

SCHEME
&
SYLLABUS
For

B.Tech Aeronautical Engineering
Semester - VII & VIII

SCHEME B.TECH AERONAUTICAL SEM - VII

SUBJECT CODE	SUBJECT
AE-701	AIRCRAFT MAINTENANCE MANAGEMENT
AE-702	AVIONICS
AE-703	MISSILES AND ROCKETS PROPULSION
AE-704	ENVIRONMENTAL ENGINEERING AND SCIENCE
AE-705	AIRCRAFT GENERAL ENGINEERING AND MAINTENANCE PRACTICES
AE-706	AIRCRAFT RULES AND REGULATIONS
AE-707	AERO ENGINE REPAIR AND MAINTENANCE
AE-708	AIRCRAFT DESIGN PROJECT- II
AE-709	MINOR PROJECT WORK
AE-710	AVIONICS LABORATORY

SCHEME OF EXAMINATION

SUBJECT CODE	THEORY				PRACTICAL			CREDIT	TOTAL	TH – THEORY MS – MID SEM TQ – THEORY QUIZ TW – THEORY TEAM WORK PR - PRACTICAL LW- LAB WORK PQ – PRACTICAL QUIZ G- GRADE GP- GRADE POINT F\$ - ABSENT # - GRACE
	TH	MS	TQ	TW	PR	LW	PQ			
	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN			
AE-701	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-702	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-703	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-704	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-705	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-706	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-707	- -	- -	- -	- -	25 -	25 -	25 -	- 2	75	
AE-708	- -	- -	- -	- -	25 -	25 -	25 -	- 2	75	
AE-709	- -	- -	- -	- -	25 -	25 -	25 -	- 2	75	
AE-710	- -	- -	- -	- -	25 -	25 -	25 -	- 2	75	

TOTAL 900

SCHEME B.TECH AERONAUTICAL SEM - VIII

SUBJECT CODE	SUBJECT
AE-801	TOTAL QUALITY MANAGEMENT
AE-802	FUELS AND PROPELLENTS TECHNOLOGY
AE-803	AERODYNAMIC DESIGN OF AIRCRAFT
AE-804	AERODYNAMICS OF HELICOPTER
AE-805	COMPUTER AIDED AIRCRAFT DESIGN LAB
AE-806	INDUSTRIAL TRAINING AND SEMINAR
AE-807	PROJECT WORK

SCHEME OF EXAMINATION

SUBJECT CODE	THEORY				PRACTICAL			CREDIT	TOTAL	TH – THEORY MS – MID SEM TQ – THEORY QUIZ TW – THEORY TEAM WORK PR - PRACTICAL LW- LAB WORK PQ – PRACTICAL QUIZ G- GRADE GP- GRADE POINT F\$ - ABSENT # - GRACE
	TH	MS	TQ	TW	PR	LW	PQ			
	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN	MAX MIN			
AE-801	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-802	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-803	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-804	70 22	20 -	10 -	- -	- -	- -	- -	4 -	100	
AE-805	- -	- -	- -	- -	50 -	25 -	25 -	- 4	100	
AE-806	- -	- -	- -	- -	50 -	25 -	25 -	- 4	100	
AE-807	- -	- -	- -	- -	150 -	75 -	75 -	- 8	300	
TOTAL									900	

Aeronautical Engineering Syllabus

B TECH (SEVENTH SEMESTER)

SVNUAE 701	AIRCRAFT MAINTENANCE MANAGEMENT
SVNUAE 702	AVIONICS
SVNUAE 703	MISSILES AND ROCKETS PROPULSION
SVNUAE 704	ENVIRONMENTAL ENGINEERING AND SCIENCE
SVNUAE 705	AIRCRAFT GENERAL ENGINEERING AND MAINTENANCE PRACTICES
SVNUAE 706	AIRCRAFT RULES AND REGULATION

B TECH (EIGHT SEMESTER)

SVNUAE 801	TOTAL QUALITY MANAGEMENT
SVNUAE 802	FUELS AND PROPELLANT TECHNOLOGY
SVNUAE 803	AERODYNAMIC DESIGN OF AIRCRAFT
SVNUAE 804	AERODYNAMIC OF HELICOPTER

SEVENTH SEMESTER **701 AIRCRAFT MAINTENANCE MANAGEMENT**

UNIT 1

Development of air transportation, comparison with other modes of transport - Role of IATA, ICAO – The general aviation industry airline - Factors affecting general aviation, use of aircraft, airport: airline management and organisation - levels of management, functions of management, Principles of organisation planning the organisation - chart, staff departments & line departments.

UNIT 2

Forecasting - Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc. - Passenger fare and tariffs - Influence of geographical, economic & political factors on routes and route selection.

UNIT 3

FLEET PLANNING: The aircraft selection process - Fleet commonality, factors affecting choice of fleet, route selection and Capital acquisition - Valuation & Depreciation - Budgeting, Cost planning - Aircrew evaluation - Route analysis - Aircraft evaluation.

Equipment maintenance, Flight operations and crew scheduling, Ground operations and facility limitations equipments and types of schedule - hub & spoke scheduling, advantages / disadvantages & preparing flight plans

UNIT 4

Aircraft scheduling in line with aircraft maintenance practices.

Aircraft reliability - The maintenance schedule & its determinations - Condition monitoring maintenance - Extended range operations (EROPS) & ETOPS - Ageing aircraft maintenance production.

UNIT 5

Airlines scheduling (with reference to engineering) - Product support and spares - Maintenance sharing - Equipments and tools for aircraft maintenance - Aircraft weight control - Budgetary control. On board maintenance systems - Engine monitoring - Turbine engine oil maintenance - Turbine engine vibration monitoring in aircraft - Life usage monitoring - Current capabilities of NDT - Helicopter maintenance - Future of aircraft maintenance.

References:

1. Fedric J.H., " Airport Management ", English Book House, New Delhi-I.
2. Gene Krope, " Airline Procedures ", English Book House, New Delhi-I.
3. Wilson & Bryon, " Air Transportation ", English Book House, New Delhi-I.
4. Philip Lockin D, " Economics of Transportation ", English Book House, New Delhi-I.
5. " Indian Aircraft manual ", Published by DGGGA, English Book House, New Delhi-I.
6. Alexander T Wells, " Air Transportation ", Wadsworth Publishing Company, California, 1993.
7. C.H. Friend, " Aircraft Maintenance Management ", English Book House, New Delhi -I.

702 AVIONICS

1. INTRODUCTION TO AVIONICS

Need for Avionics in civil and military aircraft and space systems – Integrated Avionics and Weapon system – Typical avionics sub systems – Design and Technologies.

2. PRINCIPLES OF DIGITAL SYSTEMS

Digital Computers – Microprocessors – Memories

3. DIGITAL AVIONICS ARCHITECTURE

Avionics system architecture–Data buses MIL–STD 1553 B–ARINC 429–ARINC 629.

4. FLIGHT DECK AND COCKPITS

Control and display technologies CRT, LED, LCD, EL and plasma panel - Touch screen - Direct voice input (DVI) - Civil cockpit and military cockpit : MFDS, HUD, MFK, HOTAS

5. INTRODUCTION TO AVIONICS SYSTEMS

Communication Systems - Navigation systems - Flight control systems - Radar electronic warfare - Utility systems Reliability and maintainability - Certification.

References

1. Malcrno A.P. and Leach, D.P., “Digital Principles and Application”, Tata McGraw-Hill, 1990.
2. Gaonkar, R.S., “Microprocessors Architecture – Programming and Application”, Wiley and Sons Ltd., New Delhi, 1990.
3. Middleton, D.H., Ed., “Avionics Systems, Longman Scientific and Technical”, Longman Group UK Ltd., England, 1989.
4. Spitzer, C.R., “Digital Avionic Systems”, Prentice Hall, Englewood Cliffs, N.J., USA., 1987.
5. Brain Kendal, “Manual of Avionics”, The English Book HUse, 3rd Edition, New Delhi, 1993.

703 MISSILES AND ROCKETS PROPULSION

1. ROCKETS SYSTEM

Ignition System in rockets – types of Igniters – Igniter Design Considerations – Design Consideration of liquid Rocket Combustion Chamber, Injector Propellant Feed Lines, Valves, Propellant Tanks Outlet and Helium Pressurized and Turbine feed Systems – Propellant Slash and Propellant Hammer – Elimination of Geysering Effect in Missiles – Combustion System of Solid Rockets.

2. AERODYNAMICS OF ROCKETS AND MISSILES

Airframe Components of Rockets and Missiles – Forces Acting on a Missile While Passing Through Atmosphere – Classification of Missiles – methods 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 – Numerical Problems.

3. ROCKET MOTION IN FREE SPACE AND GRAVITATIONAL FIELD

One Dimensional and Two Dimensional rocket Motions in Free Space and Homogeneous Gravitational Fields – description of Vertical, Inclined and Gravity Turn Trajectories – Determination of range and Altitude Simple Approximations to Burnout Velocity.

4. STAGING AND CONTROL OF ROCKETS AND MISSILES

Rocket Vector Control – Methods – Thrust determination – SITVC – Multistaging of rockets – Vehicle Optimization – Stage Separation Dynamics – Separation Techniques.

5. MATERIALS FOR ROCKETS AND MISSILES

Selection of Materials – Special Requirements of Materials to Perform under Adverse Conditions.

References

1. Sutton, G.P., et al., "Rocket Propulsion Elements", John Wiley & Sons Inc., New York, 1993.
2. Mathur, M., and Sharma, R.P., " Gas Turbines and Jet and Rocket Propulsion", Standard Publishers, New Delhi 1998.
3. Cornelisse, J.W., " Rocket Propulsion and Space Dynamics", J.W., Freeman & Co. Ltd., London, 1982.
4. Parket, E.R., " Materials for Missiles and Spacecraft", McGraw-Hill Book Co. Inc., 1982.
- 5.

704 ENVIRONMENTAL ENGINEERING AND SCIENCE

1. INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems – mineral resources: use effects on forests and tribal people – water resources: use and over-utilization of surface 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.

.2. ECOSYSTEMS AND BIODIVERSITY

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 (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical 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-spots 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.

3. ENVIRONMENTAL POLLUTION

Definition – causes, 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.

Field study of local polluted site – urban / rural / industrial / agricultural

4. 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

5. 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.

References

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", pearson education Pvt., Ltd., second edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. jr., "Environmental Science", Wadsworth publishing co.
3. Townsend C., Harper J and Michael Begon, "Essentials of Ecology", Blackwell science.
4. Trivedi R.K. and P.K. Goel, "Introduction to air pollution", techno-science publications.
5. Bharucha erach, "The Biodiversity of India", mapin publishing Pvt. Ltd., Ahmedabad India,
6. Trivedi R.K., "Handbook of Environmental Laws", Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro media.
7. Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
8. Wager K.D., "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.

705 AIRCRAFT GENERAL ENGINEERING AND MAINTENANCE PRACTICES

1. AIRCRAFT GROUND HANDLING AND SUPPORT EQUIPMENT

Mooring, jacking, levelling and towing operations – Preparation – Equipment - precautions – Engine starting procedures – Piston engine, turboprops and turbojets – Engine fire extinguishing – Ground power units.

2. GROUND SERVICING OF VARIOUS SUB SYSTEMS

Air

conditioning and pressurization – Oxygen and oil systems – Ground units and their maintenance.

3. MAINTENANCE OF SAFETY

Shop safety – Environmental cleanliness – Precautions.

4. INSPECTION

Process – Purpose – Types – Inspection intervals – Techniques – Checklist – Special inspection – Publications, bulletins, various manuals – FAR Air worthiness directives – Type certificate Data Sheets – ATA specifications.

5. AIRCRAFT HARDWARE, MATERIALS, SYSTEMS PROCESSES

Hand tools – Precision instruments – Special tools and equipments in an airplane maintenance shop – Identification terminology – Specification and correct use of various aircraft hardware (i.e. nuts, bolts, rivets, screws etc.) – American and British systems of specifications – Threads, gears, bearings, etc. – Drills, tapes & reamers. – identification of all types of fluid line fittings. Materials, metallic and non-metallic - Plumbing Connectors - Cables – Swaging procedures, tests, Advantages of swaging over splicing.

References

1. KROES WATKINS DELP, "Aircraft Maintenance and Repair" – McGraw-Hill, New York 1993.
2. A & P MECHANICS, "Aircraft hand Book" – F. A. A. Himalayan Book House, New Delhi, 1996.
3. A & P MECHANICS, "General hand Book" – F. A. A. Himalayan Book House, New Delhi, 1996.

706 AIRCRAFT RULES AND REGULATIONS

1. C.A.R. SERIES 'A' – PROCEDURE FOR CIVIL AIR WORTHINESS REQUIREMENTS AND RESPONSIBILITY OPERATORS Vis-à-vis AIR WORTHINESS DIRECTORATE

Responsibilities of operators / owners- Procedure of CAR issue, amendments etc., Objectives and targets of airworthiness directorate; Airworthiness regulations and safety oversight of engineering activities of operators.

C.A.R. SERIES 'B' – ISSUE APPROVAL OF COCKPIT CHECK LIST, MEL, CDL: Deficiency list (MEL & CDL); Preparation and use of cockpit checklist and emergency list.

2. C.A.R. SERIES 'C' – DEFECT RECORDING, MONITORING, INVESTIGATION AND REPORTING

Defect recording, reporting, investigation, rectification and analysis; Flight report; Reporting and rectification of defects observed on aircraft; Analytical study of in-flight readings & recordings; Maintenance control by reliability Method.

4. C.A.R. SERIES 'D' – AND AIRCRAFT MAINTENANCE PROGRAMMES

Reliability Programmes (Engines); Aircraft maintenance programme & their approval; On condition maintenance of reciprocating engines; TBO – Revision programme; Maintenance of fuel and oil uplift and consumption records – Light aircraft engines; Fixing routine maintenance periods and component TBOs – Initial & revisions.

5. C.A.R. SERIES 'E' – APPROVAL OF ORGANISATIONS

Approval of organizations in categories A, B, C, D, E, F, & G - Requirements of infrastructure at stations other than parent base.

6. C.A.R. SERIES 'F' – AIR WORTHINESS AND CONTINUED AIR WORTHINESS:

Procedure relating to registration of aircraft; Procedure for issue / revalidation of Type Certificate of aircraft and its engines / propeller; Issue / revalidation of Certificate of Airworthiness; Requirements for renewal of Certificate of Airworthiness.

7 C.A.R. SERIES 'L' & 'M'

Issue of AME Licence, its classification and experience requirements, Mandatory Modifications / Inspections.

8. C.A.R. SERIES 'T' & 'X'

Flight testing of (Series) aircraft for issue of C of A; Flight testing of aircraft for which C of A had been previously issued.

Registration Markings of aircraft; Weight and balance control of an aircraft; Provision of first aid kits & Physician's kit in an aircraft; Use furnishing materials in an aircraft; Concessions; Aircraft log books; Document to be carried on board on Indian registered aircraft; Procedure for issue of tax permit; Procedure for issue of type approval of aircraft components and equipment including instruments.

References

1. "Civil Aviation Requirements with latest Amendment (Section 2 Airworthiness)" – Published by DGCA, The English Book Store, 17-1, Connaught Circus, New Delhi 2000.
2. Aeronautical Information Circulars (relating to Airworthiness) from DGCA 2000.
3. "Aircraft Manual (India) Volume" – Latest Edition, The English Book Store, 17-1, Connaught Circus, New Delhi.
4. Advisory Circulars from DGCA 2003.

PRACTICAL SEVENTH SEMESTER **701 AERO ENGINE REPAIR AND MAINTENANCE**

1. Stripping of a piston engine
2. Engine (Piston Engine) - cleaning, visual inspection, NDT checks.
3. Piston Engine Components - dimensional checks.
4. Piston – Engine reassembly.
5. Propeller Pitch Setting
6. Stripping of a jet engine
7. Jet Engine – identification of components & defects.
8. Jet Engine – NDT checks and dimensional checks
9. Jet Engine – reassembly.
10. Engine starting procedures.

702 AIRCRAFT DESIGN PROJECT - II

Each student is assigned with work in continuation of the design project – I. The following assignments are to be carried out.

LIST OF EXPERIMENTS

1. *V-n diagram for the design study*
2. *Gust and maneuverability envelopes*
3. *Critical loading performance and final V-n graph calculation*
4. *Structural design study – Theory approach*
5. *Load estimation of wings*
6. *Load estimation of fuselage.*
7. *Balancing and Maneuvering loads on tail plane, Aileron and Rudder loads.*
8. *Detailed structural layouts*
9. *Design of some components of wings, fuselage*
10. *Preparation of a detailed design report with CAD drawings.*

703 MINOR PROJECT WORK

OBJECTIVE

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. .

Each student shall finally produce a comprehensive report covering back round information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.

704 AVIONICS LABORATORY

LIST OF EXPERIMENTS

DIGITAL ELECTRONICS

1. Addition/Subtraction of binary numbers.
2. Multiplexer/Demultiplexer Circuits.
3. Encoder/Decoder Circuits.
4. Timer Circuits, Shift Registers, Binary Comparator Circuits.

MICROPROCESSORS

5. Addition and Subtraction of 8-bit and 16-bit numbers.
6. Sorting of Data in Ascending & Descending order.
7. Sum of a given series with and without carry.
8. Greatest in a given series & Multi-byte addition in BCD mode.
9. Interface programming with 4 digit 7 segment Display & Switches & LED's.
10. 16 Channel Analog to Digital Converter & Generation of Ramp, Square, Triangular wave by Digital to Analog Converter.

AVIONICS DATA BUSES

11. Study of Different Avionics Data Buses.
12. MIL-Std – 1553 Data Buses Configuration with Message transfer.
13. MIL-Std – 1553 Remote Terminal Configuration.

EIGHT SEMESTER

801 TOTAL QUALITY MANAGEMENT

1. INTRODUCTION

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

2. TQM PRINCIPLES

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

3. STATISTICAL PROCESS CONTROL (SPC)

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

4. TQM TOOLS

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

5. QUALITY SYSTEMS

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TEXT BOOK

1. Dale H.Besterfield, et al., "Total Quality Management", Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES

1. James R.Evans & William M.Lindsay, "The Management and Control of Quality", (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management", McGraw-Hill, 1991.
3. Oakland.J.S. "Total Quality Management", Butterworth Heinemann Ltd., Oxford, 1989.
4. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers, 1991.

802 FUELS AND PROPELLANT TECHNOLOGY

UNIT 1

Properties and tests for petroleum products - Motor gasoline - Aviation gasoline - Aviation turbine fuels - Requirements of aviation turbine fuels of Kerosene type and high flash point type - Requirements for fuel oils Single base propellants - Double base propellants - composite propellants - CMDB propellants – Metalized composite Propellants - Brief introduction to combustion theory of composite and double base propellants

UNIT 2

Various liquid propellants and their properties - Monopropellant and bipropellant systems - Concept of ullage - Ignition studies of liquid propellants - Propellant loading tolerances - Inventory-Volume versus mass loading - Loading measurement and control - Outage control

UNIT 3

Introduction to cryogenic propellants - Liquid Hydrogen, liquid Oxygen, Liquid nitrogen and liquid helium - 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 4

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

References

1. Sutton, 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 Turbines and Jet and Rocket Propulsion, Standard Publishers, New Delhi, 1988
4. Cornelisse, J.W., Rocket propulsion and space dynamics, W.H. Freeman & Co., Ltd., London, 1980.
5. Parmer S.F., Propellant Chemistry, Reinhold Publishing Corp., New York 1985

803 AERODYNAMIC DESIGN OF AIRCRAFT

UNIT 1

State of the art in airplane design, Classification of airplanes based on purpose and configuration, Factors affecting configuration, Merits of different airplane layouts

UNIT 2

Principal features, Aerodynamic consideration, Lift, Drag and Interference effects, Weights and Strength considerations, Peculiarities in layout, Designing for manufacturability, Maintenance, Operational costs, Interactive design

UNIT 3

Data collection and 3-View drawings, their purpose, weight estimation, choice of wing loading and thrust loading. choices available, Comparative merits, Location of power plants, Functions dictating the locations.

a) Wing design:

Airworthiness requirements, V-n diagram, loads, Elements of wing design, Structural features.

b) Fuselage design:

Loads on fuselage, Elements of fuselage design, Determination of tail surface areas, Structural features.

c) Landing gear design:

Loads on Landing gear, Preliminary landing gear design

d) Elements of computer Aided Design:

References

1. Torenbeek, E., " *Synthesis of Subsonic Airplane Design* ", Delft University Press, U.K. 1986
2. Kuechemann, D., " *Aerodynamic Design of Aircraft* ", Pergamon Press, 1978
3. Raymer, D.P., " *Aircraft Conceptual Design* ", AIAA Series, 1989

804 AERODYNAMIC OF HELICOPTER

UNIT 1

Configurations based on torque reaction-Jet rotors and compound helicopters- Methods of control – Collective and cyclic pitch changes - Lead - Lag and flapping hinges.

UNIT 2

Hovering performance - Momentum and simple blade element theories - Figure of merit - Profile and induced power estimation - Constant chord and ideal twist rotors.

UNIT 3

Induced, profile and parasite power requirements in forward flight-Performance curves with effects of altitude- Preliminary ideas on helicopter stability

UNIT 4

Various configuration - Propeller, rotor, ducted fan and jet lift - Tilt wing and vectored thrust - Performance of VTOL and STOL aircraft in hover, transition and forward motion.

UNIT 5

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

References

1. Gessow, A., and Myers, G.C., " Aerodynamicsof Helicopter " , MacMillan & Co., N.Y. 1987.
2. McCormick, B.W., " Aerodynamics of V/STOL Flight " , Academic Press, 1987.
3. Johnson, W., " Helicopter Theory " , Princeton university Press, 1980.
4. McCormick, B.W., " Aerodynamics, Aeronautics & Flight Mechanics " John Wiley, 1995.
5. Gupta, L., " Helicopter Engineering " , Himalayan Books, 1996.

PRACTICAL**801 PROJECT WORK****OBJECTIVE**

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. .

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802 COMPTUTER ADDED AIRCRAFT DESIGN LAB

As Per Subject

803 INDUSTRIAL TRAINING & SEMINAR**OBJECTIVE**

The students are to select one technical topic related its branch for seminar. The student is to submit the synopsis for assessment and approval. Progress for preparation of the seminar topic would be continuously assessed from time to time. Students have to give a final presentation for 15 minutes on his topic.