JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. AERONAUTICAL ENGINEERING

COURSE STRUCTURE & SYLLABUS (2016-17)

II YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	MA301BS	Mathematics – IV	4	1	0	4
2	ME301ES	Fluid Mechanics and Hydraulic Machines	4	1	0	4
3	AE302ES	Aircraft Production Technology	3	0	0	3
4	ME303ES	Mechanics of Solids	3	0	0	3
5	ME304ES	Thermodynamics	4	1	0	4
6	AE305ES	Aircraft Production Technology Lab	0	0	3	2
7	ME307ES	Mechanics of Solids Lab	0	0	3	2
8	ME310ES	Fluid Mechanics and Hydraulic Machines Lab	0	0	3	2
9	*MC300HS	Gender Sensitization Lab	0	0	3	0
		Total Credits	**18**	**3**	**12**	**24**

II YEAR II SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	AE401ES	Low Speed Aerodynamics	4	1	0	4
2	AE402ES	Fundamentals of Structural Analysis	4	1	0	4
3	AE403ES	Aircraft Performance	4	1	0	4
4	AE404ES	Control Theory	3	1	0	3
5	SM405MS	Business Economics and Financial Analysis	3	0	0	3
6	AE406ES	Electrical and Electronics Engineering Lab	0	0	3	2
7	AE407ES	Numerical Simulation with MATLAB	0	0	3	2
8	AE408ES	Aircraft Engineering Drawing with CAD	0	0	3	2
9	*MC400ES	Environmental Science and Technology	3	0	0	0
		Total Credits	**21**	**4**	**9**	**24**

MA301BS: MATHEMATICS - IV
(Complex Variables and Fourier Analysis)

B.Tech. II Year I Sem.

L	T	P	C
4	1	0	4

Prerequisites: Foundation course (No Prerequisites)**.**

Course Objectives: To learn

- differentiation and integration of complex valued functions
- evaluation of integrals using Cauchy's integral formula
- Laurent's series expansion of complex functions
- evaluation of integrals using Residue theorem
- express a periodic function by Fourier series and a non-periodic function by Fourier transform
- to analyze the displacements of one dimensional wave and distribution of one dimensional heat equation

Course Outcomes: After learning the contents of this paper the student must be able to

- analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
- find the Taylor's and Laurent's series expansion of complex functions
- the bilinear transformation
- express any periodic function in terms of sines and cosines
- express a non-periodic function as integral representation
- analyze one dimensional wave and heat equation

UNIT – I

Functions of a complex variable: Introduction, Continuity, Differentiability, Analyticity, properties, Cauchy, Riemann equations in Cartesian and polar coordinates**.** Harmonic and conjugate harmonic functions-Milne-Thompson method

UNIT - II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, and Generalized Cauchy's integral formula, Power series: Taylor's series- Laurent series, Singular points, isolated singular points, pole of order m – essential singularity, Residue, Cauchy Residue theorem (Without proof).

UNIT – III

Evaluation of Integrals: Types of real integrals:

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

Bilinear transformation- fixed point- cross ratio- properties- invariance of circles.

UNIT – IV

Fourier series and Transforms: Introduction, Periodic functions, Fourier series of periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half range sine and cosine series.

Fourier integral theorem (without proof), Fourier sine and cosine integrals, sine and cosine, transforms, properties, inverse transforms, Finite Fourier transforms.

UNIT – V

Applications of PDE: Classification of second order partial differential equations, method of separation of variables, Solution of one dimensional wave and heat equations.

TEXT BOOKS:

1. A first course in complex analysis with applications by Dennis G. Zill and Patrick Shanahan, Johns and Bartlett Publishers.
2. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
3. Advanced engineering Mathematics with MATLAB by Dean G. Duffy

REFERENCES:

1. Fundamentals of Complex Analysis by Saff, E. B. and A. D. Snider, Pearson.
2. Advanced Engineering Mathematics by Louis C. Barrett, McGraw Hill.

ME301ES: FLUID MECHANICS AND HYDRAULIC MACHINES

B.Tech. II Year I Sem.

L	T	P	C
4	1	0	4

Course Objectives: The objectives of the course are to enable the student;

1. To understand the basic principles of fluid mechanics
2. To identify various types of flows
3. To understand boundary layer concepts and flow through pipes
4. To evaluate the performance of hydraulic turbines
5. To understand the functioning and characteristic curves of pumps

Course Outcomes:

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
4. To select and analyze an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts.

UNIT - I

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT - II

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flows.

Fluid dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT - III

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: Pitot tube, venturi meter, and orifice meter, Flow nozzle

UNIT - IV

Basics of turbo machinery : Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines : Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design –draft tube theory- functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT - V

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

REFERENCES:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

AE302ES: AIRCRAFT PRODUCTION TECHNOLOGY

B.Tech. II Year I Sem.	L	T	P	C
Course Code:	3	0	0	3

UNIT – I

Casting and Welding: General principles of various Casting Processes: Sand casting, die-casting, centrifugal casting, investment casting; shell moulding types; Principles and equipment used in arc welding, gas welding, resistance welding, solid phase welding process, laser welding, Electron beam welding, Soldering and brazing techniques.

UNIT – II

Machining and Forming: General Principals (with schematic diagram only) of working and types: lathe, shaper, milling machines, grinding, drilling machine, CNC machining and general principles; Sheet metal operations: shearing, punching, super plastic forming; Automation in bend forming and different operations in bending like stretch forming spinning drawing etc.

UNIT – III

Unconventional Machining: Principles (with schematic diagram only) of working and applications of abrasive jet machining, ultrasonic machining.
Electric discharge machining and electro chemical machining, laser beam/electron beam/plasma arc machining.

UNIT – IV

Tooling, Assembly and NDT: Jigs, fixtures, and stages of assembly; Types of equipment for riveted joints, bolted joints, Aircraft tooling concepts; NDT and other Inspection techniques: Dye penetrant test, X-Ray, magnetic particle, and ultrasonic testing, Acoustic holography.

UNIT – V

Introduction to Additive Manufacturing: Introduction to AM, AM evolution, Distinction between AM & CNC machining, Advantages of AM, Guidelines for process selection: Introduction, selection methods for a part, challenges of selection, example system for preliminary selection, production planning and control, AM applications, Future directions of AM.

TEXT BOOKS:

1. Kalpakajam, “Manufacturing Engineering and Technology”, Addison Wesley 5th Edn, 1991.

REFERENCE BOOKS:

1. Keshu S. C, Ganapathy K.K, “Air craft production techniques”, Interline Publishing House, Bangalore, 3rd Edition, 1993.
2. R. K Jain-Khanna, “Production technology”, Mc Graw Hill, 1st Edition, 2002.
3. O. P Khanna, Lal. M. Dhanpat Rai, “Production technology”, 5th Edition, 1997.

ME303ES: MECHANICS OF SOLIDS

B.Tech. II Year I Sem.

L	T	P	C
3	1	0	3

Course Objectives: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.
This course will advance the students' development of the following broad capabilities:

1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations.
4. Students will understand how to calculate normal and shear stresses

Course Outcomes:

1. Analyze the behavior of the solid bodies subjected to various types of loading;
2. Apply knowledge of materials and structural elements to the analysis of simple structures;
3. Undertake problem identification, formulation and solution using a range of analytical methods;
4. Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
5. Expectation and capacity to undertake lifelong learning

UNIT - I

Simple Stresses & Strains: Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT - II

Shear Force and Bending Moment : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT - III

Flexural Stresses : Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT - IV

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions. **Theories of Failure**: Introduction – Various theories of failure - Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

UNIT - V

Torsion of Circular Shafts : Theory of pure torsion – Derivation of Torsion equations : T/J = q/r = Nθ/L – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells.

TEXT BOOKS:

1. Strength of materials – R.S. Kurmi and Gupta.
2. Solid Mechanics by Popov
3. Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.
4. Strength of Materials – W.A. Nash, TMH

REFERENCES:

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol –I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt. Ltd.
4. Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.
5. Strength of Materials by S. S. Rattan, Tata McGraw Hill Education Pvt. Ltd.
6. Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd
7. Strength of Materials by R.K Rajput, S. Chand & Company Ltd.

ME304ES: THERMODYNAMICS

B.Tech. II Year I Sem.

L	T	P	C
4	1	0	4

Pre-requisite: Engineering Chemistry and Physics

Course Objective: To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

Course Outcomes: At the end of the course, the student should be able to Understand and differentiate between different thermodynamic systems and processes. Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis. Understand and analyze the Thermodynamic cycles and evaluate performance parameters.

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables

UNIT – I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path function, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT - II

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump , Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT – III

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes

UNIT - IV

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric chart.

UNIT - V

Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Refrigeration Cycles:

Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:

1. Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Thermodynamics for Engineers / Kenneth A. Kroos ; Merle C. Potter/ Cengage

REFERENCE BOOKS:

1. Engineering Thermodynamics / Chattopadhyay/ Oxford
2. Engineering Thermodynamics / Rogers / Pearson

AE305ES: AIRCRAFT PRODUCTION TECHNOLOGY LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	2

List of Experiments:

1. Introduction- lathe machine, plain turning, Step turning & grooving.
2. Taper turning-compound rest/offset method & Drilling using lathe.
3. External threading-Single start
4. Eccentric turning-Single axis
5. Shaping-V-Block.
6. Grinding-Cylindrical /Surface/Tool & cutter.
7. Slotting-Keyways.
8. Milling-Polygon /Spur gear
9. Gear hobbing-Helical gear
10. Drilling, reaming, counter boring.

REFERENCES:

1. Keshu S. C, Ganapathy K. K, "Air craft production techniques", Interline Publishing House, Bangalore, 3rd Edition, 1993.
2. R. K Jain-Khanna, "Production technology", McGraw Hill, 1st Edition, 2002.
3. O. P Khanna, Lal. M. Dhanpat Rai, "Production technology", 5th Edition, 1997.

ME307ES: MECHANICS OF SOLIDS LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	2

Course Objectives:

The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

The students will advance the students' development of the following broad capabilities:

1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
4. Students will understand how to calculate normal and shear stresses on any cross-section of a beam. Different cross-sections (including I-beam) will be discussed and applied Continuous Assessment Test 10 marks Mid Semester Test 15 marks End

Course Outcomes

1. Analyze the behavior of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods
4. Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
5. Expectation and capacity to undertake lifelong learning.

Any 10 experiments from the following

1. Direct tension test
2. Bending test on Simple supported beam
3 Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test

6. Rockwell hardness test
7. Test on springs
8. Compression test on cube
9. Izod Impact test
10 .Charpy Impact test
11. Punch shear test

ME310ES: FLUID MECHANICS AND HYDRAULIC MACHINES LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	2

Course Objectives:

1. To understand the basic principles of fluid mechanics.
2. To identify various types of flows.
3. To understand boundary layer concepts and flow through pipes.
4. To evaluate the performance of hydraulic turbines.
5. To understand the functioning and characteristic curves of pumps.

Course Outcomes:

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design.
4. To select and analyze an appropriate turbine with reference to given situation in power plants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts.

List of Experiments:

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli's Theorems

Note: Any 10 of the above 12 experiments are to be conducted.

MC300HS: GENDER SENSITIZATION LAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	3	0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT-I
UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)

Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT-II
GENDER AND BIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)

Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many? Struggles with Discrimination.

UNIT-III
GENDER AND LABOUR

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV

ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu"*.

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT-V

GENDER: CO - EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK

All the five Units in the Textbook***, "Towards a World of Equals: A Bilingual Textbook on Gender"*** written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "*I Fought For My Life…and Won*."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

AE401ES: LOW SPEED AERODYNAMICS

B.Tech. II Year II Sem.

L	T	P	C
4	1	0	4

UNIT – I

Review of Fluid Mechanics: Importance of Aerodynamics, Fundamental aerodynamics variables and dimensional analysis (statement of Buckingham π – theorem) leading to force & moment coefficient and dimensionless similarity parameters such as Reynolds number, Mach number, incompressible flow, compressible flow and Mach number- Continuity & momentum equations in differential form. Euler equation, viscosity, Navier – Stokes equation, Reynolds number as an order- of-magnitude messure of ratio of Inertia forces to viscous forces.

UNIT – II

Inviscid Incompressible Flows: Large Reynolds number flows, Prandtl's Boundary Layer Hypothesis, viscous boundary layer flow and inviscid external flow. Justification of inviscid flow analysis. Angular Velocity, Vorticity and circulation, Kelvin Theorem and irrotational flow velocity potential, Stream function, Laplace equation, boundary condition at infinity and wall, Elementary flows and their combinations, flow past circular cylinder – non lifting case, lifting case & Magnus effect, the spinning tennis ball, D'Alembert's Paradox, Kutta – Joukowsky theorem – circular cyclinder with vortex, airfoil as an arbitrary cylinder with a sharp trailing edge, Kutta condition. Kelvin's circulation theorem & starting vortex, concept of small perturbation & thin airfoil theory – linearization of the boundary condition, resolution of thin airfoil problem into lifting & nonlifting cases, their solutions by method of singularity distribution, the aerodynamic center, the center of pressure, load representation.

UNIT – III

Viscous Flow And Boundary Layer: Role of viscosity in fluid flow. boundary layer growth along a flat plate and nearly flat surface, displacement thickness and patching of inviscid external flow to viscous boundary layer flow, laminar boundary layer, transition and turbulent boundary layer, skin friction drag by integration of tangential stress & pressure drag by integration of normal stress, factors influencing boundary layer separation – adverse pressure gradient and sharp bending / turning of surface. Real (Viscous) flow and variation of drag coefficient with Reynolds number for circular cylinder. Real (viscous) flow and importance of skin friction drag for airfoils. Effect of transition and surface roughness on airfoils, N – S equation, Boundary layer approximation, Blasius solution for the flat plate problem. Definition of momentum thickness & derivation of Von Karman's momentum equation.

UNIT – IV

Invicid Flow Over Wings & Panel Methods: Vortex filament statement of Helmholtz's vortex theorems, Biot – Savart Law, starting, bound & trailing vortices of wings, Lanchester's experiment, Prandtl's Lifting line theory – downwash and induced drag,

Elliptic loading & wings of elliptic plantforms, expression for induced drag, minimum induced drag for Elliptic planform. Source and vortex panel methods for airfoils. Replacement of an air foil by a concentrated vortex at quarter – chord point, importance of three – quarter chord point for discretization, use of quarter chord and three- quarter chord points in vortex panel method for wings.

UNIT – V

Applied Aerodynamics & Introduction To Propellers: Critical Mach number & Drag Divergence, drag reduction & lift augmentation – Sweep, winglets, Flaps, slats and vortex generators. Propellers : Concept of slip stream with only axial velocity, Actuator disk theory due to Rankine & Froude ; power& thrust coefficients, why the propeller is twisted by blade element analysis , blade angle, advance ratio and Torque coefficient, efficiency , how to read propeller chart.

TEXT BOOKS:

1. Bertin, J.J., Aerodynamics for Engineers, fourth edition, Pearson Education, 2002, ISBN: 81-297-0486-2
2. Anderson, Jr., J.D., Fundamentals of Aerodynamics, International edition, McGraw-Hill, 2001, ISBN: 0-07-118146-6.
3. Kuethe, A.M., and Chow, C., Foundations of Aerodynamics, 5th Edn., Wiley, 1998,ISBN: 0-471-12919-4.
4. Karamcheti Krishnamurthy, Principles of Ideal- fluid Aerodynamics, Wiley, 1966

REFERENCES:

1. Kuchemann, D., the Aerodynamic Design of Aircraft, Pergamum, 1978.
2. Shevell, R.S., Fundamentals of Flight, Indian reprint, Pearson Education, 2004, ISBN: 81-297-0514-1
3. McCormick, B.W., Aerodynamics, Aeronautics, & Flight Mechanics, second edition, John Wiley, 1995, ISBN: 0-471-57506-2.

AE402ES: FUNDAMENTALS OF STRUCTURAL ANALYSIS

B.Tech. II Year II Sem.

L	T	P	C
4	1	0	4

UNIT- I

Introduction to Theory of Elasticity: Equilibrium and Compatibility conditions for elastic solids, 2D elasticity equations for plane stress, plane strain and generalized plane strain cases Airy's stress function. Simple problems in plane stress / plane strain Stresses and Strains on arbitrary planes and transformations. Concept of principal planes, stress and Strains, Construction of Mohr's circle.

UNIT- II

Redundant Structures: Indeterminate structures and order of redundancy, Introduction to redundant analysis, - Clapeyrons method, Moment distribution method Use of free body diagrams to explain compatibility and redundant analysis principles. Singularity method for uniform beams with various boundary and support conditions (props, hinges and fixities) subjected to distributed / discrete loads (including moments).

UNIT- III

Beams with Elastic Supports and Initial Curvature: Direct solution of beams on elastic foundation, Deflection of beams with discrete elastic supports using singularity methods and modeling concepts. Equation of equilibrium for curved beam stress and deflections of a typical curved beam (Bulk Head segments on fuselages).

UNIT -IV

Stability: Stability of Structural systems, Modes of instability of columns. Euler's formula for critical loads of column. Slenderness ratio, Effect of boundary conditions on mode shapes and critical loads. Column with initial curvature, effect of eccentricity. Long, medium and short column ranges. Rankine and Jhonson's formulae. Eigen values and Eigen modes. Effect of intermediate supports. Concept of beam column.

UNIT - V

Energy Principles And shear Flow In Closed Sections: Introduction to energy principles and methods. Principles of Virtual Displacement and Principle of Virtual Force Castigliano's theorems, Maxwell's reciprocal theorem and Unit load method.The displacement method (Rayleigh Ritz method). Direct application of energy principles to beams and trusses. Bredt-Batho formula. Single and multi-cell closed box structures. Semi monocoque and moncoque structures. Shear flow in single and multi cell monocoque and semi monocoque box beams subject to torsion.

TEXT BOOKS:

1. Megson THG, "Aircraft Structures for Engineering students", Edward Arnold Publication.

2. David J. Peery" Aircraft Structures" McGraw-HILL Book Company

REFRENCES:

1. Aircraft structures by G. Lakshmi Narasaiah, B. S. Publications.
2. B. C. Punmia, "Theory of Structures", Laxmi Publication.
3. Timoshenko S. P. and J.N. Goodier, "Theory of Elasticity McGraw Hill Book Co.
4. Structural Analysis by OA. Bauchauji, Craig - Springer Publications.
5. David J. Peery" Aircraft Structures" McGraw-HILL Book Company
6. Argyris J. H. and Kelsey S. Energy theorems and structural analysis, Butterworth's Scientific Publications. 1960
7. Donaldson, B. K. Analysis of Aircraft Structures-An introduction "McGraw Hill.
8. David H. Allen, and Walter E. Haiseler Introduction to Aeronautical Structure Analysis, John Wiley & Son, 1985.

AE403ES: AIRCRAFT PERFORMANCE

B.Tech. II Year II Sem.

L	T	P	C
4	1	0	4

UNIT- I

Introduction To Airplane Performance: The role and design mission of an Aircraft, Specification of the Performance requirements and mission profile, Importance of performance analysis, estimation, measurement, operational safety and economy, Scheduled performance and operational performance of the Aircraft, The standard atmosphere, Off-standard and design atmosphere, Measurements of air data, Air data computers.

UNIT- II

Basic Aerodynamic And Propulsion Characteristics: Source of aerodynamic forces, Aerodynamic lift, drag and moment, Aerodynamic coefficients, Variation of lift, drag, moment co-efficient, Aerodynamic centre, Lift and drag build up-Lift for the finite wing, Wing body combinations, Drag, Drag polar, Side force, Drag reduction methods, Aerodynamic relationships for a parabolic drag polar, Thrust and efficiency, Types of engines, Reciprocating engines, Turbojet engines, Turbofan, Turboprop, Variation of power, thrust, specific fuel consumption with velocity and altitude, Afterburning.

UNIT- III

Airplane Performance-Steady Flight: Equations of motion for steady level flight, Thrust required-graphical and analytical approach, Fundamental parameters-Thrust to Weight ratio, Wing loading, Lift to Drag ratio, Thrust available, Maximum velocity of the airplane, Power required, Power available and Maximum velocity, Drag divergence mach number, Effect of drag divergence on maximum velocity, Minimum velocity, Stall and High lift devices. Gliding flight-Glide angle and Sinking speed, Glide range and Endurance, Climbing flight, Rate of climb, Climb angle, Time to climb, Service and Absolute ceiling, Range-Range for a propeller driven airplane, Range for a jet propelled airplane, Endurance- Endurance for a propeller driven airplane, Endurance for a jet propelled airplane.

UNIT - IV

Maneuvering Flight: Accelerated motion of aircraft-Equations of motions-The maneuver envelope, Longitudinal maneuvers-The Pull-up or Push over maneuver and Pull down maneuver, Lateral maneuvers-Turn performance-Turn rates, Turn radius, Limiting factors, Instantaneous and Sustained turns, Specific excess power, Energy turns, Maneuvers boundaries, Maneuver performance of Military aircraft, Transport aircraft.

UNIT - V

Take-Off And Landing Performance: Take-off performance-Estimation of Take-off distances, Effect on the take-off distance of weight, wind, runway conditions, ground effect, Take off performance safety factors, Landing Performance-Estimation of Landing distances, Effect on the landing distance, The discontinued landing, Baulked landing, Air safety

procedures and Requirements on Landing performance, Flight safety criteria, Performance classification of Civil aircraft, Flight planning-Performance planning and Fuel planning-Fuel requirements, Trip fuel, Environmental effects, Reserves, Tankering.

TEXTBOOKS:

1. Anderson, J.D. Jr., Aircraft Performance and Design McGraw Hill Publishing Co., 1st Edition, 1998.
2. Eshelby, M.E., Aircraft performance: Theory and Practice, Elsevier, 1st Edition, 2000.
3. Brandt, S.A. et.al., Introduction to Aeronautics : A Design Perspective, American Institute of Aeronautics & Astronautics; 3rd Edition, 2015.
4. Edward Lewis Houghton, N. B. Carruthers, Aerodynamics for Engineering Students, Butterworth - Heineman, 5th Edition, 2003.

REFRENCES:

1. Dole, C.E., Flight Theory and Aerodynamics: A Practical Guide for Operational Safety, 2nd Edition, Wiley, 2000.
2. McCormick, B.W, Aerodynamics, Aeronautics and Flight Mechanics, 2nd Edition, Wiley, 1995.
3. Raymer, D.P., Aircraft Design: A Conceptual Approach, 2nd Edition, AIAA, 1992.
4. Yechout, T.R. et al., Introduction to Aircraft Flight Mechanics, AIAA Eduction Series , AIAA, 1st Edition, 2003.

AE404ES: CONTROL THEORY

B.Tech. II Year II Sem.

L	T	P	C
3	1	0	3

UNIT- I

Introduction to Control Systems and Modeling of Dynamic Systems: Examples of Control Systems, Closed-Loop Control versus Open-loop Control; Transfer Function and Impulse-Response Function, Automatic Control Systems, Modelling in State Space, State-Space Representation of Dynamic Systems, Mechanical Systems, Electrical and Electronic Systems, Signal Flow Graphs, Linearization of Non-Linear Mathematical Models

UNIT- II

Transient and Steady-State Response Analysis: Introduction, First-Order Systems, Second-Order Systems, Higher-Order Systems, Transient-Response Analysis with MATLAB, Routh's Stability Criterion, Effects of Integral and Derivative Control Actions on System Performance, Steady-State Errors in Unity-Feedback Control Systems

UNIT- III

Root-Locus Analysis: Root-Locus Analysis: Introduction, Root-Locus Plots, General Rules for Constructing Root Loci, Root-Locus Plots with MATLAB, Positive Feedback Systems, Conditionally Stable Systems, Root Loci for Systems with Transport Lag

UNIT- IV

Frequency Response Analysis: Introduction, Bode Diagrams, Plotting Bode Diagrams with MATLAB, Polar Plots, Drawing Nyquist Plots with MATLAB, Log-Magnitude-versus-Phase Plots, Nyquist Stability Criterion, Stability Analysis, Relative Stability, Closed-Loop Frequency Response of Unity-Feedback Systems

UNIT- V

Control Systems Design by Root-Locus Method and Frequency Response:

Root-Locus Method- Introduction, Preliminary design considerations, lead compensation, lag compensation, lead-lag compensation, parallel compensation; Frequency Response Method-Introduction, lead compensation, lag compensation, lead-lag compensation.

TEXT-BOOKS:

1. Modern Control Engineering, Katsuhiko Ogata, 4th edition, Pearson Education International, 2002

REFERENCES:

1. Automatic Control Systems, Farid Golnargh and Benjamin C. Kuo, 9th edition, John Wiley & Sons, Inc, 2019
2. Control Systems Engineering, J. Nagarath and M.Gopal, New Age International (P) Limited, 4th edition, 2005.

SM405MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Course Objective: To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

UNIT – I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT - IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

UNIT -V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2015.

AE406ES: ELECTRICAL AND ELECTRONICS ENGINEERING LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	3	2

SECTION A: ELECTRICAL ENGINEERING:

1. Verification of KCL and KVL.
2. Magnetization characteristics of D.C. Shunt generator.
3. Speed control of DC motor.
4. Swinburne's Test on DC shunt machine.
5. Brake test on DC shunt motor.
6. OC and SC tests on Single-phase transformer.
7. Brake test on 3-phase Induction motor.
8. Regulation by an alternator by synchronous impedance method.

SECTION B: ELECTRONICS ENGINEERING:

1. PN Junction Diode Characteristics (Forward bias, Reverse bias)
2. Transistor CE Characteristics (Input and Output)
3. Study of CRO.
4. Zener Diode Characteristics
5. Transistor CE Characteristics
6. Rectifier without Filters (Full wave & Half wave)
7. Rectifier with Filters (Full wave & half wave).

Note: Total 12 experiments are to be conducted.
(Six experiments from PART-A, Six experiments from PART-B)

AE407ES: NUMERICAL SIMULATION WITH MATLAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	3	2

Experiments

1. Introduction to MATLAB and basic operations
2. Basic plotting, multiple plotting with Arrays.
3. Performing operations by using different types of loops in MATLAB.
4. (a)if else (b)if-elseif (c)while (d)for loops
5. Computation of drag force using loops
6. Computation of differential equations of motions using Euler integration.
7. Computation of drag force using differential equations at different altitudes using Euler integration
8. Computation for deflection of different types of Beams
9. Computation of 'g' loads on reentry vehicle.

REFERENCES

1. "Getting Started with Matlab" by Rudra Prathap
2. "Introduction to Matlab for Engineering Students" by David Hacque
3. "Computational Methods in Aerospace engineering" by David L Darmofal

AE408ES: AIRCRAFT ENGINEERING DRAWING WITH CAD

B.Tech. II Year II Sem.

L	T	P	C
0	0	3	2

UNIT - I

Introduction to Auto-Cad, Sections And Sectional Views, Development Of Surfaces: Introduction to Auto-CAD: Geometrical construction. Sections and sectional views Sections of right regular solids-prisms, pyramids, cylinders and cones , auxiliary views, Development of surfaces Development of surfaces of right regular solids prisms, pyramids, cylinders and cones.

UNIT - II

Intersection of Solids: Intersection of solids: Intersection of prism vs prism, cylinder vs prism, cylinder vs cylinder and cylinder vs cone.

UNIT - III

Isometric Projections: Isometric projections: Principles of isometric projections, isometric scale, isometric views, conventions.

Isometric views of lines, planes, simple and compound solids, isometric views of objects having spherical parts.

UNIT - IV

Transformation of Projections: Transformation of projections: Conversion of isometric views to orthographic views -conventions for simple objects. Construction of orthographic projections for given isometric projections.

UNIT -V

Perspective Projections: Perspective projections: Perspective view of points, lines, plane figures and simple solids, vanishing point method and visual ray method.

TEXT BOOKS:

1. N. D. Bhatt, “Elementary Engineering Drawing”, Charotar Publishing House, 55th Edition, 2015.
2. K. L. Narayana and P. Kannaiah, “Engineering Drawing”, Scitech Publications, 23rd Edition, 2010.
3. K. C. John, “Engineering Graphics”, Prentice Hall of India, 1st Edition, 2009.

REFERENCES:

1. Venugopal, “Engineering Drawing and Graphics, New Age, 2nd Edition, 2010.
2. Dhananjay. A. Johle, “Engineering Drawing”, Tata Mc Graw Hill, 1st Edition, 2008.
3. Trymbaka Murthy, “Computer Aided Engineering Drawing”, I.K. International Publishers, 3rd Edition, 2011.
4. A. K. Sarkar A. P. Rastogi, “Engineering graphics with Auto CAD”, Phi Learning, 1st Edition, 2010.

MC400ES: ENVIRONMENTAL SCIENCE & TECHNOLOGY

B.Tech. II Year II Sem.	L	T	P	C
Course Code:	3	0	0	0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations

Course Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development

UNIT - I

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, Ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics

of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela . 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.