ACADEMIC REGULATIONS COURSE STRUCTURE AND DETAILED SYLLABUS

AERONAUTICAL ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2005-2006)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

KUKATPALLY, HYDERABAD - 500 072.

2005-2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

B.TECH. AERONAUTICAL ENGINEERING
I Year

COURSE STRUCTURE

Code	Subject	T	P	C
HS05231	English	2+1*	0	4
MA05363	Mathematics-I	3+1*	0	6
PY05226	Engineering Physics	2+1*	0	4
ME05224	Engineering Mechanics	3+1*	0	6
MA05431	Numerical Methods	3+1*	0	6
CS05106	C Programming & data structures	3+1*	0	6
ME05223	Engineering Graphics	0	6	8
CS05144	Computer Programming Lab	0	3	4
CS05337	IT Work Shop	0	3	4
ME05230	Engineering Work Shop Practice	0	3	4
HS05232	English Language Communication Skills Lab	0	3	4
	TOTAL	**22**	**18**	**56**

II Year **I Semester**

Code	Subject	T	P	C
MA05364	MATHEMATICS-II	4+1*	0	4
CS05433	OBJECT ORIENTED ANALYSIS AND DESIGN THROUGH UML	4+1*	0	4
CE05375	MECHANICS OF SOLIDS	4+1*	0	4
CE05374	MECHANICS OF FLUIDS	4+1*	0	4
AE05026	AIRCRAFT ENGINEERING DRAWING	0	6	4
CE05239	ENVIRONMENTAL STUDIES	4+1*	0	4
CS05564	UML LAB	0	3	2
CE05377	MECHANICS OF SOLIDS & MECHANICS OF FLUIDS LAB	0	3	2
	TOTAL	**25**	**12**	**28**

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B.TECH. AERONAUTICAL ENGINEERING
COURSE STRUCTURE

II Year **IInd Semester**

Code	Subject	T	P	C
MA05366	MATHEMATICS FOR AEROSPACE ENGINEERS	4+1*	0	4
AE05016	AERODYNAMICS – I	4+1*	0	4
ME05551	THERMODYNAMICS	4+1*	0	4
EE05187	ELECTRICAL & ELECTRONICS ENGINEERING	4+1*	0	4
AE05333	INTRODUCTION TO AEROSPACE TRANSPORTATION SYSTEMS	4+1*	0	4
AE05378	MECHANISMS AND MECHANICAL DESIGN	4+1*	0	4
AE05107	CAD LAB	0	3	2
EE05188	ELECTRICAL AND ELECTRONICS LAB	0	3	2
	TOTAL	**30**	**6**	**28**

III Year **Ist Semester**

Code	Subject	T	P	C
AE05029	AIRCRAFT PRODUCTION TECHNOLOGY	4+1*	0	4
AE05250	FLIGHT MECHANICS-I	4+1*	0	4
AE05017	AERODYNAMICS – II	4+1*	0	4
AE05023	AEROSPACE VEHICLE STRUCTURES – I	4+1*	0	4
AE05020	AEROSPACE PROPULSION – I	4+1*	0	4
EE05149	CONTROL SYSTEMS	4+1*	0	4
AE05028	AIRCRAFT MATERIALS & PRODUCTION LAB.	0	3	2
AE05018	AERODYNAMICS & PROPULSION LAB.	0	3	2
	TOTAL	**30**	**6**	**28**

2005-2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD
B.TECH. AERONAUTICAL ENGINEERING
COURSE STRUCTURE

III Year **IInd Semester**

Code	Subject	T	P	C
AE05251	FLIGHT MECHANICS-II	4+1*	0	4
AE05024	AEROSPACE VEHICLE STRUCTURES -II	4+1*	0	4
AE05021	AEROSPACE PROPULSION - II	4+1*	0	4
AE05132	COMPUTATIONAL AERODYNAMICS	4+1*	0	4
AE05247	FINITE ELEMENT AND MODELING METHODS	4+1*	0	4
AE05335	INTRODUCTION TO SPACE TECHNOLOGY	4+1*	0	4
AE05022	AEROSPACE STRUCTURES LAB.	0	3	2
AE05135	COMPUTATIONAL STRUCTURAL AND AERODYNAMIC ANALYSIS.	0	3	2
	TOTAL	**30**	**6**	**28**

IV Year **I Semester**

Code	Subject	T	P	C
AE05546	THEORY OF VIBRATIONS AND AEROELASTICITY	4+1*	0	4
AE05252	FLIGHT VEHICLE DESIGN	**4+1***	**0**	**4**
AE05531	STRUCTURAL ANALYSIS AND DETAILED DESIGN	**4+1***	**0**	**4**
AE05027	AIRCRAFT MATERIALS AND COMPOSITES	**4+1***	**0**	**4**
	ELECTIVE - I	**4+1***	**0**	**4**
AE05242	EXPERIMENTAL STRESS ANALYSIS			
AE05063	AVIONICS			
AE05290	HELICOPTER ENGINEERING			
AE05225	ENGINEERING OPTIMIZATION			
AE05306	INDUSTRIAL AERODYNAMICS			
	ELECTIVE - II	**4+1***	**0**	**4**
AE05003	ADVANCED COMPUTATIONAL FLUID DYNAMICS			
ME05108	CAD/CAM			
AE05509	ROCKETS AND MISSILES			
AE05496	PROPELLANT TECHNOLOGY			
EE05425	NEURAL NETWORKS AND FUZZY LOGIC			
AE05253	FLIGHT VECHICLE DESIGN LAB.	0	3	2
AE05532	STRUCTURAL ANALYSIS AND DETAILED DESIGN LAB.	0	3	2
	TOTAL	**30**	**6**	**28**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

B.TECH. AERONAUTICAL ENGINEERING
COURSE STRUCTURE

IV Year **IInd Semester**

Code	Subject	T	P	C
AE05030	AIRCRAFT SYSTEMS AND INSTRUMENTS	4+1*	0	4
	ELECTIVE – III	4+1*	0	4
AE05540	SYSTEM MODELING AND SIMULATION	-	-	-
AE05156	CRYOGENICS	-	-	-
EE05404	MICROPROCESSORS & MICROCONTROLERS	-	-	-
AE05299	HYPERSONIC AERODYNAMICS	-	-	-
AE05524	SPACE MECHANICS	-	-	-
	ELECTIVE – IV	4+1*	0	4
AE05244	FATIGUE AND FRACTURE MECHANICS	-	-	-
AE05102	BOUNDARY LAYER THEORY	-	-	-
AE05334	INTRODUCTION TO AVIATION MANAGEMENT	-	-	-
ME05283	HEAT TRANSFER	-	-	-
AE05019	AEROELASTICITY	-	-	-
CA05315	INDUSTRY ORIENTED MINI PROJECT	-	-	2
CA05515	SEMINAR	-	-	2
CA05495	PROJECT WORK	0	0	12
	TOTAL	**15**	**0**	**28**

Note: T = Theory; P = Practical; * = Tutorial; C = Credits

NOTE:

1) All bold faced subject syllabi are drafted by Aero Engineering board members as per the guidelines of JNTU.
2) Wherever there are 3 text books they are needed to ensure that at atleast one cheap book is included. Hence good text books shouldn't be omitted for text book recommendations.
3) Further the multidisciplinary nature of the Aero Engineering depends atleast 3 text books per subject.

2005-2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

I Year B.Tech. AE **T P C 2+1 0 4**

(HS 05231) ENGLISH

1. INTRODUCTION :

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks, to encourage them to develop their language skills. The two textbooks identified by the Board of Studies serve the purpose of illustrating the conceptual framework within which the syllabus is to be administered in the classroom. When a textbook is prescribed content is generally paid attention to. However, the stress in this syllabus is on language acquisition and skill development, calling for both the teacher and the taught to go beyond the prescribed texts and innovate exercises and tasks.

2. OBJECTIVES :

1. To promote the language proficiency of the students with emphasis on improving their LSRW skills.
2. To impart training to the students through the syllabus and its theoretical and practical components.
3. To improve communication skills in formal and informal situations.

3. SYLLABUS :

Listening Skills :

- Listening for general content
- Listening to fill up information gaps
- Intensive listening
- Listening for specific information
- Note-taking - guided and unguided
- Post-listening testing

Speaking Skills :

- Oral practice
- Developing confidence
- Introducing oneself/others
- Asking for/ giving information
- Describing objects/offering solutions
- Describing situations
- Role play
- Expressing agreement/disagreement

Reading Comprehension

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Understanding discourse features
- Recognizing coherence/sequencing of sentences

NOTE : The student, through the training imparted to him/her by means of the text-based approach, will be examined in answering questions on an unseen passage.

Writing Skills :

- Writing a sentence
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Interpreting data
- Formal and informal letter writing
- Sending e-mails
- Information transfer
- Editing a passage

4. TEXTBOOKS PRESCRIBED :

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into Eight Units, are prescribed:

1. **LEARNING ENGLISH:** A Communicative Approach, Hyderabad: Orient Longman, 2005.(Selected Lessons)
2. **WINGS OF FIRE:** An Autobiography – APJ Abdul Kalam, Abridged version with Exercises, Hyderabad: Universities Press (India) Pvt. Ltd., 2004.

The following lessons from the prescribed texts are recommended for study :

A. STUDY MATERIAL :

Unit – I

1. **Astronomy** from **LEARNING ENGLISH: *A Communicative Approach,*** Orient Longman, 2005.
2. Chapters 1-4 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004**

Unit – II

3. Information Technology **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
4. Chapters 5-8 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004**

2005-2006

Unit – III

5. Humour **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
6. Chapters 9-12 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises., Universities Press (India) Pvt. Ltd., 2004**

Unit – IV

7. Environment **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
8. Chapters 13-16 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004**

Unit – V

9. Inspiration **from** LEARNING ENGLISH: *A Communicative Approach,* **Orient Longman, 2005.**
10. Chapters 17-20 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.**

Unit – VI

11. Human Interest **from** LEARNING ENGLISH : *A Communicative Approach,* **Orient Longman, 2005.**
12. Chapters 21-24 **from** Wings of Fire**:** An Autobiography **– APJ Abdul Kalam, an abridged version with Exercises, Universities Press (India) Pvt. Ltd., 2004.**

***** Exercises from the lessons not prescribed shall also be used for classroom tasks.

Unit – VII

Reading and Writing Skills
Reading Comprehension
Situational dialogues
Report writing
Letter writing
Essay writing
Information transfer

Unit – VIII

Remedial English
Common errors
Subject-Verb agreement
Use of Articles and Prepositions
Tense and aspect

Vocabulary – Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

Books Recommended :

1. **Effective Technical Communication,** M Ashraf Rizvi, Tata McGraw-Hill Publishing Company Ltd.
2. **Everyday Dialogues in English**, Robert J Dixson, Prentice Hall of India Pvt Ltd., New Delhi.
3. **Strengthen Your English,** Bhaskaran & Horsburgh, Oxford University Press
4. **English for Technical Communication**, K R Lakshminarayana, SCITECH
5. **Strategies for Engineering Communication,** Susan Stevenson & Steve Whitmore (John Wiley and sons).
6. **English for Engineers: With CD,** Sirish Chaudhary, Vikas Publishing House Pvt. Ltd. With CD.
7. **Basic Communication Skills for Technology**, Andrea J Rutherfoord, Pearson Education Asia.
8. **Murphy's English Grammar with CD,** Murphy, Cambridge University Press
9. **A Practical Course in English Pronunciation, (with two Audio cassettes),** Sethi, Sadanand & Jindal , Prentice –Hall of India Pvt Ltd., New Delhi.
10. **English for Professional Students**, by S S Prabhakara Rao.
11. **The Oxford Guide to Writing and Speaking,** John Seely, Oxford.
12. **Grammar Games,** Renvolucri Mario, Cambridge University Press.

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I Year B.Tech. AE

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(MA 05363) MATHEMATICS – I

UNIT – I

Sequences – series – Convergences and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence. Rolle's theorem – Lagrange's Mean Value Theorem – Cauchy's Mean value Theorem – Generalized Mean Value theorem (Taylor's Theorem).

UNIT – II

Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints or without constraints- Radius, Centre and Circle of Curvature – Evolutes and Envelopes.

UNIT – III

Curve tracing – Cartesian , polar and Parametric curves - Applications of integration to lengths , volumes and surface areas in Cartesian and polar coordinates.

UNIT – IV

Differential equations of first order and first degree – exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, Orthogonal trajectories-Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, $e^{ax}V(x)$, xV(x), method of variation of parameters.

UNIT – V

Laplace transform of standard functions – Inverse transform – first shifting Theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms-Application of Laplace transforms to ordinary differential equations.

UNIT – VI

Multiple integrals - double and triple integrals – change of variables – change of order of integration.

UNIT – VII

Vector Calculus: Gradient- Divergence- Curl and their related properties of sums-products- Laplacian and second order operators. Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals.

UNIT – VIII

Vector integral theorems: Green's theorem- Stoke's and Gauss's Divergence Theorem. Verification of Green's - Stoke's and Gauss's Theorems – Cylindrical, Spherical coordinates-Expressions Grad, div, curl in spherical and cylindrical coordinates.

TEXT BOOKS :

1. A text book of Engineering Mathematics Volume – 1, 2005
T.K.V.Iyengar, B.Krishna Gandhi and others, S.Chand and Company.
2. Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.

REFERENCES :

1. Engineering Mathematics–I, 2002, P.Nageswara Rao, Y.Narsimhulu, Prabhakara Rao, Deepthi Publishers
2. Engineering Mathematics- I, 2004, Dr.Shahnaz Bathul, Right Publishers.
3. Engineering Mathematics, S.K.V.S. Sri Rama Chary, M.Bhujanga Rao, Shankar, B.S. Publications 2000.
4. Engineering Mathematics-I Rukmangadhachary, Pearson Education.
5. A Text book of Engineering Mathematics, VP Mishra, Galgotia Publications.
6. Engineering Mathematics – I, Sankaraiah, VGS Book Links, Hyderabad.

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I year B.Tech A.E. **T P C**

2+1 0 4

(PY05226) ENGINEERING PHYSICS

UNIT – I

INTERFERENCE Introduction - Superposition of waves - Young's double slit experiment - Coherence - Interference in thin films by reflection - Newton's rings.

DIFFRACTION Introduction - Fressnel and Fraunhofer diffraction - Fraunhofer diffraction at a single slit & at a double slit - Circular aperture - Diffraction grating - Grating spectrum - Resolving power of a grating - Rayleigh's criterion for resolving power.

UNIT II

POLARIZATION Introduction - Representation of polarized and unpolarized light - Polarization by reflection - Malus law - Double refraction - Nicol prism - Circular and Elliptical polarization -Quarter wave plate - Half wave plate.

ULTRASONICS Introduction - Production of Ultrasonic waves - Magnetostriction method - Piezo electric method - Detection of Ultrasonics - Properties of Ultrasonics - Use of Ultrasonics for non-destructive testing - Applications of Ultrasonics.

UNIT III

ACOUSTICS OF BUILDINGS Basic requirement of acoustically good hall - Reverberation and time of reverberation – Sabine's formula for reverberation time - Measurement of absorption coefficient of a material - Factors affecting the architectural acoustics and their remedy.

SUPERCONDUCTIVITY General properties - Meissner effect - Penetration depth - Type I and Type II superconductors - Flux quantization - Josephson Effect - BCS Theory - Applications of superconductors.

UNIT IV

LASERS Introduction - Characteristics of Lasers - Spontaneous and Stimulated Emission of radiation - Einstein's coefficients - Population inversion - Ruby Laser - Helium-Neon Laser - Semiconductor Laser - Applications of Lasers in Industry, Scientific and Medical fields.

UNIT V

FIBER OPTICS Introduction - Principle of optical fiber - Acceptance angle and Acceptance cone - Numerical aperture - Step-Index fiber and transmission of signal in SI fiber - Graded-Index fiber and transmission of signal in GI fiber - Attenuation in optical fibers - Advantages of optical fibers in communication - Application of optical fibers in Medicine and Sensors.

UNIT VI

MAGNETIC PROPERTIES Permeability - Magnetization - Origin of magnetic moment - Classification of magnetic materials - Dia, Para and Ferro magnetism - Hysteresis curve - Soft and Hard magnetic materials - anti-Ferro and Ferri magnetism - Ferrites and their applications.

CRYSTAL STRUCTURES Introduction - Space lattice - Basis - Unit cell - Lattice parameter - Crystal systems - Bravais lattices - Structure and Packing fractions of Simple cubic - Body Centred Cubic - Face Centred Cubic crystals - Structures of Diamond, ZnS, NaCl, CsCl.

UNIT VII

CRYSTAL PLANES & X-RAY DIFFRACTION Directions and Planes in crystals - Miller Indices - Separation between successive [h k l] planes - Diffraction of X-rays by Crystal planes - Bragg's Law - Laue method -Powder method.

UNIT VIII

DEFECTS IN SOLIDS Imperfections in Crystals - Point defects - Schottky and Frenkel defects - Energy for formation of a Vacancy - Equilibrium concentration of Schottky and Frenkel defects -Line defects - Edge and Screw dislocation - Burger's Vectors.

Text Books:

1. **Engineering Physics** by R.K.Gaur - S.L. Gupta; Dhanpat Rai and Sons.
2. **Applied Physics** by Dr. M.Chandra Shekar & Dr.P.Appala Naidu; V.G.S. Book links.

References :

1. **Engineering Physics** by Dr.M. Arumugam; Anuradha Agencies
2. **Physics Volume 2,** by Halliday, Resnick and Krane; John Wiley & Sons
3. **Engineering Physics** by M.N.Avadhanulu & P.G. Kshirasagar; S.Chand &Company Ltd.
4. **Engineering Physics** by P.V.Naik; Pearson Education
5. **Materials Science and Engineering** by V. Raghavan; Prentice-Hall India
6. **Engineering Physics (Vol.1)** by M.D. Khanna and V. Balaswamy; Vikas Publishing House Pvt. Ltd., New Delhi

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HYDERABAD

I Year B. Tech. AE

T	P	C
3+1	0	6

(ME05224) ENGINEERING MECHANICS

UNIT – I7

Introduction to Engg. Mechanics – Basic Concepts

Systems of Forces :

Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Equilibrium of Systems of Forces :

Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces.

UNIT – II

Friction : Types of Friction – Limiting Friction – Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

UNIT – III

Transmission of Power : Flat Belt Drives : Types of Flat Belt Drives – Length of Belt, Tensions, Tight side, Slack Side, Initial and Centrifugal – Power Transmitted and Condition for Max. Power.

UNIT – IV

Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.

UNIT – V

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia : Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – VI

Kinematics : Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics : Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – VII

Work – Energy Method :

Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion.

Impulse momentum method :

UNIT – VIII

Mechanical Vibrations : Definitions, Concepts – Simple Harmonic Motion – Free vibrations, simple and Compound Pendulums and its Applications –

TEXT BOOKS :

1. Engineering Mechanics / Fedinand . L. Singer / Harper – Collins.
2. Engg. Mechanics / S.S. Bhavikati & J.G. Rajasekharappa

REFERENCE :

1. Engg. Mechanics / Irving. H. Shames Prentice – Hall.
2. Engg. Mechanics / Timoshenko & Yound.
3. Engg. Mechanics Umesh Regl / Tayal.
4. Engg. Mechanics / R.V. Kulkarni & R.D. Askhevkar
5. Strength of Materials & Applied Mechanics / IB Prasad
6. Text Book in Applied Mechanics / Malhotra, Subramanian, Gahlot and Rathore / New Age.
7. Engg. Mechanics / KL Kumar / Tata McGraw Hill.
8. Engg. Mechanics / Rajasekharan

2005-2006

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I Year B. Tech. AE

T	P	C
3+1	0	6

(MA05431) NUMERICAL METHODS

UNIT-I

Solutions of Algebraic and Transcendental Equations: Introduction-The Bisection Method-The method of False Position- The Iteration Method- Newton-Raphson Method.

UNIT-II

Interpolation: Introduction –Errors in polynomial Interpolation- Finite differences – Forward Differences- Backward differences –Symbolic relations and separation of symbols- Differences of a polynomial –Newton's formulae for Interpolation- central difference Interpolation formulae-Gauss central Difference Formulae- Interpolation with unevenly spaced points- Lagrange's Interpolation formula.

UNIT-III

Fitting a straight line – Nonlinear curve fitting- curve fitting by a sum of Exponentials- Weighted least squares approximation –Linear weighted least squares approximation- Nonlinear weighted least square.

UNIT-IV

Orthogonal polynomials-Grams Schmidt orthogonalization process- Least-square solution-Representation of B-splines- Computation of B-splines- The Fourier Transform-The Fast Fourier transform.

UNIT-V

Numerical Differentiation and Integration: The cubic Spline method- Trapezoidal rule – Simpson's one-third rule- Simpson's 3/8 rule – Boole's and Weddle's Rules.

UNIT-VI

Matrices and linear systems of Equations: Solution of Linear Systems- Direct Methods –LU Decomposition- LU Decomposition from Gauss Elimination – Solution of Tridiagonal Systems – Solution of Linear Systems.

UNIT-VII

Numerical Solutions of ordinary Differential Equations: Solutions by Taylor's Series –Picard's Method of successive Approximations – Euler's method- Runge-Kutta Methods- Predictor – Corrector Methods – Adams Moulton Method – Milne's Method.

UNIT-VIII

Numerical Solutions of Partial Differential Equations: Introduction- Finite Difference Approximations to Derivatives –Laplace's Equation –Jacobi's Method – Gauss-Seidel Method.

TEXT BOOKS

1. Introductory methods of Numerical Analysis: S.S. Sastry, Prentice Hall of India, Pvt. Ltd.
2. Numerical Methods: Jain, Iyengar.

REFERENCES

1. Numerical Methods: V.N. Vedamurthy, Iyengar N, Ch N Vikas Pub. Reprint 2005.
2. Numerical Methods: S. Arumugam & others, SciTech Pub.
3. Elementary Numerical Analysis: An Algorithm Approach: S.D. Conte and Carl. D.E. Boor, Tata Mc-Graw Hill.

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HYDERABAD

I Year B.Tech. AE.

T	P	C
3	0	6

(CS 05106) C PROGRAMMING AND DATA STRUCTURES

UNIT - I

Algorithm, flowchart, program development steps, basic structures of C language, C tokens, data types and sizes, declaration of variables, assigning values, arithmetic, relational and logical operator, increment and decrement operators, conditional operator, bit-wise operators, type conversions, expressions, evaluation, input-output statements, blocks, if and switch statement, while, do-while and for statements, C programs covering all the above aspects.

UNIT - II

One dimensional & Two dimensional arrays, initialization, string variables-declaration, reading, writing, Basics of functions,Parameter pasing,String handling function, user-defined functions, recursive functions, variables and storage classes, scope rules, block structure, header files, C preprocessor, example C programs.

UNIT - III

Pointer and Arrays : Pointers and addresses, Pointers and Arrays, Pointers And function arguments, Address arithmetic, character pointers and functions, pointers to pointers, multi-dimensional arrays, initialization of pointer arrays, command line arguments, pointers to functions.

UNIT - IV

Structures : Definition, initializing, assigning values, passing of structures as arguments, Arrays of structures, pointers to structures, self referential structures. Unions, typedef, bit fields, C program examples.

UNIT - V

Console & File I/O : Standard I/O, Formatted I/O, opening & closing of files, I/O operations on files.

UNIT - VI

Linear DataStructures : Introduction to DataStructures, representing stacks and queues in C using arrays, Infix, Postfix & Prefix programs, circular queues.

2005-2006

UNIT - VII

Linked Lists : Singly linked list, Doubly linked list, Circular List, representing stacks and Queues in C using linked lists

Non-Linear Data Structures : Binary trees: Representation, tree traversals, graph representation, graph traversal, Spanning trees.

UNIT - VIII

Sorting & Searching : Searching Methods- Linear and binary search methods, Sorting methods- Ex: Bubble sort, Selection sort, Insertion sort, heap sort, quick sort.

TEXT BOOKS :

1. C and Data structures – P.Padmanabham, BS Publications
2. C & Data Structures, Ashok N.Kamthane, Pearson Education

REFERENCES :

1. C & Data Structures – Prof. P.S.DeshPande, Prof O.G.Kakde, Wiley Dreamtech Pvt. Ltd., NewDelhi.
2. DataStructures Using C – A.S.Tanenbaum, PHI/Pearson education
3. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/ Pearson Education

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I Year B. Tech. AE **T P C**
0 – 6 – 8

(ME05223) ENGINEERING GRAPHICS

UNIT – I
INTRODUCTION TO ENGINEERING DRAWING :
Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions.
Scales used in Engineering Practice and Representative Fraction – Construction of Plain, Diagonal and Vernier Scales.

UNIT – II
PLANE GEOMETRIC DRAWING :
Construction of Polygons – Inscription and Superscription of Polygon given the diameter of the Circles.
Curves used in Engineering Practice and their Constructions
a) Conic Sections including the Rectangular Hyperbola – General method only.
b) Cycloid, Epicycloid and Hypocycloid
c) Involute.

UNIT – III
DRAWING OF PROJECTIONS OR VIEWS
ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY :
Principles of Orthographic Projections – Conventions – First and Third Angle Projections Projections of Points and Lines inclined to both planes, True lengths, traces -
Projections of Planes regular auxiliary planes and Auxiliary projection inclined to both planes.

UNIT – IV
PROJECTIONS OF SOLIDS

Projections of Regular Solids inclined to both planes – Auxiliary Views.
Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

UNIT – V
DEVELOPMENT AND INTERPENETRATION OF SOLIDS

Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.
Interpenetration of Right Regular Solids – Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT – VI

ISOMETRIC PORJECTIONS :
Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

UNIT –VII

TRANSFORMATION OF PROJECTIONS :
Conversion of Isometric Views to Orthographic Views – Conventions :

UNIT – VIII

PERSPECTIVE PROJECTIONS :
Perspective View : Points, Lines, Plane Figures and Simple Solids ,Vanishing Point Methods(General Method only)

TEXT BOOK :
1. Engineering Drawing, N.D. Bhat / Charotar

References:
1. Engineering Drawing, Narayana and Kannaiah / Scietech publishers.
2. Engineering Drawing and Graphics, Venugopal / New age.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD

I Year B. Tech. AE **T P C**
0 – 3 – 4

(CS05144) COMPUTER PROGRAMMING LAB

1. Write a C program the evaluates the following algebraic expressions after reading necessary values from the user:
a) ax+b/ax-b
b) 2.5 log x + cos 32^0 + | x^2 –y^2 | + √ 2xy
c) 1/α √2π e- (x-m/ √2σ)^2

2. Write a C program for the following
a) Printing three given integers in ascending order
b) Sum of 1 + 2+ 3 + _ _ _ _ _ n
c) 1 + x^2/2! + x^2/ 4!+ _ _ _ _ _ upto ten terms
d) x +x^3/3! + x^5/5!+ _ _ _ _ _ upto 7^{th} digit accuracy
e) Read x and compute Y =1 for x > 0
Y=0 for x = 0
Y= -1 for x<0

3. Write C program using FOR statement to find the following from a given set of 20 integers.
i) Total number of even integers. ii) Total number of odd integers.
iii) Sum of all even integers. iv) Sum of all odd integers.

4. Write a C program to obtain the product of two matrices A of size (3X3) and B of size (3X2). The resultant matrix C is to be printed out along with A and B. Assume suitable values for A & B.

5. Using switch-case statement, write a C program that takes two operands and one operator from the user, performs the operation and then prints the answer. (consider operators +,-,/,* and %).

6. Write C procedures to add, subtract, multiply and divide two complex numbers (x+iy) and (a+ib). Also write the main program that uses these procedures.

7. The total distance traveled by vehicle in 't' seconds is given by distance = ut+1/2at^2 where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance traveled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

8. A cloth show room has announced the following seasonal discounts on purchase of items.

Purchase Amount	Discount (Percentage)	
	Mill Cloth	Handloom items
1-100	-	5.0
101-200	5.0	7.5
201-300	7.5	10.0
Above 300	10.0	15.0

Write a C program using switch and If statements to complete the net amount to be paid by a customer.

9. Given a number, write C program using while loop to reverse the digits of the number. Example 1234 to be written as 4321.

10. The Fibonacci sequence of numbers is 1,1,2,3,5,8… based on the recurrence relation
f(n) = f (n-1) + f (n-2) for n>2.
Write C program using d0-while to calculate and print the first m fibonacci numbers.

11. Write C programs to print the following outputs using for loop.

```
1
2  2
3  3  3
4  4  4  4
5  5  5  5  5
```

```
      1
    2  2
  3  3  3
4  4  4  4
5  5  5  5  5
```

12. Write a C program to extract a portion of a character string and print the extracted string. Assume that m characters are extracted starting with the nth character.

13. A Maruthi Car dealer maintains a record of sales of various vehicles in the following form:

Vehicle type	Month of Sales	Price (Rs).
Maruthi – 800	02/87	75,000
Maruthi – DX	07/87	95,000
Gypsy	04/88	1,10,000
Maruthi Van		08/88 85,000

Write a C program to read this data into a table of strings and output the details of a particular vehicle sold during a specified period. The program should request the user to input the vehicle type and the period (Starting month & ending month).

14. Write a function that will scan a character string passed as an argument and covert all lower case characters into their upper case equivalents.

15. Implement the following data structures using Arrays
i) Stacks ii) Linear Queues iii) Circular queues iv) Dequeue.

16. Implement polynomial addition and multiplication with linked list sparse matrix.

17. Implement binary search tree using linked list and perform the following operations.
i) Insertion ii) Deletion iii) Inorder Traversal iv) Preorder Traversal
v) Post Order Traversal.

18. Singly linked list and doubly linked lists
i) Insertion ii) Deletion iii) Lookup

19. i) Implement stack using singly linked list.
ii) Implement queue using singly linked list.

20. Implement the following sorting techniques.
i) Bubble sort ii) Insertion Sort iii) Quick Sort iv) Heap Sort.

21. Implement the following searching method.
i) Sequential Search ii) Binary Search iii) Fibonacci

22. i) Conversion of Infix expression to Postfix notation.
ii) Simple expression evaluator, that can handle +,-,/ and *.

23. Implement the algorithms for the following iterative methods using C to find one root of the equation
$9x_1+2x_2+4x_3 = 0$
$x_1+10x_2+4x_3 = 6$
$2x_1-4x_2+10x_3 = -15$.

25. Write Computer programs to implement the Lagrange interpolation and Newton-Gregory forward interpolation.

26. Implement in 'C' the linear regression and polynomial regression algorithms.

27. Implement Traezoidal and Simpson methods.

28. Practice of exercises (in text book 2 of theory) related to:
a) Word 2000 Chapter 7, 8, 9. b) Excel 2000 Chapter 12, 13.
c) Powerpoint- 2000 Chapter 15, 16. d) Access 2000 Chapter 18,19.
e) Outlook 2000 Chapter 21,22,23. f) FrontPage 2000 Chapter 25

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD

I Year B.Tech. AE

T	P	C
0	3	4

(CS 05337) IT WORKSHOP

Objectives :

The IT Workshop for engineers is a 6 training lab course spread over 90 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including MS Word, Excel, Power Point and Publisher.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like Windows XP, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered.

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools and LaTeX.

PC Hardware

Week 1 – Task 1 : Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Week 2 – Task 2 : Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 3 – Task 3 : Every student should individually install windows XP on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Week 4 – Task 4 : Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Week 5 – Task 5 : Several mini tasks would be that covers Basic commands in Linux and Basic system administration in Linux which includes: Basic Linux commands in bash, Create hard and symbolic links, Text processing, Using wildcards

Week 6 – Task 6 : Hardware Troubleshooting : Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Week 7 – Task 7 : Software Troubleshooting : Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back

to working condition. The work done should be verified by the instructor and followed up with a Viva.

Week 8 – Task 8 : The test consists of various systems with Hardware / Software related troubles, Formatted disks without operating systems.

Internet & World Wide Web

Week 9 - Task 1 : **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Week 10 - Task 2 : Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 11 - Task 3 : **Search Engines & Netiquette :** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors.

Week 12 - Task 4 : Cyber Hygiene : Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Week 13 Module Test A test which simulates all of the above tasks would be crafted and given to the students.

LaTeX and Microsoft Word

Week 14 – Word Orientation : The mentor needs to give an overview of LaTeX and Microsoft word : Importance of LaTeX and MS Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1 : Using LaTeX and word to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Week 15 - Task 2 : Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes.

Week 16 - Task 3 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

Week 17 - Task 4 : Creating a Feedback form - Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word.

Week 18 - LaTeX and Word Module Test - Replicate the given document inclusive of all features

Microsoft Excel

Week 19 - Excel Orientation : The mentor needs to tell the importance of MS Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources

Task 1 : Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Week 20 - Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std.deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, HLOOKUP/VLOOKUP

Week 21 - Task 3 : Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Week 22 - Task 4 : Cricket Score Card - Features to be covered:-Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation,

Week 23 – Excel Module Test - Replicate the given document inclusive of all features

LaTeX and Microsoft Power Point

Week 24 - Task1 : Students will be working on basic power point utilities and tools which help them create basic power point presentation.

Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Powerpoint.

Week 25 - Task 2 : Second week helps students in making their presentations interactive.

Topic covered during this week includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Week 26 - Task 3 : Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation.

Topic covered during this week includes :- Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

Week 27 - Task 4 : Entire week concentrates on presentation part of LaTeX and Microsoft power point.

Topic covered during this week includes -Using Auto content wizard, Slide Transition, Custom Animation, Auto Rehearsing

Week 28 - Task 5 : Power point test would be conducted. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Microsoft Publisher

Week 29 : Help students in preparing their personal website using Microsoft publisher.

Topic covered during this week includes - Publisher Orientation, Using Templates, Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, Hosting website.

REFERENCES :

1. Comdex Information Technology course tool kit 'Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book,3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. All LaTeX and others related material is available at
   (a) www.sssolutions.in and
   (b) www.sontisoftsolutions.org

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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I Year B. Tech. AE — **T P C**
0 – 3 – 4

(ME05230) ENGINEERING WORKSHOP PRACTICE

1. TRADES FOR EXERCISES:

1. Carpentry
2. Fitting
3. Tin-Smithy and Development of jobs carried out and soldering.
4. Black Smithy
5. House-wiring
6. Foundry
7. IT Workshop-I : Computer hard ware , identification of parts , Disassembly, Assembly of computer to working condition, Simple diagnostic exercises.
8. IT workshop-II : Installation of Operating system windows and Linux , simple diagnostic exercises.

II TRADES FOR DEMONSTRATION & EXPOSURE:

1. Plumbing
2. Welding
3. Machine Shop
4. Power tools in construction, Wood working, Electrical Engg & Mechanical Engg
5. Metal Cutting (water plasma)

Text Books: Work shop Manual / P.Kannaiah/ K.L.Narayana/ Scitech publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
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I Year B. Tech. AE **T P C**
0 – 3 – 4

(HS05232) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Syllabus

The following course content is prescribed for the English Language Laboratory Practice

1. Introduction to Phonetics.
2. Introduction to Vowels and Consonants and associated Phonetic symbols.
3. Introduction to Accent, Intonation and Rhythm.
4. Situational Dialogues / Role Play.
5. Public Speaking.
6. Debate
7. Group discussions
8. Facing Interviews
9. Resume preparation
10. e-correspondence

Minimum Requirement

- Computer aided multi media language lab with 30 systems with LAN facility.
- Conventional Language Lab. with audio and video systems, speakers, head phones and a teacher console to accommodate 30 students.

Suggested Software:

- Cambridge Advanced Learners' Dictionary with exercises
- The Rosetta Stone English Library
- Clarity Pronunciation Power
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd
- Learning to Speak English - 4 CDs
- Microsoft Encarta
- Murphy's English Grammar, Cambridge
- Time series of IQ Test, Brain-teasers, Aptitude Test etc.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy,Cambridge

Books Suggested for English lab :

1. Developing Communication Skills by Krishna Mohan & Meera Benerji (Macmillan)
2. Speaking English Effectively by Krishna Mohan & NP Singh (Macmillan)
3. Better English Pronunciation by JDO Connor (UBS – Cambridge)
4. Oxford Practice Grammar with Answers, John Eastwood, Oxford
5. Handbook of English Grammar and Usage, Mark Lester and Larry Beason, Tata McGraw-Hill
6. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
7. Lingua TOEFL CBT Insider, by Dreamtech
8. TOEFL & GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
9. English Skills for Technical Students, WBSCTE with British Council, OL
10. A Handbook of English for Competitive Examinations, by B Shyamala Rao, Blakie Books, Chennai.

SCHEME OF EVALUATION—Subject: English Language Laboratory Practice Lab: Code—

Practical Examination: As per University Norms:

I Internal Assessment —— 25 Marks

II End Examination —— 50 Marks

Distribution and Weightage of Marks

ENGLISH LANGUAGE LABORATORY PRACTICE

1. The practical examinations for the English Language Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

HYDERABAD

II Year B. Tech. AE – I semester **T P C**

4+1 0 4

(MA05364) MATHEMATICS – II

UNIT – I

Matrices : Elementary row transformations – Rank – Normal form - Echelon form – Consistency – Solution of system of simultaneous linear homogeneous and non-homogeneous equations.

UNIT – II

Eigen values, eigen vectors – properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices. Real matrices – Symmetric, skew - symmetric, orthogonal, Linear Transformation - Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and eigen vectors of complex matrices and their properties.

UNIT-III

Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index - signature - Sylvester law.

UNIT –IV

Fourier Series: Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT-V

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type)equations. Method of separation of variables – Classification of second order linear Partial Differential Equations, solutions of one dimensional heat equation, wave equation and two-dimensional Laplace's equation under initial and boundary conditions.

UNIT –VI

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT-VII

z-transform – inverse z-transform - properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equation by z-transforms.

UNIT-VIII

Wave lets – The Haar wavelets – A wavelet expansion - Multiresolution analysis with Haar Wavelets - General construction of wavelets and multiresolution analysis - Shannon wavelets.

TEXT BOOKS:

1. A Text book of Engineering Mathematics Volume – II, 2005 T,K.V.Iyengar, B.Krishna Gandhi and others, S.Chand and Company.
2. Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill 2003.

REFERENCES:

1. Engineering Mathematics–II, 2002, P.Nageswara Rao, Y.Narsimhulu, Prabhakara Rao
2. Engineering Mathematics, S.K.V.S. Sri Rama Chary, M.Bhujanga Rao, Shankar, B.S.Publications 2000.
3. Advanced Engineering Mathematics (eighth edition), Erwin Kreyszig, John Wiley & Sons (ASIA) Pvt. Ltd. 2001.
4. Advanced Engineering Peter V.O'Neil Thomson Brooks/Cole.
5. Advanced Engineering Mathematics, Merle C.Potter, J.L.Goldberg, E.F.Abrufadel, Oxford University Press. Third Edition 2005.
6. Engineering Mathematics – II, 2005, Sankaraiah, VGS Book Links, Hyderabad.

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II Year B. Tech. AE – I semester **T P C**
4+1 0 4

(CS05433) OBJECT ORIENTED ANALYSIS AND DESIGN THROUGH UML

UNIT-I

INTRODUCTION TO UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT-II

BASIC STRUCTURAL MODELING: Classes, Relationships, common Mechanisms, and diagrams.

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

UNIT-III

CLASS & OBJECT DIAGRAMS: Terms, concepts, modeling techniques for Class & Object Diagrams.

UNIT- IV

BASIC BEHAVIORAL MODELING-I: Interactions, Interaction diagrams

UNIT-V

BASIC BEHAVIORAL MODELING-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT-VI

ADVANCED BEHAVIORAL MODELING: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-VII

ARCHITECTURAL MODELING: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT-VIII

CASE STUDY: The Unified Library application

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY- Dreamtech India Pvt. Ltd.

REFERENCES:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML.
5. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

2005-2006

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II Year B. Tech. AE – I semester **T P C**
4+1 0 4

(CE05375) MECHANICS OF SOLIDS

UNIT – I

SIMPLE STRESSES AND STRAINS

Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and 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 cantilver, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contraflexure – 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.

UNIT – IV

SHEAR STRESSES

Derivation of formula – Shear stress distribution across various beams sections like rec tangular, circular, triangular, I, T angle sections.

UNIT – V

ANALYSIS OF PIN-JOINTED PLANE FRAMES :

Determination of Forces in members of plane, pin-joined, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses.- by method of joints, method of sections and tension coefficient methods.

UNIT – VI

DEFLECTION OF BEAMS

Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT – VII

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 – Riveted boiler shells – Thin spherical shells.

UNIT – VIII

Thick cylinders – lame's equation – cylinders subjected to inside and out side pressures – compound cylinders.

TEXT BOOKS :

1. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.
2. Strength of Materials by Jondar; Galgotia Publications.

REFERENCES:

1. Strength of Materials by Bensal, Lakshmi Publications.
2. Strength of Materials by S.Tumoshenko.
3. Strength of Materials by R.S.Khurmi; S.Chand & Co. 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

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II Year B. Tech. AE – I semester **T P C**

4+1 0 4

(CE05374) MECHANICS OF FLUIDS

UNIT – I

Fluid Properties And Fluid Statics: Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, Pressure at a point, Pascal's law, pressure variation with temperature, density and attitude. Hydro static law, Piezometer, Simple and differential manometers, pressure gauges, total pressure and center of pressure – plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT – II

Fluid Kinematics : Stream line, path line, streak line, stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows – Continuity equation in 3D flow, stream function, velocity potential function.

UNIT – III

Fluid Dynamics : Surface and Body forces – Euler's and Bernoulli's equation derivation, Navier-stokes equation (explanation only) Momentum equation - applications, vortex – Free and Forced. Forced vortex with free surface.

UNIT – IV

Similitude and Flow Measurement – Similarly laws, distorted models. Flow through Venturimeters and Orificemeter, flow through notches and weirs, Viscometers, Hot wire Anemometers, Pitot tube, Flow through nozzles.

UNIT – V

Approximate solutions of N.S. Equations - Boundary layer- concepts, Prandtl contribution,Characteristices of boundary layer along a thin flat plate Von-karman's momentum integral equation (No derivation), laminar and turbulent Boundary layers,BL in transition,separation of BL,control of BL separation,flow around submerged objects, Drag and lift – types of drag – magnus effect.

UNIT – VI

Closed Conduit Flow: Characteristics of real fluids – Reynolds experiment –Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line.

UNIT VII

Exact Solutions of Navier Stokes Equations. Flow between parallel plates, flow through long tubes - Fow through inclined tubes, Turbulent flow, variation of friction factor with Reynold's Number – Mody's chart.

UNIT VIII

Flow of Compressible Fluid: Introduction, Thermodynamic relations, basic equations of compressible flow, velocity of sound wave in a fluid for isothermal and adiabatic process, mach number and its applications, mach angle, Propagation of Pressure waves and stagnation properties

TEXT BOOKS:

1. Fluid Mechanics Hydraulics and Hydraulics Machines Modi & Seth, Standard publications, New Delhi.
2. Engineering Fluid Mechanics by K.L.Kumar, S.Chand & Co.

REFERENCES :

1. Fluid Mechanics – Frank in white Mc-Grawhill.
2. Fluid Mechanics - John – F.Dauglas, Pearson Educations publishers.
3. Fluid Mechanics & Hydraulic Machines - D. Ramadurgaiah, Newage Publishers.

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II Year B. Tech. AE – I semester **T P C**
0 – 6 – 4

(AE05026) AIRCRAFT ENGINEERING DRAWING

UNIT :I

Machine Drawing conventions. Need for Drawings conventions – Introduction to ISI- Conventions

a) Conventional representation of materials , common machine elements and parts such as screws,nuts,bolts,keys,gears,webs,ribs
b) Types of sections – Selection of sectional planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned
c) Methods of dimensioning , general rules for sizes and placement of dimensions for holes ,centers, curved and Tapered features
d) Title boxes, their size, location and details –common abbreviations and their liberal usage.
e) Types of drawing – working drawing for machine parts

UNIT : II

Drawing of Machine Elements and simple parts .Section of views , additional views for the following machine elements and parts with every drawing proportions

a) Popular forms of screw threads, bolts, set screws and bolted joints.
b) Keys,cottered joint and knuckle joint
c) Riveted joints for plates.
d) Shaft couplings, spigot and socket pipe joint.
e) Journal, pivot, collar and foot step bearing
f) Welded joints and welding symbols.

UNIT : III

Following simple Air Craft assembly drawings only.

a) Different types of trusses used in wings fuselage including ribs, striengers,skin,brakets
b) Different elements of fuselage structures ,bulk head , rings (frame) long irons
c) Different types of fuselage.
d) landing gear basic elements ,structural brackets ,wheel, shock absorber and Hydraulic cylinder
e) connecting rod for aero piston engine

Text Books:

1. Machine drawing by N.D. Baht / V.M. Panchal / Charotar Publication House – 2000 Ed .
2. Air Craft structures BY TMH Megson

REFERENCES:

1. Machine Drawing by K.L.Narayana, P.Kannaiah and K.Venkata Reddy / New Age Publishers.
2. Air Craft structures by Bruhn.E.H
3. Machine Drawing by P.S.Gill
4. Machine Drawing by Luzzader
5. Machine Drawing by Rajput.

2005-2006

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II Year B. Tech. AE – I semester **T P C**
4+1 0 4

(CE 05239) ENVIRONMENTAL STUDIES

UNIT - I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

UNIT - II

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - III

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:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - IV

Biodiversity and its conservation : Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - V

Environmental Pollution : Definition, Cause, effects and control measures of :

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. 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.

UNIT - VI

Social Issues and the Environment : From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. -Wasteland reclamation. -Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT - VII

Human Population and the Environment : Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health. -Case Studies.

UNIT - VIII

Field work : Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. -Study of simple ecosystems-pond, river, hill slopes, etc.

TEXTBOOK :

Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

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II Year B. Tech. AE – I semester **T P C**

0 – 3 – 2

(CS05564) UML LAB

1. The student should take up the case study of Unified Library application which is mentioned in the theory, and Model it in different views i.e Use case view, logical view, component view, Deployment view, Database design, forward and Reverse Engineering, and Generation of documentation of the project.

2. Student has to take up another case study of his/her own interest and do the same what ever mentioned in first problem. Some of the ideas regarding case studies are given in reference books which were mentioned in theory syllabus can be referred for some idea.

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II Year B. Tech. AE – I semester **T P C**

0 – 3 – 2

(CE05377) MECHNICS OF SOLIDS & MECHANICS OF FLUIDS LAB

MECHANICS OF SOLIDS LAB

1. Direct tension test

2. Bending test on
   a) Simple supported
   b) Cantilever beam

3. Torsion test

4. Hardness test
   a) Brinells hardness test
   b) Rockwell hardness test

5. Test on springs

6. Compression test on cube

7. Impact test

8. Punch shear test

MECHANICS OF FLUIDS LAB

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch
6. Calibration of contracted Triangular Notch
7. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
8. Verification of Bernoulli's equation.

2005-2006

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II Year B. Tech. AE – II semester **T P C**

4+1 0 4

(MA05366) MATHEMATICS FOR AEROSPACE ENGINEERS

UNIT -I

SPECIAL FUNCTIONS: Gamma and beta functions and their properties. Evaluation of improper integrals. Bessel functions – Properties – Recurrence relations. Orthogonality of Bessel functions. Legendre functions –Legendra Polynomials- properties-recurrence relations. Orthogonality of Legendre polynomials- Rodrigue's formula

UNIT- II

Functions of a complex variable –continuity-differentiability –analyticity- properties of analytic functions. Cauchy – Riemann equations in Cartesian and polar co- ordinates .Harmonic and conjugate harmonic functions. Milne – Thomson method, complex integration.

UNIT- III

Line integral – evaluation along a path and by indefinite integration – Cauchy integral theorem- Cauchy integral formula. Generalized integral formula- zero- singular point- isolated singular point – pole of order, m – essential singularity

UNIT- IV

Complex power series: radius of convergence – Expansion in Taylor's series , Maclaurins series and Laurent's series.

Residue: Evaluation of residue by formula and by Laurent series – Residue theorem –Evaluation of Integrals of type ? $f(\cos\theta, \sin\theta)\, d\theta$, ?$f(x)\, dx$,?$e^{imx} f(x)\, dx$; Argument principle- Rouche's theorem – fundamental theorem of algebra. Liou ville's theorem

UNIT- V:

Conformal mapping, Transformation by e^z , $\log_e z$ z^n , sinz ,cosz , z+ n/z . Bilinear transformation – fixed point, cross ratio, properties, invariance of cross ratio under bilinear transformation. Determination of bilinear transformation mapping 3 given points.

UNIT- VI

Tensor analysis: Introduction to tensor analysis. Summation to convention- co –variant and contravariant tensors- Fundamental and reciprocal tensors and christoffel symbols.

UNIT-VII

STATISTICS: Sample space and events – probability, the axioms of probability –some elementary theorems- conditional probability- Baye's theorem

UNIT - VIII

Introduction to random variables – discrete and continuous- discontinuous functions. Binomial, Poisson and normal distributions and related properties, mean, standard deviation, auto and cross correlations.

TEXT BOOKS:

1. A text book of engineering mathematics vol iv-2004 by T.K.Iyengar, B.Krishna Gandhi & Others, S.Chand and company.
2. Engineering Mathematics – B.V.Ramana BY Tata Mc-Grawhill.

REFERENCES:

1. Fundamentals of Mathematical statistics by S.C. Gupta and VK Kapoor.
2. Brog .S.F. Matrix – Tensor methods in Continuum Mechanics- D- VAN Nostrand company.

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II Year B. Tech. AE – II semester **T P C**
4+1 0 4

(AE05016) AERODYNAMICS – I

UNIT-I - BASICS

Wing and Airfoil section geometry - Aerodynamic forces and moments-Force and moment components and coefficients, Pressure distribution on an airfoil, Types of drag, Estimation of lift, Drag and pitching moment coefficient from the pressure distribution. Experimental methods, wake survey.

UNIT-II - ELEMENTARY FLOWS

Incompressible flow condition, Governing equation for irrotational, incompressible flow: Laplace's equation, Boundary conditions. Elementary flows. Combination of uniform flow with a Source and Sink, Doublet. Flow over a circular cylinder, Vortex flow. Circulation, Kutta-Joukowski theorem. Lifting flow over a cylinder The vortex sheet. Kelvin circulation theorem and starting vortex.

UNIT-III - INCOMPRESSIBLE FLOW OVER AIRFOILS

The complex potential function and conformal transformation, The Kutta-Zhukovsky transformation. Kutta condition. Lift on the Zhukovsky airfoil section.

UNIT-IV - THIN AIRFOIL THEORY

Classical thin airfoil theory for symmetric and cambered airfoil sections. Comparison of theoretical and experimental results. Limitations of thin airfoil theory.

UNIT-V - INCOMPRESSIBLE FLOW OVER FINITE WINGS

Vortex filament, Biot-Savart law and Helmholtz's theorems, Prandtls classical lifting line theory: Downwash and induced drag. Elliptical and modified elliptical lift distribution. Lift distribution on wings. Limitations of Prandtl's lifting line theory.

UNIT-VI - EXTENDED LIFTING LINE THEORY

Extended lifting line theory- lifting surface theory, vortex lattice method for wings. Lift, drag and moment characteristics of complete airplane.

UNIT-VII - SOURCE PANEL METHOD

Source panel method-non-lifting flow over an arbitrary bodies-potential flow over a circular cylinder.

UNIT-VIII - VORTEX PANEL METHOD

Vortex panel methods-Lifting flow over an arbitrary body- flow over a symmetrical airfoil

TEXT BOOKS

1. Anderson, J .D., Fundamental of Aerodynamics, Mc Graw-Hill International Edition
2. Houghton, E.L., and Carruthers, N.B., Aerodynamics for Engineering Students, Edward Arnold Publishers Ltd., London, 1989

REFERENCES :

1. Clancy, L.J., Aerodynamics, Pitman, 1986
2. Milne Thomson, Theoretical Aerodynamics, Macmillan, 1985

2005-2006

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II Year B. Tech. AE – II semester T P C
4+1 0 4

(ME05551) THERMODYNAMICS

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables should be supplied

UNIT – I

System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Work and Heat, Point and Path function.

UNIT II

Zeroth Law of Thermodynamics – Concept of quality of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – 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.

UNIT – III

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 IV

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.

UNIT - V

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

UNIT – VI

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 - VII
POWER CYCLES

Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericcson 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.

UNIT VIII
REFRIGERATION CYCLES

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

TEXT BOOKS :
Engineering Thermodynamics / PK Nag /TMH, III Edition

REFERENCES:

1. Fundamentals of Classical Thermodynamics – G. Van Wylan & R.E. Sonntag – John Wiley Pub.
2. Engineering Thermodynamics – Jones & Dugan
3. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
4. Thermodynamics – J.P.Holman / McGrawHill
5. An introduction to Thermodynamics / YVC Rao / New Age

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II Year B. Tech. AE – II semester **T P C**
4+1 0 4

(EE05187) ELECTRICAL AND ELECTRONICS ENGINEERING

UNIT-I - ELECTRICAL CIRCUITS

Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

UNIT II - DC MACHINES

Principle of operation of DC Generator – emf equation - types – DC motor types – torque equation – applications – threee point starter.

UNIT III - TRANSFORMERS

Principle of operation of single phase transformers – emf equation – losses – efficiency and regulation

UNIT IV - AC MACHINES

Principle of operation of alternators – regulation by synchronous impedance method – Principle of operation of induction motor – slip – torque characteristics – applications.

UNIT V - INSTRUMENTS

Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

UNIT VI - DIODE AND IT'S CHARACTERISTICS

P-n junction diode, symbol, V-I Chacracteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems)

UNIT VII - TRANSISTORS

PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications

UNIT VIII - CATHODE RAY OSCILLOSCOPE

Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

TEXT BOOKS:

1. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin
2. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand & Co.

REFERENCES:

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering by Kothari and Nagarath, TMH Publications, 2nd Edition.

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II Year B. Tech. AE – II semester **T P C**
4+1 0 4

(AE05333) INTRODUCTION TO AEROSAPCE TRANSPORTATION SYSTEMS

UNIT-I - TRANSPORTATION SYSTEMS

Transportation as a human activity - significance - principal modes – applications. History of the development of transportation systems including aviation and space flight - some landmarks.

UNIT-II - AVIATION

The Atmospheric Flight – Science and Technology

The atmosphere – properties. Principles of atmospheric flight – aerostatic and aerodynamic forces. Generation of lift and thrust and reduction of drag - aerodynamic efficiency - the streamlined body.

UNIT-III - THE FLIGHT VEHICLE

Flight vehicle configurations- The Airplane-construction, Description of principal components - functions.

UNIT-IV - PERFORMANCE OF FLIGHT VEHICLES

Performance, stability and control of flight vehicles- relation to design features and construction. Structural loads on Airframe – requirements - principal structural design features.

UNIT-V - AIR TRANSPORT OPERATIONS

Purpose, role and mission of Civil and Military flight vehicles. Flight planning, navigation, air traffic management, maintenance, ground support, airport and passenger facilitation systems – principal features.

UNIT-VI - AIR SAFETY AND SECURITY

Air safety- airworthiness of aircraft equipment - safety of operations. Civil and Military Aviation regulatory agencies- role in prescribing and maintaining air safety standards.

UNIT-VII - SPACE TRANSPORTATION

The high altitude and space environment. Space vehicles- rockets, missiles, earth satellites, space probes, and space stations- applications.

UNIT-VIII - AVIONICS

The role of avionics in the navigation, guidance and control of flight vehicles.

TEXT BOOKS

1. Anderson J.D. , “Introduction to flight” , McGraw Hill, 1995.
2. Kermode, A.C. , “Flight without Formulae”, McGraw Hill, 1987

2005-2006

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II Year B. Tech. AE – II semester **T P C**
4+1 0 4

(AE05378) MECHANISMS AND MECHANICAL DESIGN

UNIT - I
MECHANISMS

Elements of links – Classification – Rigid link, flexible and fluid link – Types of kinematic pairs – Sliding, turning, rolling, screw and spherical pairs – Lower ad higher pairs – Closed and open pairs – Constrained motion – Completely, partially or successfully constrained and incompletely constrained.

MACHINES
Mechanism and machines – Classification of machines – Kinematic chain – Inversion of mechanism – Inversion of quadratic cycle, Chain – single and double slider crank chains.

UNIT – II
STRAIGHT LINE MOTION MECHANISMS

Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

UNIT – III
KINEMATICS

Velocity and acceleration – Motion of link in machine – Determination of velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

ANALYSIS OF MECHANISMS
Analysis of slider crank chain for displacement, Velocity and acceleration of sliding – Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, Determination of Coriolis component of acceleration.

UNIT – IV
PLANE MOTION OF BODY

Instantaneous center of rotation, centroids and axodes – Relative motion between two bodies – Three centers in line theorem – Graphical determination of instantaneous center, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – V
CAMS

Definition of cam and followers – Their uses – Types of followers and cams – Terminology – Types of follower motion – Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and Maximum acceleration during out ward and return strokes in all the above three cases.

UNIT – VI
ANALYSIS OF MOTION OF FOLLOWERS

Roller follower – Circular cam with straight, concave and convex flanks.

UNIT – VII
DESIGN OF MACHINE ELEMENTS

Principles of mechanical design- dimensional tolerances, fits.
Design of common machine elements
Springs, shafts, couplings, Universal coupling.

UNIT – VIII
GEARS AND GEAR TRAINS

Introduction to gears-types, Law of gearing, Tooth profiles, specifications, classification-Helical, Bevel and worm gears:
Simple and reverted gear train, epicyclic gear trains-velocity ratio or train value

TEXT BOOKS

1. Theory of Machines, Dr Jagdish Lal, JM Shaw.
2. Theory of Machines, PL Ballaney, Khanna Publishers, 2003.

REFERENCES

1. Theory of Mechanisms and machines, Amithab Ghosh and Asok Kumar Malik, East West Press Private Limited – 2001.
2. Theory of Machines, Abdulla Sharif, Dhanpat Rai, 1987.
3. Mechanism and Machine Theory, JS Rao and RV Dukkipati / New Age – 1996.
4. Theory of Machines Through Solved Problems, JS Rao / New Age – 1996.
5. Machine Design Pandya & Sha - Charotar Publication House – 1997.
6. Mechanical Engineering and Design, J.E.Shigley and Charles.R.Mischke, TMH, 2003.

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II Year B. Tech. AE – II semester **T P C**
0 – 3 – 2

(AE05107) CAD LAB

1. Fundamentals of CAD and Design process
2. Geometric Modeling
   - 2D Drawings: points, lines, curves, and planes
   - 3D Drawings: Solids (Boolean operations)
   - Part Drawings and Dimensioning
   - Part modeling through 2D, 3D modeling techniques.
3. Solid and Surface Modeling
   - 2D Drawing:
   - 3D Drawing:
   - Part Drawing and Dimensioning from Aircraft Drawing
   - Part modeling from Aircraft Components
   - Solid and surface modeling.

TEXT BOOKS

1. Mikell, P., Groover, “Automation Systems and CIM”; Prentice Hall of India
2. Ibrahim Zeid, “CAD/CAM Theory and Practice”; Prentice Hall of India

REFERENCES

1. Stephen J. Kochen & Patrick II. Wood. “Exploring the UNIX System”; Techmedia, 1999.
2. CAD/CAM By P.N.Rao.

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II Year B. Tech. AE – II semester **T P C**
0 – 3 – 2

(EE05188) ELECTRICAL & ELECTRONICS LAB

Section A: Electrical Engineering

The following experiments are required to be conducted as compulsory experiments :

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiecy and regulation at given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.

In addition to the above four experiments, any one of the experiments from the following list is required to be conducted :

5. Speed control of D.C. Shunt motor by
   a. Armature Voltage control motor
   b. Field flux control method

6. Brake test on D.C Shunt Motor

Section B: Electronics Engineering

1. Transistor CE Characteristics (Input and Output)
2. Full wave Rectifier with and without filters.
3. CE Amplifiers.
4. RC Phase Shift Oscillator
5. Class A Power Amplifier
6. Micro Processor

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HYDERABAD

III Year B. Tech. AE – I semester **T P C**
4+1 0 4

(AE05029) AIRCRAFT PRODUCTION TECHNOLOGY

UNIT – I
INTRODUCTION

Classification and comparision (merits and limitations) of manufacturing process, criterion for selection of a process
General principles of various Casting Processes - Sand casting, die-casting, centrifugal casting, investment casting, shell moulding types

UNIT - II
WELDING

Principles and equipment used in arc welding, gas welding, resistance welding, thermit welding, recent advances in welding technology, Soldering and brazing techniques.

UNIT - III
MACHINING

General principals (with schematic diagram only) of working and types-lathe, shaper, milling machines, grinding, drilling m/c, CNC machining and general principles.

UNIT - IV
SHEET METAL FORMING

Sheet metal operations-shearing, punching, dropstamp forming, Advanced metal forming (super plastic forming and diffusion bonding). Bend correction for bending in single plane and bi-directional bending. Automation in bend forming.

UNIT- V
UNCONVENTIONAL MACHINING

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

UNIT-VI
HEAT TREATMENT AND SURFACE FINISHING

Heat treatment of Aluminium alloys, titanium alloys, steels, case hardening, Initial stresses and the stress alleviation procedures. Corrosion prevention, protective treatment for aluminium alloys, steels, anodizing of titanium alloys, organic coating, and thermal spray coatings. Grinding and Polishing, Technology of surface finish.

UNIT - VII
AIRCRAFT ASSEMBLY

Aircraft Tooling Concepts, Jigs, fixtures, stages of assembly, types and equipment for riveted joints, bolted joints (only).

UNIT - VIII
QUALITY CONTROL AND ASSURANCE

Concepts and definitions of quality, reliability, quality circles, zero defect program: international standards, six-sigma quality.

NDT AND OTHER INSPECTION TECHNIQUES

Dye Penetrant Test, X - ray, magnetic particle and ultrasonic testing. Accoustic holography.

TEXTBOOKS:

1. "Air craft production techniques" Keshu S.C, Ganapathy K.K., Interline Publishing House, Banglore-1993
2. "Manufacturing Engineering and Technology" by Kalpakajam – Addison Wesley.

REFERENCES:

1. "Production technology"- R.K. Jain – Khanna Publishers – 2002.
2. "Production technology"-O.P.Khanna and lal. M.Dhanpat rai publications-New Delhi-1997
3. "Production technology" Chapman W.A.J. Arnold publisher-New Delhi-1994-4th edition
4. "Production Technology" by Hindustan Machine Tools (HMT).
5. "Workshop Technology" by Hajrat Choudhary (Vol I, II & III) – Media Publishers and Promoters – 2002.

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HYDERABAD

III Year B. Tech. AE – I semester **T P C**
4+1 0 4

(AE05250) FLIGHT MECHANICS – I

UNIT-I
AERODYNAMIC CHARACTERISTICS
Airfoils, wings and bodies: geometry, nomenclature. Aerodynamic characteristics. Effect of geometry, Reynolds number, Mach no. Measures of aerodynamic performance. Performance augmentation methods.
UNIT –II
DRAG AND THRUST EVALUATIONS
Drag of aerospace vehicle components. Total drag estimation, Methods of drag reduction, Propellers, Performance analysis. Aerospace engines reciprocating, turbine and rockets. Design features. Performance characteristics.
UNIT –III
AIRCRAFT PERFORMANCE IN STEADY FLIGHT
Level flight, Stall, Cruise, Maximum speed, Ceiling, Cruise climb, Range and endurance. Climb performance, Performance optimization.
UNIT-IV
PERFORMANCE IN ACCELERATED FLIGHT
Take-off and landing. Level turns and maneuvers.
UNIT-V
PERFORMANCE OF ROCKETS AND MISSILES
Principal design features of rockets and missiles. Types, Applications, Staging, Launch and Climb. Performance in boost glide, boost sustain, long range cruise and long - range ballistic trajectories.
UNIT-VI
Introduction to Flight path and performance optimizations.
UNIT-VII
Introduction to Sonic boom and hazards of Transonic and Supersonic Flight. Flight path control based on Ground noise considerations.
UNIT-VIII
Rigid Body Mechanics relevant to Aircrafts, space crafts and Missiles.
TEXT BOOKS

1. Anderson, J .D., Aircraft Performance and Design, Mc Graw-Hill International Edition 1999
2. Clancy, L.J., Aerodynamics, Pitman, 1986

REFERENCES:

1. PerPerkins, C.D., and Hage, R.E., Airplane Performance and Stability and Control, Wiley Toppan, 1974
2. Milne Thomson, Theoretical Aerodynamics, Macmillan, 1985
3. Houghton, E.L., and Carruthers, N.B., Aerodynamics for Engineering Students, Edward Arnold Publishers Ltd., London, 1989
4. Chin SS, Missile Configuration Design, Mc Graw Hill, New York, 1961.

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III Year B. Tech. AE – I semester **T P C**
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(AE05017) AERODYNAMICS – II

Tables/Codes: Isentropic Expansion, Normal Shock, Oblique Shock.

UNIT-I
ONE DIMENSIONAL FLOWS

Isentropic process for closed system/flow processes. Velocity of sound. Mach number, flow regimes. Governing equations of inviscid compressible flow. Continuity, Momentum and Energy equations in Integral and Differential form. Stagnation conditions.

UNIT-II
FLOW THROUGH NOZZLES

Isentropic flow through Convergent – Divergent nozzles. Chocked flow conditions. Normal shock. Under and Over expansion conditions. Flow through diffusers – wave reflections from a free boundary. Description of supersonic wind tunnels and rocket engine.

UNIT-III
OBLIQUE SHOCKS AND EXPANSION WAVES

Oblique shock relations. Super sonic flow over a wedge θ, β, M relations strong and weak shock solutions / Shock polar. Regular reflection from a solid boundary. Intersections of shock wave. Expansion waves. Prandtl – Meyer Expansion.

UNIT-IV
SUBSONIC COMPRESSIBLE FLOW OVER AIRFOIL

Introduction - Velocity potential equation – Transonic small perturbation equation - Prandtl-Glauert compressibility corrections - Critical Mach number - Drag divergence Mach number - Area rule - Supercritical airfoil.

UNIT-V
SUPERSONIC FLOW

Linearized supersonic flow- Linearized supersonic flow over airfoil and wings. Shock Expansion theory. Detached shock. Axi-symmetrical flows-flow past slender bodies of revolution, conical flows-Numerical integration procedure.

2005-2006

UNIT-VI
HYPERSONIC FLOWS

Qualitative aspects of hypersonic flow. Newtonian theory. Flat plate at an angle of attack. Hypersonic shock wave relations. Lift and drag of wings at hypersonic speeds. Recent advances in hypersonic flows and testing techniques.

UNIT-VII
FLOW MEASUREMENTS AND MODEL TESTING

Non dimensional parameters andΠ numbers Similarity of flows. Model testing in wind tunnels. Pressure, Velocity measurements – Hotwire and Laser – Doppler anemometer, Turbulence measurements. Measurement errors. Test section speed, horizontal buoyancy, flow angularities.

UNIT-VIII
FORCE MEASUREMENTS WIND TUNNEL BALANCES

Force measurements – Wind tunnel balances. Scale effects and corrections, wall interferences, induced drag and other computations/corrections.

TEXTBOOKS

1. Anderson, J .D., Fundamental of Aerodynamics, Mc Graw-Hill International third edition Singapore-2001.
2. Radhakrishnan, E, E., Gas Dynamics, Prentice Hall of India, 1995

RFFERENCES

1. Anderson, J .D., Modern Compressible Fluid Flow, Mc Graw-Hill International Edition
2. Hodge B.K & Koenig K Compressible Fluid Dynamics with Computer Application, Prentice Hall, 1995
3. Clancy, L.J., Aerodynamics, Pitman, 1986, Macmillan, 1985

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III Year B. Tech. AE – I semester **T P C**

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(AE05023) AEROSPACE VEHICLE STRUCTURES – I

UNIT - I

STATICALLY DETERMINATE BEAMS

Direct solution of Governing Differential equations for 1-D continua. McCauley's method and introduction of singularity methods for internal force as well as deflection analysis. Beam of constant strength and composite beams.

UNIT - II

STATICALLY INDETERMINATE BEAMS AND FRAMES

Order of redundancy, Introduction to redundant analysis, statically determinate models and introduction of compatibility, principles for redundant analysis, matrix methods for redundant analysis of frames.

UNIT - III

UNSYMMETRIC BENDING

Stress analysis of isotropic, composite beams including unsymmetrical beams.

UNIT - IV

COLUMNS

Columns with various end conditions, column curves, columns with initial curvature, with eccentric loading, short column formulae like Rankine's, Johnson's, etc, Energy method

UNIT - V

BEAM COLUMNS

Introduction to beam columns, elementary treatment.

UNIT - VI

ENERGY PRINCIPLES AND METHODS

Introduction to energy principles and methods, PVD & PVF, Castigliano's theorem, Maxwell's reciprocal theorem, Unit load method. Direct application of energy principles to beams, trusses, frame, rings, etc.

2005-2006

UNIT – VII

The displacement method (Rayleigh Ritz method) for redundant analysis of 1-D structures (rods, shafts and beams), Simple illustration for general stress analysis.

UNIT – VIII

D'Alembert's principle and concepts of Stiffness, Mass Geometric stiffness. Matrix evaluation of equilibria for statics, dynamics and stability. Derivations of kinematically consistent load vectors, Illustration of solutions with simple examples.

TEXT BOOKS

1. Timoshenko, S., "Strength of materials", Vols. I & II, Princeton, D.Von Nostrand Co., 1988.
2. Donaldson, B.K, "Analysis of Aircraft Structures – An Introduction", McGraw Hill, 1993.

REFRENCES

1. Megson THG, "Aircraft Structures for Engineering students", Edward Arnold Publication.
2. Mott, "Applied Strength of materials", PHI.
3. B.C.Punmia, "Theory of Structures", Laxmi Publication.
4. Egor P. Popov, "Engineering Mechanics of Solids" - PHI
5. S.Ramamrutham, R.Narayanan, "Theory of Structures" – Dhanpat Rai Publishing Co, 2003.
6. "Strength of Materials", S.Ramamrutham – Dhanpat Rai

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III Year B. Tech. AE – I semester **T P C**

4+1 0 4

(AE05020) AEROSPACE PROPULSION – I

UNIT -I
FUNDAMENTALS OF GAS TURBINE ENGINES

Illustration of working of gas turbine engine - The thrust equation - Factors affecting thrust – Effect of pressure, velocity and temperature changes of air entering compressors – Method of thrust augmentation – Characteristics of turboprop, turbojet – Performance characteristics.

UNIT - II
SUBSONIC INLETS

Internal flow and Stall in Subsonic inlets - Boundary layer separation – Major features of external flow near a subsonic inlet – Relation between minimum area ratio and eternal deceleration ratio - Diffuser performance .

UNIT - III
SUPERSONIC INLETS

Supersonic inlets - Starting problem in supersonic inlets - Shock swallowing by area variation- External deceleration – Modes of inlet operation.

UNIT - IV
COMBUSTION CHAMBERS AND PERFORMANCE

Classification of combustion chambers – Important factors affecting combustion chamber design – Combustion process – Combustion chamber performance.

UNIT - V
PERFORMANCE SENSITIVITY

Effect of operating variables on performance - Flame tube cooling - Flame stabilization – Use of flame holders – Numerical problems.

UNIT - VI
NOZZLES

Theory of flow in isentropic nozzles - Convergent nozzles and nozzle choking – Nozzle throat conditions – Nozzle efficiency – Losses in nozzles – Over-expanded and under-expanded nozzles - Ejector and variable area nozzles - Interaction of nozzle flow with adjacent surfaces – Thrust reversal .

2005-2006

UNIT - VII
CENTRIFUGAL COMPRESSORS

Principle of operation of centrifugal compressors - Work done and pressure rise - Velocity diagrams - Diffuser vane design considerations – Concept of Prewhirl – Rotating stall.

UNIT - VIII
AXIAL FLOW COMPRESSORS

Elementary theory of axial flow compressor – Velocity triangles – Degree of reaction - Three dimensional flow - Air angle distribution for free vortex and constant reaction designs - Compressor blade design - Centrifugal and Axial compressor performance characteristics.

TEXT BOOKS

1. Mathur M L & Sharma R P; Gas Turbines and Jet & Rocket Propulsion, Standard Publisher, Delhi, 2000.
2. Cohen, H. Rogers, G.F.C. and Saravanamuttoo, H.I.H. Gas Turbine Theory, Longman, ELBSEd, 1989.

REFERENCES

1. Oates G C, AeroThermodyanamics of Aircraft Engine Components, AIAA Edn. Services, NY, 1986.
2. Rolls- Royce, Jet Engine, 3rd edition, 1983.
3. Ganesan V, Gas Turbines, TMGH Pub Co & ed, Delhi, 1999.
4. Philipa Hill and Carl Peterson, Mechanics and Thermodynamics of Propulsion, Addison Wesley Longman Inc, 1999.

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III Year B. Tech. AE – I semester **T P C**

4+1 0 4

(EE05149) CONTROL SYSTEMS

UNIT – I INTRODUCTION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.
Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

UNIT II TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

UNIT-III TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – IV STABILITY ANALYSIS IN S-DOMAIN

The concept of stability - Routh stability criterion – qualitative stability and conditional stability

Root Locus Technique:

The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

2005-2006

UNIT – V FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT – VI STABILITY ANALYSIS IN FREQUENCY DOMAIN

Polar Plots, Nyquist Plots and applications of Nyquist criterion to find the stability – Effects of adding poles and zeros to G(s)H(s) on the shape of the Nyquist diagrams.

UNIT – VII CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT – VIII STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties

TEXT BOOKS:

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.
2. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.

REFERENCES:

1. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
2. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.
3. Control Systems Engg. by NISE 3rd Edition – John Wiley
4. " Modelling & Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers.

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III Year B. Tech. AE – I semester **T P C**

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(AE05028) AIRCRAFT MATERIALS & PRODUCTION LAB

Exercises in Lathe, Shaper, Milling, Slotting, EDM, CNC and Grinding machines comprising the following.

PRODUCTION LAB

1. Plain Turning, Taper turning, Facing, Knurling, Thread Cutting.
2. Drilling, boring, counter boring, counter sinking
3. Shaping and planning of square blocks, V-ways and Dovetail ways
4. Plain Milling
5. Gear Milling
6. Cylindrical Grinding / Surface Grinding
7. Simple exercises in EDM
8. Sheet metal joining by rivets, Soldering and brazing.
9. Simple exercises on CNC machines and Programme generation.

MATERIALS LAB

10. Aircraft wood gluing practice
11. Study of properties of sandwich structures
12. Study of Micro Structures of Non ferrous alloys
13. Experiment on Autoclave for different geometrical structures.

2005-2006

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HYDERABAD

III Year B. Tech. AE – I semester **T P C**

0 – 3 – 2

(AE05018) AERODYNAMICS & PROPULSION LAB

AERODYNAMICS LAB

1. Fluid flow studies using blower
2. Calibration of lowspeed wind tunnel
3. Drag of different bodies
4. Pressure distribution studies on two-dimensional models
5. Pressure distribution over an airfoil at different angles of attack
6. Measurements in wind tunnel, such as boundary layer measurements, wake survey etc.
7. Axial Flow Compressor
8. Centrifugal Flow Compressor
9. Flow Visualization Techniques.

PROPULSION LAB

1. Study of piston engine (Valve Timing And Port Timing Diagram)
2. Stripping of a piston engine, visual inspection and reasoning for common troubles and trouble shooting
3. Performance of piston engine
4. Heat Balance Test on piston engine
5. Engine Balancing

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III Year B. Tech. AE – II semester **T P C**
4+1 0 4

(AE05251) FLIGHT MECHANICS - II

UNIT – I
Degree of freedom of a system - Static and dynamic stability - Need for stability in an airplanes - Purpose of controls - Inherently and marginally stable airplanes.

UNIT – II
EQUATIONS OF MOTION

Equations of motion of a rigid body. Inertial forces and moments. Equations of motion of flight vehicles. Aerodynamic forces and moments. Decoupling of longitudinal and lateral-directional equations. Linearisation of equations.

UNIT - III
AERODYNAMIC STABILITY DERIVATIVES

Aerodynamic stability and control derivatives. Relation to geometry, flight configuration. Effects of power, compressibility and flexibility.

UNIT – IV
STATIC LONGITUDINAL STABILITY AND CONTROL – CONTROL FIXED

Stick Fixed: Basic equilibrium equation - Stability criterion – Contribution of wing and tail and elevator to pitching moments - Effect of fuselage and nacelles - Effects of center of gravity location - Power effects - Stabiliser setting and center of gravity location – Elevator power– Elevator to trim . Trim gradients. Control fixed static stability – Control fixed neutral point. Stability margins.

UNIT – V
STATIC LONGITUDINAL STABILITY – CONTROL FREE

Effects of releasing the elevator. Hinge moment coefficients – Control forces to trim. Control free neutral point – Trim tabs. Aerodynamic balancing of control surfaces. Means of augmentation of control.

UNIT – VI
MANEUVER STABILITY

Contribution of pitch damping to pitching moment of flight vehicle - Effect on trim and stability. Control deflections and control forces for trim in symmetric maneuvers and coordinated turns. Control deflection and force gradients. Control fixed and control free maneuver stability. Maneuver points. Maneuver margins.

UNIT – VII
STATIC LATERAL AND DIRECTIONAL STABILITY AND CONTROL

Dihedral effect - Coupling between rolling and yawing moment - Adverse yaw - Aileron power - Aileron reversal. Weather cocking effects – Rudder power. Lateral and directional stability- definition. Control surface deflections in steady sideslips, rolls and turns one engine inoperative conditions - Rudder lock.

UNIT – VIII
DYNAMIC STABILITY AND RESPONSE TO CONTROL.

Solutions to the stability quartic of the linearised equations of motion. The principal modes. Phugoid , Short Period Dutch Roll and Spiral modes - Further approximations. Restricted degrees of motion. Solutions. Response to controls. Auto rotation and spin.

TEXT BOOKS

1. Houghton, E.L., and Carruthers, N.B., Aerodynamics for Engineering Students, Edward Arnold Publishers Ltd., London, 1989

2. Mc.Cormic, B.W., Aerodynamics, Aeronautics & Flight Mechanics, John Wiley 1995

REFERENCES

1. Perkins C.D., & Hage, R.E., Airplane Performance, Stability and Control, Wiley Toppan 1974.

2. Nelson, R.C., Flight Stability and Automatic Control, McGraw Hill 1989

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III Year B. Tech. AE – II semester

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(AE05024) AEROSPACE VEHICLE STRUCTURES – II

UNIT – I
LOAD DIFFISION IN STIFFNED PANELS

Wagner's theory of beams. Shear carrying capabilities of panels and introduction to Tension field webs. Semi tension and full tension field beams. Monocoque and semi Monocoque structures.

UNIT – II

Axial Load flow diagrams for boom in stiffened panels. Simple illustrate examples of A/C sheet stringer elements through Free body diagrams.

UNIT – III

Load diffusion in thin walled panels with oblique stiffness (at right angles to the bottom).

UNIT – IV

Stability of stiffened panels. Effective width concept. Simple estimations of load carrying capability of stressed skins.

UNIT – V
SHEAR FLOW IN OPEN SECTIONS

Thin walled beams - Concept of shear flow - Shear centre - Elastic axis of box beams with one axis of symmetry, Unsymmetrical box beam with effective and ineffective skins.

UNIT - VI
SHEAR FLOW IN CLOSED SECTIONS

Bredt-Batho formula. Single and multi-cell closed box structures. Approximate method box beams. Shear flow in single & multicell structures beams torsion. Shear flow in single and multicell monocoque and semi monocoque box beams.

2005-2006

UNIT - VII
STRESS ANALYSIS OF WING AND FUSELAGE

Procedure - Shear and bending moment distribution for semi cantilever and other types of wings and fuselages - Thin webbed beam with parallel and non parallel flanges - Shear resistant web beams.

UNIT-VIII
INTRODUCTION TO FATIGUE

Repetitive loads, Endurance strength, stress concentration factor, S-N curve, Goodman &Soderberg lines, low cycles and high cycle fatigue, cumulative fatigue damage for multiple stress cycles-Miner's rule

TEXT BOOKS

1. Megson, T.M.G., Aircraft Structures for Engineering Students, Edward Arnold, 1985.
2. J.T. Oden, "Mechanics of Elastic Structures", McGraw-Hill.

REFERENCES

1. Peery, D.J, and Azar, J.J., Aircraft Structures, 2nd edition, Mc Graw-Hill, N.Y., 1993.
2. Rivello, R.M., Theory and Analysis of Flight Structures, McGraw Hill, 1993.
3. Bruhn. E.H, Analysis and Design of Flight Vehicles Structures, tri -state off set company, USA, 1965.
4. Kuhn.P, "Stresses in Aircraft and Shell Structure", McGraw-Hill.
5. William.D, "An Introduction to the Theory of Aircraft Structures", Edward Arnold.
6. Scheler.E.E and Dunn L.G, "Airplane Structural Analysis and Design", John Wiley & Sons.
7. Kermode.A.C, "The Airplane Structure", Sir Issacc Pitman Publication.
8. Dowty G.H, "Structural Principles and Data", The new ERA Publishing Cp, 1980.
9. "Mechanical Engineering Design" by Joseph. E. Shigley and Charless R. Mischeke, TMH-2003.
10. Machine Design by Pandy and Sha, Charotar Publishing house- 1997.

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III Year B. Tech. AE – II semester **T P C**
4+1 0 4

(AE05021) AEROSPACE PROPULSION – II

UNIT - I
GAS TURBINE THEORIES

Impulse and reaction blading of gas turbines - Velocity triangles and power output - Elementary theory - Vortex theory - Choice of blade profile, pitch and chord - Estimation of stage performance.

UNIT – II
DESIGN CONSILRETIONS

Limiting factors in gas turbine design - Overall turbine performance - Methods of blade cooling - Matching of turbine and compressor - Numerical problems.

UNIT – III
THRUST CONTROL

Thrust Augmentation through after burning, thrust vector control methods.

UNIT – IV
RAMJET PROPULSION

Operating principle- Subcritical, critical and supercritical operation - Combustion in ramjet engine - Ramjet performance - Sample ramjet design calculations - Introduction to SCRAMJET - Preliminary concepts in supersonic combustion - Integral ram - Rocket - Numerical problems.

UNIT - V
FUNDAMENTALS OF ROCKET PROPULSION

Operating principle - Specific impulse of a rocket - Internal ballistics - Rocket nozzle classifications - Rocket performance considerations - Numerical problems.

UNIT - VI
CHEMICAL ROCKETS

Solid propellant rockets - Selection criteria of solid propellants - Important hardware components of solid rockets – Propellant grain design considerations.

2005-2006

UNIT - VII

Liquid propellant rockets - Cooling in liquid rockets - Limitations of hybrid rockets - Relative advantages of liquid rockets over solid rockets.

UNIT - VIII
ADVANCED PROPULSION TECHNIQUES

Electric rocket propulsion - Ion propulsion techniques - Nuclear rocket - Types - Solar sail- Preliminary concepts in nozzle less propulsion.

TEXT BOOKS

1. Sutton, G.P., Rocket Propulsion Elements, John Wiley & Sons Inc., New York, 5th Ed., 1993.
2. Philipa Hill and Carl Peterson, Mechanics and Thermodynamics of Propulsion, Addison Wesley Longman Inc, 1999.

REFERENCES

1. Marcl Bacare et. al. Rocket Propulsion, Elsevier Pub Co, 1960.
2. Zucrow M J, Aircraft & Missile Propulsion, John Wiley & Sons, NY, 1964.
3. Gorden, C.V., Aerothermodynamics of gas turbine and Rocket Propulsion, AIAA Education Series, New York, 1986.
4. Oates G C, AeroThermodyanamics of Aircraft Engine Components, AIAA Edn. Services, NY, 1986.
5. Rolls- Royce, Jet Engine, 3rd edition, 1983.
6. Cohen. H., Rogers, G.F.C. and Saravanamuttoo, H.I.H., Gas turbine theory, Longman Co., ELBS Ed., 1989.
7. Ganesan V, Gas Turbines, TMGH Pub Co & ed, Delhi, 1999.
8. Mathur, M., and Sharma, R.P., Gas Turbines and Jet and Rocket Propulsion, Standard Publishers, New Delhi, 1988.
9. S M Yahya, Fundamentals of Compressible Flow with Aircraft and Rocket propulsion, New Age International Pub, Delhi, 2003.

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III Year B. Tech. AE – II semester **T P C**
4+1 0 4

(AE05132) COMPUTATIONAL AERODYNAMICS

UNIT-I - BASICS

Introduction to computational fluid dynamics – Research tool – Design Tool, Finite control volume, infinitesimal fluid element, substantial derivatives, divergence of Velocity.

UNIT-II - GOVERNING EQUATIONS OF FLUID DYNAMICS

The continuity equation, the momentum equation, the energy equation, physical boundary conditions.

UNIT-III - SHOCK FITTING AND SHOCK CAPTURING

Form of Governing equation suited for CFD - Conservation form - shock fitting and shock capturing.

UNIT-IV - IMPACT OF PARTIAL DIFFERENTIAL EQAUTIONS ON CFD

Introduction, Classification of Quasi-Linear Partial differential equation, The Eigen value method, General behavior of different classes of Partial differential equation – elliptic, parabolic and hyperbolic.

UNIT-V - DISCRETIZATION

Introduction, Finite differences, difference equations, Explicit and implicit approaches, Errors and an analysis of stability.

UNIT-VI - TRANSFORMATIONS

Introduction, transformation of the governing partial differential equations, Matrices and the Jacobian of transformation

UNIT-VII - GRID GENERATIONS – I

Grid Generation techniques, Elliptic Grid Generator – Simply connected domain – doubly connected domain.

UNIT-VIII - GRID GENERATIONS – II

Coordinate system control – Grid Point clustering, Introduction to Hyperbolic Grid Generation techniques and parabolic grid generator.

TEXT BOOKS

1. Hoffmann, K.A: Computational Fluid Dynamics for Engineers, Engineering Education System, Austin, Tex., 1989
2. Kreyszig,E., Advanced Engineering Mathematics, Wiley, New York

REFERENCES

1. John .D. Anderson " Computational Fluid Dynamics", McGraw Hill
2. Anderson, Dale A., John C. Tanhill and Richard H. Pletcher, "Computational Fluid Mechanics and Heat Transfer", McGraw Hill, New York 1984, Volumes I & II
3. Introduction to Computational Fluid Dynamics, Chow CY, John Wiley, 1979

2005-2006

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III Year B. Tech. AE – II semester T P C
4+1 0 4

(AE05247) FINITE ELEMENT AND MODELLING METHODS

UNIT – I
MODELS

Macro and Micro mechanical models and 'The Finite Elements'-Bases of developing and specification structural models. Equilibrium and energy bases for designing such as stiffness, flexibility, Inertia, damping and stability characteristics. Degrees of freedom and their relevance's to approximate methods of analysis

UNIT – II
GENERELIZED COORDINATES

Introduction to generalized coordinates and their classification based frames of reference (local/global), nature and utility. Field specific nature of such coordinates in time & space for representing both continuua and discontinuua. Nom dimensional coordinates, Area and Volume coordinates, utility of generalized coordinates in respresenting continuum and discrete systems.

UNIT – III
DISCRETIZATION

Role of interpolation (Hermitian and Langragian) functions in discretization – concepts of nodes and elements in discretizing 1 – D and 2 – D Solid fluid continuua. Examples of discretization of heat conduction, shear, axial, Torsional and Bending deformations of constant and stepped – 1-D structures. Discretization of plane stress Plain strain and 3-D space frame problems

UNIT – IV
PROPERTIES AND DERIVATION

Derivation of element property matrices from first principles - energy basis for deriving stiffness, mass element properties – Assembly Technique - Concept of work done and derivation of kinematically consistent load vectors
Direct deduction of matrix equation of equilibria using assembly technique for property derivation for 1-D structures and frames.

UNIT – V
APPROXIMATIONS AND ERROR CONTROL

Nodal parametric representation of discrete domains and fields. Isoparametric, Subparametric and Superparametric representation. Injection of singularity in field distortions and their utility in fracture mechanics.

UNIT – VI
MATHEMATICAL TOOLS AND FEM TOOLS

Importance of designing codes in discretizing. Illustration of 1-D and 2-D field problems. Basics of Numerical integration and Gauss quadrature. Techniques of data storage and solution of storage of large scale matrices. Concept of bandwidth and Front widths and their minimization. In core, and out of core solution of based on matrices. Frontal techniques.

UNIT – VII

Symmetries in Fields. 1 – dimensional, 2 Axial, Polar symmetry (cyclic), Axisymmetry problem, symmetry condition and samplification.

UNIT – VIII

Mess generation Techniques, uses of Educational sofwares such as Ansys, NISA, NASTRAN, ASKA, CAEFEM etc.

TEXT BOOKS

1. Concepts and Application of FEA, R.D.Cook, David S. MALKUS, Micheal E_PLESHA, Robert J. Witt Wiley Student Edition, India, 2002.
2. S S Rao, “The Finite Element Methods in Engineering”, Pergamon.

REFERENCES

1. Segarlind, L.J., Applied Finite Element Analysis, John Wiley and Sons, Inc., New York, 1991.
2. Desai, C.S and Abel, J.F., An introduction to the Finite Element Method, Affiliated East-West Press Pvt., Ltd., New Delhi, 1987.
3. Bathe, K.J. And Wilson, E.L., Numerical Methods in Finite Element Analysis, Prentice Hall of India, 1985.
4. Tirupathi R.Chandrupatla and Ashok D Belagundu, “Introduction to Finite Elements in Engineering”, PHI
5. “Finite Element and Modelling Methods”, KSRK Prasad.

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III Year B. Tech. AE – II semester **T P C**
4+1 0 4

(AE05335) INTRODUCTION TO SPACE TECHNOLOGY

UNIT-I
INTRODUCTION

Space Mission-Types-Space Environment-Launch Vehicle Selection

UNIT II
FUNDAMENTALS OF ROCKET PROPULSION

Introduction to rocket propulsion-fundamentals of solid propellant rockets-Fundamentals of liquid propellant rockets-Rocket equation

UNIT-III
ASCENT FLIGHT MECHANICS OF ROCKETS AND MISSILES

Two-dimensional trajectories of rockets and missiles-Multi-stage rockets-Vehicle sizing-Two stage Multi-stage Rockets-Trade-off Ratios-Single Stage to Orbit-Sounding Rocket-Aerospace Plane-Gravity Turn Trajectories-Impact point calculation-Injection conditions-Flight dispersions

UNIT-IV
ATMOSPHERIC REENTRY

Introduction-Steep Ballistic Reentry-Ballistic Orbital Reentry-Skip Reentry-“Double-Dip” Reentry - Aero-braking - Lifting Body Reentry

UNIT-V
FUNDAMENTALS OF ORBITAL MECHANICS

Two-body motion-Circular, elliptic, hyperbolic, and parabolic orbits-Basic Orbital Elements-Ground Trace

UNIT-VI
ORBITAL MANEUVERS

In-Plane Orbit changes-Hohmann Transfer-Bielliptical Transfer-Plane Changes-Combined Maneuvers-Propulsion for Maneuvers

UNIT -VII
SATELLITE ATTITUDE DYNAMICS

Torque free Axi-symmetric rigid body-Attitude Control for Spinning Spacecraft - Attitude Control for Non-spinning Spacecraft - The Yo-Yo Mechanism – Gravity – Gradient Satellite-Dual Spin Spacecraft-Attitude Determination

UNIT-VIII
SPACECRAFT POWER AND COMMUNICATION SYSTEMS

Spacecraft Power-Telecommunications

TEXT BOOKS

1. "Spaceflight Dynamics", W.E. Wiesel, McGraw-Hill, 1997
2. "Rocket Propulsion and Space flight dynamics", Cornelisse, Schoyer HFR, and Wakker KF, Pitman, 1984

REFERENCES

1. "Understanding Space: An Introduction to Astronautics", J.Sellers, McGraw-Hill, 2000
2. "Introduction to Space Flight", Francis J Hale, Prentice-Hall, 1994
3. "Spacecraft Mission Design", Charles D.Brown, AIAA Education Series, 1998
4. "Spacecraft Mission Design", Charles D.Brown, AIAA Education Series, 1998
5. "Elements of Space Technology for Aerospace Engineers", Meyer Rudolph X, Academic Press, 1999

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III Year B. Tech. AE – II semester **T P C**
0 – 3 – 2

(AE05022) AEROSPACE STRUCTURES LAB

1. Tensile testing using universal Testing Machine - Mechanical and optical Extensometers - Stress - strain curves and strength tests for various engineering materials.
2. Bending tests - Stress and deflection of beams for various end conditions - Verification of Maxwell's and Castiglianos theorems - Influence coefficients.
3. Compression tests on load and short column - Critical buckling loads - South well plot.
4. Test on riveted and bolted joints.
5. Test using NDT inspection method.
6. Strain gauge techniques - Measurement of strain in beams, thin and thick walled cylinders subjected to internal pressure - Shaft subjected to combined loading.
7. Shear centre in open and closed sections beams - Test on semi-tension field beams.
8. Elastic constants for composite materials - Flexural test on composites.
9. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude.

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III Year B. Tech. AE – II semester **T P C**
0 – 3 – 2

(AE05135) COMPUTATIONAL STRUCTURAL AND AERODYNAMIC ANALYSIS

A. FINITE ELEMENTS METHOD LAB

UNIT-I
One of the following
a) Exercises on discretization
b) Grid generation and element/node numbering

UNIT-II
Element Generation Exercises (two of the following)
1-D elements(rods, shafts and beams)
Plane Stress /Plane Strain Quadrilateral elements
Triangular plate elements

UNIT-III
FEM Solutions using any one of the following
MATLAB
ANSYS
NASTRAN
PRO - E
Any one of the normal procedures:
a) Gauss Quadrature for unit 1 and 2-D domes
b) Generation of stiffness and load vector matrices.
c) Use of eigen value solvers for frequency and mode shapes determination

B. CFD LAB

UNIT – I
Numerical solutions for any one of the following, using Finite difference method.
Elliptic Equations
Parabolic Equations
Hyperbolic Equations

UNIT – II
Grid Generations for any one of the following
Algebraically stretched Cartesian grids.
Elliptic grids

UNIT – III
Numerical solutions for any one of the following
Vortex panel method
Source panel method
Incompressible coutte flow
Supersonic flow over a flat plate

2005-2006

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IV Year B. Tech. AE – I semester **T P C**
4+1 0 4

(AE05546) THEORY OF VIBRATIONS AND AEROELASTICITY

UNIT - I
INTRODUCTION

Simple Harmonic Motion, Terminology, Newton's Law, D'Alembert's Principle, Resonce, introduction to mechanism of damping. Damped and undamped oscillations.

UNIT - II
SINGLE DEGREE OF FREEDOM SYSTEMS

Free vibrations, Free damped vibrations, Forced vibration with and without damping, Support excitation, and Vibration-measuring instruments. Amplitude and phase response diagrams

UNIT – III
MULTI-DEGREE OF FREEDOM SYSTEMS

Two degree of freedom systems, Static and dynamic couplings, Vibration absorber, Principal coordinates, Principal modes, orthogonality conditions. Hamilton's principle, Lagrangean equation and applications. Longitudinal vibration, Lateral vibration, Torsional vibration of shafts dynamical equations of equilibria of elastic bodies, natural frequencies and mode shapes determination.

UNIT - IV

Vibrations of solid continuua. Determination of Eigen values and Eigen vectors.

UNIT – V
GENERLIZED SINGLE DOF SYSTEM

Derivation of equations of equilibria stiffness mass and damping parameters for continuous systems for one-D approximation.

UNIT – VI

Natural frequency of rotating shafts and whirling of shafts. Dynamic balancing of rotating shafts. Dynamic dampers.

UNIT - VII

Approximate methods to determine the natural frequencies. Introduction to normal mode method of response.

UNIT - VIII

Collar's triangle, introduction to Aero-elasticity, couplings, Aeroelatic instabilities and their prevention. Static and dynamic aero elastic phenomenon Wing divergence, Control reversal and Control flutter speed, Flutter prevention. Aero elastic tailoring.

TEXT BOOKS:

1. Bisplinghott, R.l., Ashley, H. and Hogman, R.l., Aero elasticity, Addison Wisely Publication, New York, 1983
2. Rao, J.S and Gupta .K., Theory and practice of Mechanical vibrations, Wiley Eastern Ltd., New Delhi, 2002.

REFERENCES:

1. Fug, Y.C., An Introduction to Theory of Aeroelasticity, John Wiley & Sons, New York, 1984
2. Timoshenko, S., Vibration Problems in Engineering, John Wiley and Sons, New York, 1987.
3. R.W. Clough and Penzien, "Dynamics of Structures".
4. Shock and Vibrations by Harris & Creed Mc-Graw Hill book company, third edition.
5. Mechanical Vibrations by V.P.Singh, Dhanapati Rai and Co. 2003 edition.
6. Mechanical Vibrations by S.Grahamkelly- TMH 2004 edition.
7. Mechanical Vibrations G.K.Groover, Nemchand and Brothers 2001 edition.
8. Mechanical Vibrations by Singiresure.S.Rao, Pearson Education LPE-2004.
9. Vibrations and waves CBS Publishers and Distributors MIT series 1987.
10. Scanlon, R.H., & Rosenbaum, R., "Introduction to the Study of Aircraft Vibration & Flutter." John Wiley and Sons, New York, 1982

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IV Year B. Tech. AE – I semester

T	P	C
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(AE05252) FLIGHT VEHICLE DESIGN

UNIT-I
OBJECTIVES REQUIREMENTS OF THE VEHICLE : Type, role, mission. Payload, performance and other requirements. Study of comparable aircraft - principal design and constructional and performance. Data collection and statistical analysis.

UNIT-II
CONCEPTUAL SKETCH AND FIRST ESTIMATE OF WEIGHT : Conceptual sketch of candidate design- alternative configurations. First estimate of take off weight.

UNIT-III
INITIAL SIZING : Airfoil and wing geometry selection. Estimate of thrust to weight ratio and wing loading.

UNIT-IV
FUSELAGE AND CONTROL SURFACES : Sizing of Fuselage and control surfaces.

UNIT-V
CONFIGURATION LAYOUT : Layout and drawing of the configuration. Weight balance

UNIT-VI
PERFORMANCE AND STABILITY ESTIMATE : Performance and stability estimate.

UNIT-VII
LOAD ESTIMATES : Airload distribution on the wing. Preliminary structural Layout.

UNIT-VIII
REVIEW : Review and evaluation of the design.

TEXT BOOKS

1. Raymer, Daniel P. Aircraft Design: A Conceptual Approach (Third Edition) AIAA Educational Series. AIAA 1999

REFERENCE

1. Torenbeek E. Synthesis of Subsonic Airplane Design. Delft University Press 1986

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IV Year B. Tech. AE – I semester **T P C**

4+1 0 4

(AE05531) STRUCTURAL ANALYSIS AND DETAILED DESIGN

UNIT – I
LANDING GEAR

Reactions and loads on members of landing gear, oleo strut, torque link

UNIT – II
FUSALAGE – I

Loads, effective cross-section, bending strength, shear flow analysis,

UNIT – III
FUSALAGE – II

Pressurization stresses secondary stresses in stringers, ultimate strength of stiffened cylindrical structures

UNIT IV
MONOCOQUE CYLINDERS – I

Strength under pure torsion, external pressure, internal pressure.

UNIT – V
MONOCOQUE CYLINDERS – II

Strength under Compression, bending and combination of them in monocoque cylinders.

UNIT – VI
WINGS-I

Semi tension field design, elementary approximate formulae, general Wagner equations.

2005-2006

UNIT – VII
WINGS-II

Beams with non parallel flanges, engineering theory of incomplete critical shear stress, loading ratio.

UNIT – VIII
FAIL SAFE DESIGN

Crack propagation, residual strength, fail safe design criterion

TEXT BOOKS

1. Peery, D.J, and Azar, J.J., Aircraft Structures, 2nd edition, Mc Graw-Hill, N.Y., 1993.
2. Rivello, R.M., Theory and Analysis of Flight Structures, McGraw Hill, 1993.

REFERENCES

1. Megson, T.M.G., Aircraft Structures for Engineering Students, Edward Arnold, 1985.
2. Bruhn. E.H, Analysis and Design of Flight Vehicles Structures, tri -state off set company, USA, 1965. J.T. Oden, “Mechanics of Elastic Structures”, McGrawHill.
3. Kuhn.P, “Stressess in Aircraft and Shell Structure”, McGrawHill.
4. William.D, “An Introduction to the Theory of Aircraft Structures”, Edward Arnold.
5. Scheler.E.E and Dunn L.G, “Airplane Structural Analysis and Design”, John Wiley & Sons.
6. Kermode.A.C, “The Airplane Structure”, Sir Issacc Pitman Publication.
7. Dowty G.H, “Structural Principles and Data”, The new ERA Publishing Cp, 1980.
8. Shigley JE, “Mechanical Engineering Design”.
9. Pandya & Shah, “Machine Design”

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IV Year B. Tech. AE – I semester

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(AE05027) AIRCRAFT MATERIALS AND COMPOSITES

UNIT- I

Mechanical behavior of engineering materials, liner and non linear elastic properties, yielding, strain hardening, fracture, Bauschinger's effect, notch effect, testing and flaw detection of material

UNIT- II

Introduction, wrought aluminium alloys, cast aluminium alloys, production of semi-fabricated forms, aerospace applications

UNIT -III
INTRODUCTION TO COMPOSITES

Classification, Characterization, advantages and applications of composite materials, and structures. Structural composites. Reinforcements and matrices. Single layer/ multiplayer; symmetric/unsymmetric and anti-symmetric lay-up configuration with cross ply and angle ply lay-ups. Introduction 3-D composites and Woven composites.

UNIT -IV
CHARATERIZATION OF COMPOSITES

Stress strain relations of composites, orthographic behavior of composites, mechanics of materials approach to determine young modulus, shear modulus and poisson's ratio, stress strain relations in material coordinates: strength concepts, Biaxial strength theories- maximum stress, maximum strain fracture toughness of composites.

UNIT- V
MICRO MECHANICS OF COMPOSITES

Limitation of CCA models and introduction to micro mechanics. Elasticity based micro mechanical models. Introduction to of FEM in composite characterization.

UNIT- VI
FABRICATION PROCESSES

Open and closed mould process, filament winding pull- trusion and on-line production methods of manufacture of fibers and properties

2005-2006

UNIT -VII
DAMAGE TOLERANCE

Introduction to impact damage of composites. Life prediction and damage tllarance studies, fracture toughness of composites, NDT techniques for quality assurance.

UNIT- VIII
SELECTION OF MATERIALS

Environmental and manufacturing considerations in selection of materials for aircrafts and rockets. Materials used for aircraft components: application of composite materials, super alloys.

TEXT BOOKS

1. Balram Gupta, Aerospace Materials Vol. I to V, S.Chand & Company Ltd., New Delhi – 1996.
2. "Analysis and Performance of fibre Composites", Agarwal BD and Broutman LJ., John Wiley and Sons., NY, 1980.

REFERENCES

1. "Mechanics of Composite Materials", Jones RM., McGraw Hill, Kogakusha Ltd., Tokyo, 1985.
2. Titterton, G., Aircraft Materials and Processes, V Edition, Pitman Publishing Co., 1995.
3. Cindy Foreman, Advanced Composites.
4. Lubin G, Hand Book of Advanced Plastics and Fibber glass Von Narstand Reihold Co.N.Y.1989.
5. "Handbook on Advanced Plastics and Fibre Glass:, Lubin G., Von Nostrand Reinhold Co., NY, 1989.
6. "Advanced Composite Materials", Lalit Gupta, Himalayan Books, New Delhi, 1998.

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IV Year B. Tech. AE – I semester

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(AE05242) EXPERIMENTAL STRESS ANALYSIS
(ELECTIVE – I)

UNIT – I
MEASUREMENTS

Basic principles, Accuracy, Sensitivity, Range Measurements, Errors.

UNIT – II
EXTENSOMETERS

Mechanical, Optical, Acoustical and Electrical extensometers and their use – Advantage and disadvantage.

UNIT – III
STRAIN GAUGE - PRINCIPLES

Principles and operation of electrical strain gauge- Requirement - Type and their uses, Material for strain gauge, Calibration, Cross sensitivity, Rosette Analysis.

UNIT - IV
STRAIN GAUGE – STRAIN MEASUREMENT

Wheatstone bridge and potentiometer circuits for static and dynamic strain measurements, Strain indicator.

UNIT – V
PHOTOELASTICITY

Two dimensional Photoelasticity, Concept of Light – Photo–elastic effects, Stress and optic law.

UNIT – VI
FRINGE INTERPOLATION TECHNIQUS
Interpretation of fringe pattern, Compensation and separation techniques, Photoelastic material.

2005-2006

UNIT – VII
NON-DESTRUCTIVE TESTING – I

Fundamentals of Non Destructive Testing, Radiography, Ultrasonic Inspection,Ultrasonic C-Scan, Magnetic particles Inspection, Fluorescent penetrant technique, Eddy current testing, Acoustic Emission Technique.

UNIT – VIII
NON-DESTRUCTIVE TESTING – II

Fundamentals of brittle coating methods, Intoduction to Moiré Techniques, Holography, Thermography.

TEXT BOOKS

1. Daily, J.W., and Riley, W.F., Experimental Stress Analysis, McGraw Hill Inc., New York 1978
2. Mechanical Measurement / Beckwith, Maragoni and Lienhard / Addision – Wesley

REFERENCES

1. Hetyenyi, M., Hand Book of Experimental Stress Analysis, John Wiley and Sons INC., New York, 1972
2. Srinath, L.S., Raghava, M.R., Lingaiah, K., Gargesha, G. Pant B., and Ramachandra, K., Experimental Stress Analysis, Tata McGraw Hill, New Delhi, 1984.
3. Pollock A.A., Acoustic Emission in Acoustics and Vibration Progress, Stephens R.W.B., Chapman and Hall, 1983.
4. Manufacturing Engineering Technology, Kalpakajam / Addision Wesley.

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IV Year B. Tech. AE – I semester

T	P	C
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(AE05063) AVIONICS
(Elective-1)

UNIT –I
BASICS

Basic principles of Avionics – Typical avionics sub system in civil/ military aircraft and space vehicles.

UNIT –II
FLIGHT DECK AND DISPLAY SYSTEMS

Flight deck display technologies – CRT, LED, LCD, Touch screen – Head up display – Electronic instrumentation systems.

UNIT-III
AUDIO AND COMMUNICATION SYSTEMS

Aircraft audio systems basic – audio transmitter and receiver principles – VHF communication system – UHF communication systems.

UNIT-IV
RANGING AND LANDING SYSTEMS

VHF Omnirange – VOR receiver principles – distance maturity equipment – principles of operation – Instrument landing system – localizer and glideslope.

UNIT-V
POSITIONG SYSTEM

Global positioning system principles – triangulation – position accuracy – applications in aviation.

UNIT-VI
INERTIAL NAVIGATION SYSTEM

Principle of Operation of INS – navigation over earth – components of inertial Navigation systems – accelerometers – gyros and stabilized platform.

2005-2006

UNIT-VII
SURVELLIENCE SYSTEM

ATC surveillance systems principles and operation interrogation and replay standards – Collision avoidance system – ground proximity warning system.

UNIT-VIII
AUTO FLIGHT SYSTEM

Automatic flight control systems – fly by wire and fly by light technologies – flight director systems – flight management systems. Integrated DATATRANSFER methodology by use of MILS – STD – 1553/ ARINC – 429.

TEXT BOOKS

1. Elements of electronic navigation, N.S.Nagaraja, Tata Mc Graw Hill, 1995.
2. Avionic systems Operation and maintenance, Janes W.Wasson, Jeppesen Sandersen Training products (Sterling Book House, Mumbai),1994.

REFERENCES

1. Principle of Avionics, Albert Hel frick, Avionics Communications Inc., 2000.
2. Aircraft Instrumentation and Integrated systems EHJ Pallet, Longan Scientific Technical (Sterling Book House, Mumbai) 1996.
3. Aircraft Radio Systems, J.Powell, Pitman publishers, 1998.

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IV Year B. Tech. AE – I semester **T P C**
4+1 0 4

(AE05290) HELICOPTER ENGINEERING
(Elective-1)

UNIT - I

ELEMENTS OF HELICOPTER AERODYNAMICS

Configurations based on torque reaction - Jet rotors and compound helicopters.

UNIT – II

ROTOR CONTROL

Methods of control - Collective and cyclic pitch changes - Lead-lag and flapping hinges.

UNIT - III

IDEAL ROTAR THEORY

Hovering performances - Momentum and simple blade element theories.

UNIT – IV

ROTOR PERFORMANCE

Figures of merit - Profile and induced power estimation - Constant chord and ideal twist rotors.

UNIT - V

POWER ESTIMATES

Induced, Profile and Parasite power requirements in forward flight - Performances curves with effects of altitude.

UNIT – VI

STABILITY AND TRIM

Preliminary ideas on helicopter stability.

UNIT - VII

LIFT AND CONTROL OF V/STOL AIRCRAFT

Various configuration - Propeller, Rotor ducted fan and jet lift - Tilt wing and vectored thrust - Performances of VTOL and STOL aircraft in hover, Transition and Forward motion.

UNIT - VIII

GROUND EFFECT MACHINES

Types - Hover height, Lift augmentation and power calculations for plenum chamber and peripheral jet machines - Drag of hovercraft on land and water. Applications of hovercraft.

TEXT BOOKS

1. Johnson, W., Helicopter Theory, Princeton University Pres, 1980.
2. McCormick, B.W., Aerodynamics, Aeronautics & Flight Mechanics John Wiley, 1995

REFERENCES

1. Gessow, A., and Myers, G.C., Aerodynamics of Helicopter, Macmillan & Co., N.Y.1987.
2. McCormick, B.W., Aerodynamics of V/STOL Flight, Academics Press, 1987
3. Gupta, L Helicopter Engineering, Himalayan books, 1996.

2005-2006

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IV Year B. Tech. AE – I semester **T P C**
4+1 0 4

(AE05225) ENGINEERING OPTIMIZATION
(Elective-I)

UNIT-I

INTRODUCTION TO OPTIMIZATION

Statement of an Optimization Problem-Classification of Optimization Problems-Local and Global Optima

UNIT-II

CLASSICAL OPTIMIZATION TECHNIQUES

Single Variable Optimization-Multivariable Optimization with Equality Constraints-Direct Substitution-Method of Constrained Variation- Method of Lagrange Multipliers

UNIT-III

LINEAR PROGRAMMING

Applications of Linear Programming-Standard form of a Linear Programming Problem-Solution by graphical method-Simplex Method; Two phase and Big M methods-Revised simplex method- Duality in Linear Programming

UNIT-IV

TRANSPORTATION AND ASSIGNMENT PROBLEMS

Transportation Problem- North west corner method-Vogel's approximation method-MOD method-Assignment problems

UNIT-V

NON-LINEAR PROGRAMMING-UNCONSTRAINED OPTIMIZATION TECHNIQUES

Classification of Unconstrained Minimization-Powell's M-Steepest Dscent Method-Conjugate Gradient Method-Marquardt Method,Davidon-Fletcher-Powell Method, Broyden-Fletcher-Goldfarb-Shanno Method

UNIT-VI
NON-LINEAR PROGRAMMING -CONSTRAINED OPTIMIZATION TECHNIQUES

Characteristics of a Constrained Problem-Rosen's Gradient Projection Method-Penalty Function Method

UNIT-VII
INTEGER PROGRAMMING

Graphical Representation-Cutting Plane Method-Branch and Bound Method

UNIT-VIII
DYNAMIC PROGRAMMING

Multi-stage decision process-Computational Procedures in dynamic programming

TEXT BOOKS

1. "Engineering Optimization: Theory and Practice", S.S.Rao, New Age International(P) Ltd.
2. "Optimization for Engineering Dsign:Algorithms and Examples", K.Deb, Prentice-Hall, New Delhi,1995.

REFERENCES

1. **"**Introduction to Optimum design", J.S.Arora, McGraw Hill
2. "Numerical Optimization Techniques for Engineering Design", Vanderplatts, G.N., McGraw Hill

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IV Year B. Tech. AE – I semester **T P C**
4+1 0 4

(AE05306) INDUSTRIAL AERODYNAMICS

(ELECTIVE – I)

UNIT-I - ATMOSPHERE

Types of winds, Causes of variation of wind, Effect of terrain on gradient height.

UNIT-II - ATMOSPHERIC BOUNDARY LAYER

Pressure and velocity distribution over the rising car, Wind tunnel model for atmospheric boundary layer, variation of drag force for various positions of the rising car.

UNIT –III - WIND ENERGY COLLECTORS-I

Horizontal axis and vertical axis machines, Power coefficient, Betz coefficient by momentum theory.

UNIT –IV - WIND ENERGY COLLECTORS-II

Working principles of horizontal and vertical axis machines, Design of axial machines.

UNIT –V - VEHICLE AERODYNAMICS

Power requirements and drag coefficients of automobiles, Effects of cut back angle, Aerodynamics of trains and hovercraft.

UNIT –VI - BUILDING AERODYNAMICS

Pressure distribution on low-rise buildings, Wind forces on buildings, Environmental winds in city blocks, Special problems of tall buildings, Building codes, Building ventilation and architectural aerodynamics, Interference effect of Building.

UNIT –VII - FLOW INDUCED VIBRATIONS

Effects of Reynolds number on wake formation of bluff shapes, Vortex induced vibrations, Galloping and stall flutter.

UNIT-VIII - DESIGN OF CHIMNEY

Height of chimney for various gas effluents, Effective height of chimney, flume rise, Different types of flume rise for various climatic conditions.

TEXT BOOKS

1. Blevins, R.D., Flow Induced Vibrations, Van Nostard, 1990.
2. Calvert, N.G., Wind Power Principles, Charles Griffin & Co., London, 1979.

REFERENCES

1. Scorer, R.S., Environmental Aerodynamics, Ellis Harwood Ltd, England, 1978
2. Sovran, M., Aerodynamics Drag Mechanisms of Bluff Bodies and Road Vehicles, Plenum Press, N.Y., 1978.
3. Sachs. P., Wind Forces in Engineering, Pergamon Press, 1988.

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IV Year B. Tech. AE – I Semester **T P C**
4+1 0 4

(AE05003) ADVANCED COMPUTATIONAL FLUID DYNAMICS
(ELECTIVE – II)

UNIT - I
PANEL METHODS

Introduction to panel method, Basic aspects of uniform source and vortex flows, Source panel method – Non-lifting flows over arbitrary two-dimensional bodies.

UNIT – II
VORTEX PANEL METHOD

Vortex panel method – Lifting flows over arbitrary two-dimensional bodies.

UNIT – III
METHOD OF CHARACTERISTICS

Introduction to numerical techniques for steady supersonic flows, Philosophy of method of characteristics. Determination of characteristic lines – Two-dimensional irrotational flow. Determination of the compatibility equation and unit processes. Regions of influence and Domains of dependence.

UNIT – IV
APPLICATIONS OF METHOD OF CHARACTERISTICS

Supersonic nozzle design using method of characteristics - Description of Mc Cormack's predictors - Corrector techniques.

UNIT - V
TRANSONIC RELAXATION METHOD

Theoretical aspects of transonic flows, Small Perturbation flows - Transonic small perturbation equations - Central and Backward difference schemes, Shock capturing vs. shock fitting techniques: Conservation vs. non conservation forms of governing equations, Line relaxation techniques.

UNIT - VI
BOUNDARY LAYER EQUATION

Introduction to boundary layer equations and their solutions. Description of the boundary layer equations. Transformation of boundary layer equations and the numerical solution method. Choice of discretization model and the generalized Crank-

Nicholson Scheme. Discretization of boundary layer equations and illustration of solutions of a tridiagonal system of linear algebraic equations.

UNIT - VII
TIME DEPENDENT METHODS – I

Stability of Solution, Explicit time dependent methods - Euler, Backward Euler, One step trapezoidal, Backward differencing, methods, Leap Frog method.

UNIT – VIII
TIME DEPENDENT METHODS – II

Description of Lax-Wendroff Scheme and Mac Cormack's two-step predictor – Corrector method. Description of time split methods and Approximate factorization schemes

TEXT BOOKS

1. John .D. Anderson " Computational Fluid Dynamics", McGraw Hill
2. Anderson, Dale A., John C. Tanhill and Richard H.P Letcher, "Computational Fluid Mechanics and Heat transfer", McGraw Hill, New York 1984, Volumes I & II.

REFERENCES

1. Hoffmann, K.A: Computational Fluid Dynamics for Engineers, Engineering Education System, Austin, Tex., 1989
2. Kreyszig, E., Advanced Engineering Mathematics, Wiley, New York
3. Introduction to Computational Fluid Dynamics, Chow CY, John Wiley, 1979
4. Bose, T.K., Computation Fluid Dynamics, Wiley Eastern Ltd., 1988.
5. Chow, C.Y., Introduction to Computational Fluid Dynamics, John Wiley, 1979.
6. Hirsch, A.A., Introduction to Computational Fluid dynamics, Mcgraw Hill, 1989.
7. Fletcher, Computational Fluid Dynamics, Vol I & II, Springer Verlag, 1993.
8. Patankar, S.V., Numerical heat Transfer and Fluid Flow. Hemispher Publishing Corporation, 1992.

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IV Year B. Tech. AE – I Semester **T P C**
4+1 0 4

(ME05108) CAD/CAM
(ELECTIVE – II)

UNIT – I
Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

UNIT – II
Computer Graphics : Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – III
Geometric modeling : Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

UNIT – IV
Drafting and Modeling systems : Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling, constraint based modeling.

UNIT – V
Numerical control : NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming : fundamentals, manual part programming methods, Computer Aided Part Programming.

UNIT – VI
Group Tech : Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT – VII
Material requirement planning, manufacturing resources planning, DNC, AGV, ASRS, Flexible manufacturing systems – FMS equipment, system layouts, FMS control.

UNIT – VIII
CIM : Integration, CIM implementation, major functions in CIM, Benefits of CIM, Lean manufacturing, Just-in-time.

Text Books :
1. CAD / CAM Principles and Applications – 2nd edition, P.N. Rao, Tata Mc. Graw Hill

REFERENCES :
1. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH
2. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
3. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
4. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson.
5. CAD / CAM by CSP Rao – Hi-Tech Publishers.

2005-2006

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IV Year B. Tech. AE – I Semester **T P C**
4+1* 0 4

(AE05509) ROCKETS AND MISSILES
(ELECTIVE – II)

UNIT-I
SOLID PROPELLANT ROCKET SYSTEMS

Ignition system in rockets-Types of igniters-Igniter design considerations- Combustion system of solid rockets

UNIT-II
LIQUID PROPELLANT ROCKET SYSTEMS

Design consideration of liquid rocket combustion chamber, injector, propellant feed lines, valves, propellant tank outlet and helium pressurized and turbine feed systems-Propellant slosh - Propellant hammer- Geysering effect in cryogenic rocket engines

UNIT-III
AERODYNAMICS OF ROCKETS AND MISSILES

Airframe components of rockets and missiles- Forces acting on a missile while passing through atmosphere- Classification of missiles- Method of describing aerodynamic forces and moments-Lateral aerodynamic moment-Lateral damping moment and longitudinal moment of a rocket-Lift and drag forces-Drag estimation-Body upwash and downwash in missiles-Rocket dispersion.

UNIT-IV
TWO-DIMENSIONAL ROCKET MOTION IN VACUUM

Equations of motion-Rocket Motion in free space (Tsiokovsky's equation, Rocket Parameters, Burnout range)-Rocket Motion in a homogeneous gravitational field(Vertical flight, Constant Pitch angle, Gravity turns)

UNIT-V
MULTI-STAGE ROCKET

Nomenclature of the multi-stage rocket-Ideal Velocity of the multi-stage rocket-Vertical ascent in a homogeneous gravitational field and in vacuum (Burnout velocity-Culmination altitude-Vertical ascent of a two-stage rocket)

UNIT-VI
ATTITUDE CONTROL OF ROCKETS AND MISSILES

Rocket thrust vector control - Methods of thrust vector control-Thrust magnitude control, Thrust Termination

UNIT-VII
SEPARATION SYSTEMS FOR ROCKETS AND MISSILES

Stage separation dynamics-Separation techniques

UNIT-VIII
MATERIALS FOR ROCKETS AND MISSILES

Criteria for Selection of materials for rockets and missiles-Choice of materials at cryogenic temperatures, extremely high temperatures - Requirement of materials for thermal protection and pressure vessels

TEXT BOOKS

1. "Rocket Propulsion Elements", George P. Sutton and Oscar Biblarz, Wiley-Interscience, 2000
2. "Rocket Propulsion and Spaceflight Dynamics", J.W. Cornelisse, H.F.R.Schoyer, and K.F.Wakker, Pitman, 1979

REFERENCES

1. "Missile Configuration Design", SS Chin, McGraw Hill, NY, 1961
2. "Space Vehicle Dynamics", K.J.Ball and G.F.Osborne, Oxford University Press, 1967
3. "Materials for Missiles and Spacecraft", E.R. Parker, McGraw Hill, 1982.

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IV Year B. Tech. AE – I Semester **T P C**
4+1 0 4

(AE05496) PROPELLANT TECHNOLOGY
(ELECTIVE – II)

UNIT - I
LIQUID FUELS

Properties and tests for petroleum products - Motor gasoline - Aviation gasoline - Aviation turbine fuels - Requirements of aviation fuels of kerosene type and high flash point type - Requirements for fuel oils.

UNIT - II
SOLID PROPELLANTS – I

Single base propellants - Double base propellants - Composite propellants - CMBD propellants - Metallized composite propellants.

UNIT - III
SOLID PROPELLANTS – II

Introduction to different fuels and oxidizers of composite propellants - Brief introduction to composite theory of composite and double base propellants.

UNIT - IV
LIQUID PROPELLANTS – I

Various liquid propellants and their properties - Monopropellants and bipropellant system - concept of ullage - Ignition studies of liquid propellants.

UNIT - V
LIQUID PROPELLANTS – II

Propellant loading tolerances - inventory - Volume versus mass loading - Loading measurement and control - Outage control.

UNIT –VI
CRYOGENIC PROPELLANTS – I

Introduction to cryogenic propellants - Liquid hydrogen, liquid oxygen, liquid nitrogen and liquid nitrogen and liquid helium and their properties.

UNIT –VII
CRYOGENIC PROPELLANTS – II

Theory behind the production of low temperature - Expansion engine - Cascade process - Joule Thompson effect - Magnetic effect - Ortho and para H2 - Helium 4 and Helium 3 - Ideal cycles and efficiency of cryo systems - Storing of cryogenic propellants - Cryogenic loading problems.

UNIT - VIII
PROPELLANT TESTING

Laboratory testing - Arc Image Furnace - Ignitability studies - Differential Thermal Analysis - Thermo-gravimetric analysis - Particle size measurement Micro-merograph - Strand burner tests impulse bomb - Performance estimation.

TEXT BOOKS

1. Cornelissse, J.W., Rocket Propulsion and Space Dynamics, J.W. Freeman & Co., Ltd., London, 1980.
2. Panrner, S.F. Propellant Chemistry, Reinhold Publishing Corp., N.Y 1985.

REFERENCES

1. Shutton, G.P., Rocket Propulsion Elements, John Wiley, 1993.
2. Sharma, S.P. and Mohan .C., Fuels and Combustion, Tata McGraw Hill Publishing Co, Ltd., 1984
3. Mathur, M., and Sharma, R.P., Gas Turbine and Jet and Rocket Propulsion, Standard Publishers, New Delhi, 1988.

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IV Year B. Tech. AE – I Semester **T P C**
4+1 0 4

(EE05425) NEURAL NETWORKS & FUZZY LOGIC
(ELECTIVE – II)

UNIT – I
INTRODUCTION TO NEURAL NETWORKS

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

UNIT- II
ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

UNIT–III
SINGLE LAYER FEED FORWARD NEURAL NETWORKS

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

UNIT- IV
MULTILAYER FEED FORWARD NEURAL NETWORKS

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

UNIT V
ASSOCIATIVE MEMORIES

Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory), Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms:

Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network
Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

UNIT – VI
CLASSICAL & FUZZY SETS

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT VII
FUZZY LOGIC SYSTEM COMPONENTS

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT VIII
APPLICATIONS

Neural network applications: Process identification, control, fault diagnosis and load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TEXT BOOK:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
2. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.

REFERENCES:

1. Neural and Fuzzy Systems: Foundation, Architectures and Applications, - N. Yadaiah and S. Bapi Raju, Pearson Education
2. Neural Networks – James A Freeman and Davis Skapura, Pearson, 2002.
3. Neural Networks – Simon Hykins , Pearson Education
4. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
5. Neural Networks and Fuzzy Logic System by Bork Kosk, PHI Publications.

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IV Year B. Tech. AE – I semester **T P C**
0 – 3 – 2

(AE05253) FLIGHT VEHICLE DESIGN LAB

1. Objectives Requirements of the vehicle
2. Conceptual Sketch and first estimate of weight
3. Initial Sizing
4. Fuselage and control surfaces
5. Configuration layout.
6. Performance and stability Estimate
7. Load estimates

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IV Year B. Tech. AE – I semester **T P C**
0 – 3 – 2

(AE05532) STRUCTURAL ANALYSIS AND DETAILED DESIGN LAB

Design and Analysis of the following Aircraft Components:-

1. Landing Gear
2. Wings
3. Fuselage
4. Propeller Shaft
5. Propeller Blades
6. Nose Cone

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IV Year B. Tech. AE – II semester **T P C**
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(AE05030) AIRCRAFT SYSTEMS AND INSTRUMENTS

UNIT - I
HYDRAULIC SYSTEMS

Study of typical workable system – Components – Hydraulic system controllers – Modes of operation

UNIT – II
PNEUMATIC AND LANDING GEAR SYSTEMS

Pneumatic systems – Advantages – Working principles – Typical air pressure system – Brake system – Typical pneumatic power system – Components – Landing gear systems – Classification – Shock absorbers – Retractive mechanism.

UNIT – III
AIRPLANE 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.

UNIT – IV
MODERN CONTROL SYSTEMS

Digital fly by wire systems – Auto pilot system active control technology, Communication and Navigation systems – Instrument landing systems, VOR – CCV, Case studies.

UNIT - V
ENGINE SYSTEMS

Fuel system for piston and jet engines - Components of multi engines – Lubricating systems for piston and jet engines.

UNIT – VI
STARTING AND IGNITION SYSTEMS

Starting and Ignition systems – Typical examples for piston and jet engines.

UNIT - VII
AIR CONDITIONING AND PRESSURIZING SYSTEMS

Basic air cycle systems – Vapor cycle systems, Boost – strap air cycle system – Evaporative vapor cycle systems – Evaporative air cycle systems – Oxygen systems – Fire protection systems, De-icing and anti-icing systems.

UNIT - VIII
AIRCRAFT INSTRUMENTS

Flight instruments and Navigation instruments – Accelerometers, Air speed indicators – Mach meters – Altimeters – Principles and operation – Study of various types of engine instruments – Tachometers – Temperature gauges – Pressure gauges – Operation and principles.

TEXT BOOKS

1. McKinley, J.L., and Bent, R.D., Aircraft Maintenance & Repair, McGraw Hill, 1993.
   Transportation, Federal Aviation Administration The English Book Store, New Delhi, 1995
2. General Handbooks of Airframe and Power Plant Mechanics, U.S.Dept. of

REFERENCES

1. McKinley, J.L.and Bent, R.D., Aircraft Power Plants, McGraw Hill 1993.
2. Pallet, E.H.J., Aircraft Instruments & Principles, Pitman & Co 1993.
3. Treager, S., Gas Turbine Technology, McGraw Hill 1997.

2005-2006

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IVYear B. Tech. AE – II semester

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(AE05540) SYSTEM MODELING AND SIMULATION

(ELECTIVE – III)

UNIT I
BASIC CONCEPTS

Hierarchy Types – Elements of a system – system description – Modeling definition – Functions, classification.

UNIT II
SIMULATION

Structure of Simulation Models – Modeling approaches – System simulation – Definition – The Simulation process – Advantages

UNIT III
TECHNIQUES FOR RANDOM NUMBER GENERATION

Simulation of random phenomena – Monte-Carlo sampling – Random number generation – Mid square method – Mid product method – Multiplicative congruential method – Additive congruential method,

UNIT IV
RANDOMNESS TESTING

Testing for randomness – Chi-square method – Kolmogrov method – Runs test – Gasp test.

UNIT V

DATA PREPARATION

Correlation and regression analysis – Curve fitting – Fitting of known distributions – Uniform, normal, exponential Poisson, Weibull empirical distribution – Time flow mechanism – Flow diagram

UNIT VI

SIMULATION OF DISCRETE SYSTEM – I

Simulation of an event occurrence using random number table – Simulation of component failure using exponential and Weibull models

Simulation of single server and two server queue – Simulation of an inventory system.

UNIT VII

SIMULATION OF DISCRETE SYSTEM – II

Planning of simulation experiments – Tactical planning – Run length determination – Validation of simulation models – Analysis of simulation results

UNIT VIII

SIMULATION LANGUAGES

Introduction – Basic Concepts and Advantages of GPSS – Case Example – Basic concepts and advantages of SIMSCRIPT – Case example.

TEXT BOOKS

1 "System Simulation with Digital Computers", Narasingh Deo, PHI, 1979.

2 "System Simulation", Geoffrey Gordon, PHI, 1995.

REFERENCES

1 "Discrete Event System Simulation", Jerry Banks, John S. Carson and Baryl nelson., PHI, 1996.

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IVYear B. Tech. AE – II semester **T P C**

4+1 0 4

(AE05156) CRYOGENICS

(ELECTIVE – III)

UNIT – I - INTRODUCTION

Historical background – Introduction to cryogenic problems.

UNIT – II - CRYOGENIC PROPELLANTS

Liquid hydrogen, Liquid helium, Liquid nitrogen and Liquid oxygen and their properties.

UNIT – III - PRODUCTION OF LOW TEMPERATURE

Theory behind the production of low temperature – Expansion engine heat exchangers – Cascade process Joule Thomson effect – Magnetic effect - Ortho and para H_2 – Helium 4 and Helium 3.

UNIT – IV - EFFICIENCY OF CRYOGENIC SYSTEMS

Types of losses and efficiency of cycles – Specific amount of cooling – The fraction liquefied – Cooling coefficient of performance – Thermodynamic efficiency – The energy balance method.

UNIT –V - CYCLES OF CRYOGENIC PLANTS – I

Classification of cryogenic cycles – The structure of cycles – Throttle expansion cycles – Expander cycles – numerical problems.

UNIT –VI - CYCLES OF CRYOGENIC PLANTS – II

Mixed throttle expansion and expander cycles – Thermodynamic analysis – Numerical problems.

UNIT – VII - CRYOGENICS IN AEROSPACE APPLICATIONS

Cryogenic liquids in missile launching and space simulation of cryogenic liquids – Effect of cryogenic liquids on properties of Aerospace materials.

UNIT – VIII - CRYOGENIC PROBLEMS

Cryogenic loading problems – Zero gravity problems associated with cryogenic propellants – Phenomenon of tank collapse – Elimination of geysering effect in missiles.

TEXT BOOKS

1. "Cryogenic Systems", Barron RF, Oxford Univ., 1985

2. "Propellant Chemistry", Parner SF, Reinhold Pub. Corp., NY, 1985

REFERENCE

1. "Cryogenic Fundamentals", Haseldom G, Academic Press, 1971

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IV Year B. Tech. AE – II Semester **T P C**

4+1 0 4

(EE05404) MICROPROCESSORS & MICROCONTROLLERS

(ELECTIVE – III)

UNIT –I

An over view of 8085, Architecture of 8086 Microprocessor. Special functions of General purpose registers. 8086 flag register and function of 8086 Flags.

UNIT –II

Addressing modes of 8086. Instruction set of 8086. Assembler directives, simple programs.

UNIT – III

Assembly language programs involving, Logical, Branch & Call instructions, sorting, string manipulation.

UNIT – IV

Pin diagram of 8086-Minimum mode and maximum mode of operation. Timing diagram. Need for DMA. DMA data transfer Method, using 8237.

UNIT - V

8255 PPI – various modes of operation and interfacing to 8086. Interfacing Keyboard, Displays, Stepper Motor and actuators. D/A and A/D converter interfacing.

UNIT –VI

Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. Introduction to DOS and BIOS interrupts. 8259 PIC Architecture and interfacing

UNIT –VII

Serial data transfer schemes. Asynchronous and Synchronous data transfer schemes. 8251 USART architecture and interfacing. TTL –to – RS 232c and

UNIT – VIII

8051 Microcontroller Architecture, Register set of 8051, Modes of timer operation, Serial port operation, Interrupt structure of 8051, Memory and I/O interfacing of 8051.

TEXT BOOKS:

1. A.K.Ray and K.M.Bhurchandi – Advanced microprocessor & Preripherals,TMH
2. Kenneth J. Ayala – 8051 Microcontroller, (Penram International).

REFERENCES:-

1. Y.LIU and G.A. Gibson Micro computer systems: The 8086/8088 Family architecture, programming and design 2nd ed, PHI.
2. Avatar singh and Triebel – Microprocessors 8086/ 8088 ,PHI
3. Alan R,Miller- Assembly Language Techniques for the IBM PC,BPB (for DOS and BIOS interrupts only)
4. Rajkamal, Micro Controllers - Pearson Education, 2005.
5. Design with PIC Micro Controllers – John B. Peatman, 2005.
6. 8051 Micro Controllers – Dr. Rajiv Kapadia.
7. Kenneth J Ayala – 8086 Micro Processor (Pennam International).

2005-2006

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IV Year B.Tech AE II Semester **T P C**

4+1 0 4

(AE05299) HYPERSONIC AERODYNAMICS

(ELECTIVE-III)

UNIT-I - FUNDAMENTALS OF HYPERSONIC FLOWS

Importance/properties of hypersonic flow-Basic equations boundary conditions for inviscid flow, shock wave shapes, flow over a wedge

UNIT-II - HYPERSONIC APPROXIMATIONS

Prandtl-Meyer flow- Axi-symmetric flow over a cone - Flow over a flat plate

UNIT-III - HYPERSONIC SMALL DISTURBANCE THEORY

Flow over a wedge and a cone- Blast wave analogy,-Newtonian impact theory-Busemann centrifugal correction -Shock expansion method- Tangent cone and tangent wedge methods

UNIT-IV - BASIC ASPECTS OF HYPERSONIC VISCOUS FLOWS

Introduction to viscous flow and pressure interactions over a flat plate- Boundary layers

UNIT-V - HYPERSONIC AERODYNAMIC HEATING

Reference temperature method-Entropy layer effects on aerodynamic heating

UNIT-VI - HYPERSONIC VISCOUS INTERACTIONS

Strong and weak interactions-Shock wave/ boundary layer interactions

UNIT-VII - HYPERSONIC VEHICLE DESIGN

Hypersonic propulsion and vehicle design

UNIT-VIII - RAREFIED GAS DYNAMICS

Rarefied flow regimes-Kinetic theory of gases-Gas-surface interaction-Aerodynamic forces in hypersonic free molecular flow around simple geometries

TEXT BOOKS

1. “Hypersonic and High Temperature Gas Dynamics”, Anderson, J.D,McGraw-Hill, 1989.
2. “Hypersonic Aerothermodynamics”, Bertin, J.J., AIAA, 1994.

REFERENCES

1. “Introduction to Hypersonic flow”, Cherni C G, Academic Press,1961
2. “Hypersonic Flow Theory”, Hayes W D and Problein R F, Academic Press 1959
3. “Elements of Hypersonic Aerodynamics”, Cox R N and Crabtree L P, London 1965

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IV Year B.Tech AE II Semester

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(AE05524) SPACE MECHANICS
(ELECTIVE-III)

UNIT-I
BASIC CONCEPTS

The solar system-Reference frames and coordinate systems-The celestial sphere-The ecliptic-Motion of vernal equinox-Sidereal time-Solar Time-Standard Time-The earth's atmosphere

UNIT-II
THE GENERAL N-BODY PROBLEM

The many body problem-Lagrange-Jacobi identity-The circular restricted three- body problem-Libration points-Relative Motion in the N-body problem

UNIT-III
THE TWO-BODY PROBLEM

Equations of motion-General characteristics of motion for different orbits-Relations between position and time for different orbits-Expansions in elliptic motion-Orbital Elements-Relation between orbital elements and position and velocity

UNIT-IV
THE LAUNCHING OF A SATELLITE

Launch vehicle ascent trajectories-General aspects of satellite injection-Dependence of orbital parameters on in-plane injection parameters-Launch vehicle performances-Orbit deviations due to injection errors

UNIT-V
PERTURBED SATELLITE ORBITS

Special and general perturbations- Cowell's Method-Encke's method-Method of variations of orbital elements-General perturbations approach

2005-2006

UNIT-VI
INTERPLANETARY TRAJECTORIES

Two-dimensional interplanetary trajectories-Fast interplanetary trajectories-Three-dimensional interplanetary trajectories-Launch of interplanetary spacecraft-Trajectory about the target planet

UNIT-VII
BALLISTIC MISSILE TRAJECTORIES

The boost phase-The ballistic phase-Trajectory geometry-Optimal flights-Time of flight-Re-entry phase-The position of the impact point-Influence coefficients.

UNIT-VIII
LOW-THRUST TRAJECTORIES

Equations of Motion-Constant radial thrust acceleration-Constant tangential thrust(Characteristics of the motion, Linearization of the equations of motion-Performance analysis

TEXT BOOKS

1. "Rocket Propulsion and Spaceflight Dynamics", J.W.Cornelisse, H.F.R. Schoyer, and K.F. Wakker, Pitman, 1979

2. "Spaceflight Dynamics", William E.Wiesel, McGraw-Hill, 1997

REFERENCES

1. "Spacecraft Mission Design", Charles D.Brown, AIAA Education Series, Published by AIAA, 1998

2. "Orbital Mechanics", Vladimir A. Chobotov, AIAA Education Series, AIAA Education Series, Published by AIAA, 2002

3. "Fundamentals of Astrodynamics and Applications", David.A. Vellado, Microcosm and Kluwer, 2001

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IV Year B.Tech AE II Semester **T P C**
4+1 0 4

(AE05244) FATIGUE AND FRACTURE MECHANICS
(ELECTIVE-IV)

UNIT - I - FATIGUE OF STRUCTURES

S-N Curves - Endurance limit - Effect of mean stress - Notches and stress concentrations - Neuber's stress concentration factors - Plastic stress concentration factor - Notched S-N curves.

UNIT - II - DESIGN OF COMPONENTS

Goodman, Gerber and Soderberg relations and diagrams – Modified Goodman Diagram – Design of components subjected to axial, bending, torsion loads and combination of them.

UNIT - III - STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR

Low cycle and high cycle fatigue - Coffin - Manson's relation – Transition life - Cyclic strain hardening and softening.

UNIT – IV - LOAD ASPECTS

Analysis of load histories - Cycle counting techniques - Cumulative damage - Miner's theory - Other theories.

UNIT - V - PHYSICAL ASPECTS OF FATIGUE

Phase in fatigue life - Crack initiation - Crack growth - Final fracture - Dislocations - Fatigue fracture surfaces.

UNIT - VI - FRACTURE MECHANICS

Strength of cracked bodies - Potential energy and surface energy - Griffith's theory - Irwin-Orwin extension of Griffith's theory to ductile materials.

UNIT – VII - STRESS ANALYSIS

Stress analysis of cracked bodies - Effect of thickness on fracture toughness - Stress intensity factors for typical geometries.

UNIT – VIII - FATIGUE DESIGN AND TESTING

Safe life and fail-safe design philosophies – Importance of fracture mechanics in aerospace structure - Application to composite materials structures.

TEXT BOOK

1. Knott, J.F., Fundamentals of Fracture Mechanics, Butter Worth & Co., (Publishers) Ltd., London, 1983

REFERENCES

1. Barrois, W., and Ripley, E.L., Fatigue of Aircraft Structures, Pergamon Pres., Oxford, 1983.
2. Sih, C.G., Mechanics of Fracture, Vol. I, Sijthoff and Noordhoff International Publishing Co., Netherlands, 1989.
3. "Mechanical Engineering Design" by J E Shigley.

2005-2006

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IV Year B.Tech AE II Semester **T P C**
4+1 0 4

(AE05102) BOUNDARY LAYER THEORY
(ELECTIVE-IV)

UNIT – I
BASIC LAWS

Basic laws of fluid flow – Continuity, momentum and energy equations as applied to system and control volume – Concept of flow fields.

UNIT – II
FUNDAMENTALS OF BOUNDARY LAYER THEORY

Viscous fluid flow – Boundary conditions – Development of boundary layer – Estimation of boundary layer thickness – Displacement thickness, momentum and energy thickness for two-dimensional flows. General stress system in a deformable body – General strain system.

UNIT - III
NAVIER STOKES EQUATION

Relation between stress and strain system in a solid body (Hooke's Law) – Relation between stress and strain rate system in liquids and gases (Stroke's Law) – The Navier - Strokes Equation (N-S) – General properties of Navier - Stokes Equation.

UNIT- IV
EXACT SOLUTION OF N-S EQUATION

Two dimensional flow through a straight channel, Hagen –Poiseulle flow – Suddenly accelerated plane wall – Flow near a rotating disk – Very slow motion: Parallel flow past a sphere.

UNIT - V
LAMINAR BOUNDARY LAYER

Analysis of flow past a flat plate and a cylinder – Integral relation of Karman – Integral analysis of energy equation – Laminar boundary layer equations – Flow separation – Blasius solution for flat–plate flow – Boundary layer temperature profiles for constant plate temperature.

UNIT – VI
BOUNDARY LAYER METHODS

Falkner Skan Wedge flows – Integral equation of Boundary layer – Pohlhausen method – Thermal boundary calculations – One parameter and two parameter integral methods.

UNIT – VII
INCOMPRESSIBLE TURBULENT MEAN FLOW

Two-dimensional turbulent boundary layer equations – Integral relations – Eddy-viscosity theories – Velocity profiles.

UNIT – VIII
COMPRESSIBLE – BOUNDARY LAYER FLOW

The law of the wall – The law of the wake – Turbulent flow in pipes and channels – Turbulent boundary on a flat plate – Boundary layers with pressure gradient.

TEXT BOOKS

1. "Turbulent Flows in Engineering", Reynolds AJ, John Wiley & Sons, 1980
2. "Incompressible Flow", Panton RL, John Wiley & Sons, 1984

REFERENCES

1. "Boundary Layer Theory", Schlichting H, McGraw Hill, New York, 1979
2. "Viscous fluid Flow", White FM, McGraw Hill Co. Inc., NY, 1991, 2nd Edition
3. "Fundamentals of Aerodynamics", Anderson JD, McGraw Hill Book Co., Inc., NY, 2001, 3rd Edition.

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IV Year B.Tech AE II Semester **T P C**
4+1 0 4

(AE05334) INTRODUCTION TO AVIATION MANAGEMENT
(ELECTIVE-IV)

UNIT-I
INTRODUCTION TO AIR TRANSPORTATION
Air transportation industry-Regulation and Administration of air transportation-Introduction to air carriers and general aviation

UNIT-II
INTRODUCTION TO GENERAL AVIATION MANAGEMENT

An introductory study on principles of management applied to general aviation, airlines- Includes topics on planning, organizing, directing, controlling and marketing relating to the aviation industry.

UNIT-III
FUNDAMENTALS OF AIR TRAFFIC CONTROL

Introduction to airspace systems-En-route/Terminal Environment-Pilot/Controller actions and responsibilities

UNIT-III
INTRODUCTION TO AIRLINES MANAGEMENT

Aircraft selection- Route feasibility analysis- Computerized Reservation System and Management Systems- Traffic Flow Analysis-Aircraft personnel and Flight systems

UNIT-V
AVIATION ECONOMICS

Introduction to economic considerations in Airport and Airline managements-Passenger and Cargo Transport Economies-Load Sharing and Operational Economics

UNIT-VI
INTRODUCTION TO AIRPORT MANAGEMENT

Major functions of airport management including facilities and services, organization, human resources, maintenance, planning and zoning, operations, revenues and expenses, public relations, ecology, and safety.

UNIT-VII
AVIATION MARKETING

Function of marketing in airline and general aviation operations-Market research-Demand analysis-Advertising and Promotion- Sales traffic- Theory of price determination

UNIT-VIII
INTRODUCTION TO AVIATION SAFETY

Basic principles of aviation accident prevention in Airlines-Flight deck management objectives and procedures-Human factors for flight and ground personnel

TEXT BOOKS

1. "Essentials of Aviation Management", Rodwell Julie, Kendall Hunt Publishing Co, 2003
2. "Airline Management", Charles Banfe, Prentice Hall, 1991

REFERENCES

1. "Airport Planning and Management", Alexander T. Wells, McGraw Hill, 2000
2. "Aviation Maintenance Management", Harry A. Kinnison, McGraw Hill,2004
3. "Air Transportation: A Management Perspective", Alexander T. Wells, Jhon G. Wensveen, Thomson Brooks/Cole, 2003
4. "Business and Corporate Aviation: On Demand Management", John J Sheehan, McGraw Hill, 2003
5. "The Airline Business in the 21st century", Rigas Doganis, Routledge, Taylor&Francis Books Ltd,2000
6. "Fiscal Aspects of Aviation Management", Robert W. Kaps, Southern Illinois University Press, 2000.
7. "Airline Marketing and Management", Stephen Shaw, Ashgate Publishing,2004

2005-2006

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IV Year B.Tech AE II Semester **T P C**
4+1 0 4

(ME05283) HEAT TRANSFER

(ELECTIVE-IV)

UNIT – I

Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

Conduction Heat Transfer:

Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

UNIT – II

Simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions.

One Dimensional Steady State Conduction Heat Transfer:

Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius of insulation

One Dimensional Steady State Conduction Heat Transfer:

Variable Thermal conductivity – systems with heat sources or Heat generation Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature

UNIT III

One Dimensional Transient Conduction Heat Transfer:

Systems with negligible internal resistance – Significance of Biot and Fourier Numbers - Chart solutions of transient conduction systems- Concept of Functional Body

UNIT – IV

Convective Heat Transfer:

Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Π Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations.

Forced convection: External Flows:

Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders

Internal Flows:

Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

UNIT – V

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

UNIT VI

Heat Transfer with Phase Change:

Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

Condensation: Film wise and drop wise condensation –Nusselt's Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

UNIT VII

Heat Exchangers:

Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

UNIT VIII

Radiation Heat Transfer :

Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

Tables/Codes: Heat and Mass transfer data book / C.P. Kothandaraman, Subramanian/ New Age Pub.

TEXT BOOKS :

1. Heat Transfer – Ghoshdastidar – Oxford University Press – II Edition
2. Heat Transfer – P.K.Nag/ TMH

REFERENCES:

1. Fundamentals of Engg. Heat and Mass Transfer / R.C.SACHDEVA / New Age International
2. Essential Heat Transfer - Christopher A Long / Pearson Education
3. Heat Transfer – A Practical Approach – Yunus Cengel, Boles / TMH
4. Heat and Mass Transfer – D.S.Kumar / S.K.Kataria & Sons
5. Heat Transfer / HOLMAN/TMH
6. Fundamentals of Heat Transfer & Mass Transfer- Incropera & Dewitt / John Wiley Pub.
7. Engineering Heat and Mass Transfer – Sarit K. Das / Dhanpat Rai Pub.
8. Heat and Mass Transfer – R. Yadav /CPH

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HYDERABAD

IV Year B.Tech AE II Semester — **T P C** **4+1 0 4**

(AE05019) AEROELASTICITY

(ELECTIVE-IV)

UNIT - I - AEROELASTICITY PHENOMENA

Stability versus response problems – The aero-elastic triangle of forces - Aeroelasticity in Aircraft design – Prevention of Aeroelastic instability.

UNIT – II - DIVERGENCE OF LIFTING SURFACE

Simple two-dimensional idealization – Strip theory – Fredholm integral equation of the second kind –Exact solutions for simple rectangular wings

UNIT – III - APPROXIMATE SOLUTIONS

Semigrid assumptions and approximate solutions – Generalized coordinates – Successive approximations –Numerical approximations using matrix equations.

UNIT - IV - STEADY STATE AEROELASTIC PROBLEM

Loss and reversal of aileron control – Critical aileron reversal speed – Aileron efficiency – Semigrid theory and successive approximations – Lift distribution – Rigid and elastic wings

UNIT - V - FLUTTER PHENOMENON

Non-dimensional Parameters – Stiffness criteria – Dynamic mass balancing – Model experiments – Dimensional similarity – Flutter analysis

UNIT – VI - QUASI-STEADY ANALYSIS

Two dimensional thin airfoils in steady incompressible flow – Quasi-steady aerodynamic derivatives – Galerkin method for critical speed

UNIT – VII - DISTRIBUTED MOTION

Stability of distributed motion –Torsion flexure flutter – Solution of the flutter determinant – Methods of determining the critical flutter speeds – Flutter prevention and control.

UNIT - VIII - EXAMPLES OF AEROELASTIC PROBLEMS

Galloping of transmission lines and flow induced vibrations of tall slender structures and suspension bridges.

TEXT BOOKS

1. Fung, Y.C., An introduction to the theory of Aeroelasticity, John Wiley and Sons Inc., New York, 1985.
2. Scanlan, R.H. and Rosenbaum, R., Introduction to the Study of Aircraft Vibration and Flutter, McGraw Co., N.Y., 1991

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1. Bisplinghoff, R.L., Ashley, H., and Halfmann, R.L., Aeroelasticity, Addison Wesley Publishing Co., Inc., II ed, 1987
2. Broadbent, E.G., Elementary theory of Aeroelasticity, BunHill Publication Ltd., 1986