structure and Function of the Following Ecosystem:
1. ForestEcosystem
2. GrasslandEcosystem
3. DesertEcosystem
4. Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans,Estuaries

UNIT-IV (11 Hrs.)

Environmental Pollution: Definition, Causes, Effects and Control m
1. Airpollution
2. Waterpollution
3. Soilpollution
4. Marinepollution
5. Noisepollution
6. Thermalpollution
7. Nuclear hazards

Solid Waste Management: Causes, Effects and Control Measures of Urban and Industrial wastes. Role of an Individual in Prevention of Pollution. Pollution Case Studies, Disaster Management: Floods, Earthquake, Cyclone and Landslides.

AIRCRAFT STRUCTURES LAB

Subject Code –BANES1-405	L T P Cr	Duration:30 Hours
	0 0 2 1	

COURSE OBJECTIVE

The aircraft structures Lab with enable the student to conduct experiments, so that they are able to understand the theoretical concepts and principles in a better way.

DETAILED CONTENTS

1 Prove Maxwell Reciprocal theorem for a simply supported beam

2 Prove Maxwell Reciprocal theorem for a cantilever beam

3 To determine/calculate shear centre of a channel section

4 Determine/calculate shear centre of a Z section

5 To Determine/calculate shear centre of a rectangular section

6 Find direct strain in a simply supported beam by strain gauges

7 Determine/calculate direct strain in a cantilever by strain gauges

8 Stress analysis of a truss by using software

9 Stress analysis of initially bent column by using software

10 Stress analysis of a pinned column by using software

11 Stress analysis of a column with both ends fixed by using software

MEANS OF ASSESSMENT

Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce.

AIRCRAFT PROPULSION LAB

Subject Code –BANES1-406 **L T P Cr** **Duration:30 Hours**
0 0 2 1

COURSE OBJECTIVE

- At the end of this course, the student should be able to perform experiments to measure different aircraft engine parameters.

DETAILED CONTENTS

1. Study the functioning of aircraft piston engines having various arrangements of cylinders.
2. Study of Jet Engine.
3. Experiments on Continuous Combustion test rig.
4. Conduct Morse test on given multi cylinder engine.
5. Conduct dynamometer test and retardation test
6. Performance test on reciprocating air compressor.

MEANS OF ASSESSMENT

Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce.

***NOTE**: During the summer vacation after 4th/ 6th semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry.