INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
ACCREDITED BY NAAC WITH 'A' GRADE
*Marching Beyond 25 Years Successfully*

# PG diploma in

# Aircraft Maintenance

## Curriculum and Syllabus
## Regulations2022

**Based on Choice Based Credit System (CBCS) and**

**Learning Outcomes based Curriculum Framework (LOCF)**

**Effective from the Academic year**
**2022-2023**

## Department of Aviation

## Department of Aviation

### VISION

To be fore front in the aviation field by contributing to the intellectual, social and economic development of the aviation industry and the citizens of our nation. It is served through precept, research fueled by the advanced curriculum to endeavor the highest standards to excel in their Aviation profession.

### MISSION

- To empower and encourage the students with the knowledge and practical skills required in the field of Aircraft Maintenance.
- To impart quality education through the technologically advanced curriculum which would be delivered by the industry experts.
- To train the students to have in-depth knowledge of the subjects in the field of aviation and groom them in soft skills & survival skills.

## PROGRAMME EDUCATIONAL OUTCOME (PEOs)

PEO 1: To produce graduates having competencies in the maintenance and repair of modern aircraft.

PEO 2: To produce graduates who can meet the demands of the dynamic aviation maintenance area of aviation industry.

PEO 3: To produce graduate shaving the basic knowledge and skills necessary to pursue technical and professional careers in aviation industry.

## PROGRAM OUTCOMES (POs)

**PO1: Disciplinary knowledge**

Students will demonstrate in-depth knowledge and understanding of Aircraft Maintenance.

**PO2: Communication Skills**

Students can express thoughts and ideas effectively in writing and orally, and also able to present complex information clearly and concisely to different groups.

**PO3: Critical thinking**

Students can apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs based on empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following a scientific approach to knowledge development.

**PO4: Problem-solving**

Students can build the capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real-life situations.

**PO5: Analytical reasoning**

Students can evaluate their liability and relevance of evidence; identify

logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

**PO6: Research-related skills**

Students can recognize cause and effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; the ability to plan, execute and report the results of an experiment or investigation.

**PO7: Cooperation/Teamwork**

Students can work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

**PO8: Scientific reasoning**

Students can analyze, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

**PO9: Reflective thinking**

Students can develop Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

**PO10: Information/digital literacy**

Students can use ICT in a variety of learning situations, demonstrate the ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

**PO11: Self-directed learning**

Students can work independently, identify appropriate resources required for a project, and manage a project through to completion.

**PO12: Multicultural competence**

Students can get knowledge of the values and beliefs of multiple cultures and a global perspective, and the capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

**PO13: Moral and ethical awareness/reasoning**

Students can embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting an objective, unbiased and truthful actions in all aspects of work.

**PO14: Leadership readiness/qualities**

Students can develop the ability to mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team that can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, smoothly and efficiently.

**PO15: Lifelong learning**

Students can acquire knowledge and skills, including learning how to learn, that is necessary for participating in learning activities throughout life.

## PROGRAMME SPECIFIC OUTCOME(PSOS)

**Attend of the program, the students are**

**PSO1:** Able to examine different parts of an aircraft and ensure their proper functioning.

**PSO2:** Able to Conduct maintenance procedures in Aircraft Engines, Airframe, and Avionics systems for Continuous Airworthiness.

**PSO3:** Able to work in an Aviation industry as a team member well as an individual with professional qualities and evolve oneself for lifelong learning.

# LIST OF BOARD OF STUDIES(BOS)MEMBERS

| S. No | Name of the Board Member | Designation | Signature |
|---|---|---|---|
| | | CHAIRMAN | |
| 1 | Dr. S. Ramasubramanian | Associate Professor & HoD i/c, Department of Aviation, Vels Institute of Science, Technology and Advanced Studies | |
| | | Internal Member | |
| 2 | Dr. M. Chandrasekaran | Professor & Dean, Academic Courses, Vels Institute of Science, Technology and Advanced Studies. | |
| | | Industry Expert Members | |
| 1 | Er. Karthikeyen | Flight Engineer Boing 747, Trans Volga Airline, Kazakhstan. | |
| 2 | Er. Ashif Naseer | Aircraft Maintenance engineer Airbus A-320, Indigo, India | |
| | | Academic Expert Members | |
| 1 | Dr. Manigandan | HOD, Former BOS Chairman Department of Aerospace, Dhanalakshmi Srinivasan College, Perambalur, India. | |
| 2 | Mr. Ahmed Zubair | Chief Executive officer, MH Cockpit, India. | |
| 3 | Er. Immanuel Inbaezhilarsan C. | Flight Engineer, Senior Technical Instructor, Mh Cockpit, India. | |
| 4 | Mr. Mathew Alexander | Assistant training manager, Technical instructor, Mh Cockpit, India. | |
| 5. | Capt. Srikanth Chandrasekaran | Chief Flight Instructor, Training Manager, Mh Cockpit, India. | |

**REGULATIONS 2022**

**POST GRADUATE DIPLOMA (AIRCRAFT MAINTENANCE)**

## 1. DURATION OF THE PROGRAMME

1.1 One Year (Two semesters)

2.1 The course will be conducted for period from July to June of each year

## 2. ELIGIBILITY FOR ADMISSION

The details of Eligibility for Admission – obtained a bachelor degree in Bachelor of Engineering, Bachelor of technology or any Technical B.Sc. course from a recognized university or obtained a technical diploma and have at least five-year experience in aircraft maintenance

## 3. MEDIUM OF INSTRUCTION

The medium of instruction for all PG program is English as aviation language is English

## 4. CREDIT REQUIREMENTS AND ELIGIBILITY FOR AWARD OF DEGREE

A Candidate shall be eligible for the award of Diploma only if he/she has undergone the prescribed course of study in VISTAS for not less than one academic year and passed the examinations of all the prescribed courses of Two Semesters earning a minimum of 50 credits as per the distribution given in for Part I, II and III, also fulfilled such other conditions as having been prescribed there of.

## 5. COURSE

Each course / subject is to be designed under lectures / tutorials laboratory or field work / seminar / practical training / Assignments / Term paper or Report writing etc., to meet effective teaching and learning needs.

## 6. COURSE OF STUDY, CREDITS AND SCHEME OF EXAMINATION

The Course Components and Credit Distribution shall consist Part 1,2 & 3

Credit Assignment:

For each course, credit is assigned based on the following:

| Contact hour per week | | CREDITS |
|---|---|---|
| 1 Lecture hour | - | 1Credit |
| 1 Tutorial hour | - | 1Credit |
| 2 Practical hours | - | 1 Credit |

## 7. REQUIREMENTS FOR THE AWARD OF DEGREE

1.1 **Eligibility:** Students shall be eligible to go to subsequent semesters only if they earn sufficient attendance as prescribed therefore by the Board of Management from time to time.

2.1 **Attendance:** All Students must earn 75% and above of attendance for appearing for the University Examination. (Theory/Practical)

3.1 **Condonation of shortage of attendance:** If a student fails to earn the minimum attendance (Percentage stipulated), the HODs shall condone the shortage of attendance on medical grounds up to a maximum limit of 10% (i.e. between 65% and above and less than 75%) after paying the prescribed fee towards the condonation of shortage of attendance. The students with attendance of less than 65 and more than 50% shall be condoned by VC on the recommendation of HOD on genuine grounds, will be Permitted to appear for the regular examination on payment of the prescribed condonation fee.

4.1 **Detained students for want of attendance:** Students who have earned less than 50% of attendance shall be permitted to proceed to the next semester and to complete the Program of study. Such Students shall have to repeat the semester, which they have missed by rejoining after completion of the final semester of the course, by paying the fee for the break of study as prescribed by the University from time to time.

5.1 **Transfer of Students and Credits:** The strength of the credits system is that it permits inter Institutional transfer of students. By providing mobility, it enables individual students to develop their capabilities fully by permitting them to move from one Institution to another following their aptitude and abilities. Transfer of Students is permitted from one Institution to another Institution for the same program with the same nomenclature, provided, there is a vacancy in the respective program of Study in the Institution where the transfer is requested. The marks obtained in the courses will be converted into appropriate grades as per the University norms. The transfer students are not eligible for Rankings, Prizes and Medals. Students who want to go to foreign Universities for up to two

semesters or Project Work with the prior approval of the Departmental / University Committee are allowed to transfer their credits. Marks obtained in the courses will be converted into Grades as per the University norms and the students are eligible to get CGPA and Classification.

# LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (LOCF)

## TABLE OF CONTENTS

# Learning Outcomes-Based Curriculum Framework for Postgraduate Education In PG Diploma in (Aircraft Maintenance)

## 1. Introduction

The Learning Outcomes-based Curriculum Framework (LOCF) for the post graduate programs in Aircraft Maintenance is intended to make available an extensive structure to create an academic base that responds to the requirements of the students to understand the basics of Aircraft Maintenance. The learning outcomes-based curriculum framework (LOCF) for PG Diploma in Aircraft Maintenance is intended to prepare a curriculum that enables the graduates to respond to the current needs of the industry and equip them with skills relevant to national and global standards. The framework will assist in maintaining international standards to ensure global competitiveness and facilitate student/graduate mobility after completion of this PG Diploma in Aircraft Maintenance program. The framework intends to allow for greater flexibility and innovation in curriculum design and syllabus development, teaching-learning process, assessment of student learning levels.

Many courses incorporate training and practical experience, in the form of projects, presentations, internships, industrial visits, of the Diploma Course syllabus.

## 2. Learning Outcomes-based Curriculum framework

Nature and extent of PG Diploma in Aircraft Maintenance Program is on the basic physics, maths and chemistry taught at the Diploma or +2 level in all the schools in the country along with that they should have obtained technical UG degree or should have worked in the aviation field. Ideally, the +2 senior secondary school education should aim and achieve a sound grounding in understanding the fundamentals of science orientated subjects with sufficient content of topics from the modern science subjects and contemporary areas of exciting developments in science to ignite the young minds. The curriculum provides skills in Electrics Aircraft General Knowledge, Aerodynamics, Aircraft Structures, Propulsion, Airframe & Aircraft Systems, Air Regulation. The PG in Aircraft Maintenance is a program precisely designed to allow students to appear and clear, aircraft maintenance modules and obtain AME licenses from government licensing authority from each contracting state.

The aim and objectives of the PG Diploma in Aircraft Maintenance Program. The aims and objectives of our Diploma Program are structured to:

1. To produce Aviation professionals who are knowledgeable, competent and innovative which will contribute towards the human capital in airline / Aerospace / Aircraft engineering and aviation technology related industry.
2. To produce aviation professional who has effective leadership and team work skills as well as verbal, non-verbal and interpersonal communication skills to support the role in the industry.
3. To produce aviation professionals who are committed to the importance of lifelong learning and continuous improvement.
4. To produce leaders who practice professionalism with ethics and social responsibility.
5. To practice a high level of professionalism necessary to deliver the knowledge, expertise and skill of students through the application of research to business problems and issues.

## 3. Graduate attributes

Some of the characteristic attributes of a graduate in PG Diploma in Aircraft Maintenance are:

i. **Disciplinary knowledge and skills:** Capable of Understanding the major concepts and principles in Aircraft Maintenance and its different subfields like aerodynamics, aircraft structures, aeroengines, navigation, meteorology etc.,

ii. **Skilled communicator:** Ability to transmit National and international information relating to all are as in the aviation field clearly and concisely in writing and oral.

iii. **Critical thinker and problem solver:** Ability to employ critical thinking and efficient problem-solving skills in all the fields in business and management to meet the competition and for proper decision making in business.

iv. **Sense of inquiry:** Capability for asking relevant / appropriate questions relating to contemporary issues and problems in the field of Aircraft Maintenance and aviation.

v. **Team player / worker**: Capable of working effectively in diverse teams in both classroom and field visits like industry and market.

vi. **Digitally Efficient*:*** Capable of using computers for design, analysis and computation with appropriate software, and employing modern e-library search tools.

vii. **Ethical awareness / reasoning*:*** The graduate should be capable of demonstrating the ability to think and analyze rationally with a modern and scientific outlook and identify ethical issues related to one's work, avoid unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights, and adopting objectives, unbiased and truthful actions in all aspects of work.

viii. **National and international perspective*:*** The graduates should be able to develop a national as well as international perspective for their career in the chosen field of academic activities. They should prepare themselves during their most formative years for their appropriate role in contributing towards the national development and projecting our national priorities at the international level about their field of interest and future expertise.

ix. **Lifelong learners:** Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling in all areas of business management.

## 4. Qualification description

A qualification descriptor indicates the generic outcomes and attributes expected for the award of a particular type of qualification. The learning experiences and assessment procedures are expected to be designed to provide every student with the opportunity to achieve the intended program learning outcomes. The qualification descriptors reflect the followings:

1. Disciplinary knowledge and understanding
2. Skills & Ability
3. Global competencies that all students in different academic fields of study should acquire / attain and demonstrate.

Some of the expected learning outcomes that a student should be able to demonstrate on completion of a PG Diploma in Aircraft Maintenance program may include the following:

**Knowledge & Understanding**

i. Demonstrate extensive knowledge of the disciplinary foundation in the various areas of Aeronautics, as well as insight into contemporary research and development.
ii. Demonstrate specialized methodological knowledge in the specialized areas of aeronautics about professional literature, principles off light and reviewing scientific work.

**Skills & Ability**

i. Demonstrate ability to apply aeronautics knowledge & experimental skills critically and systematically for assessment and solution of complex problems and issues related to aircraft design, Flight operation and other specialized areas of aviation.
ii. Demonstrate ability to model, simulate and evaluate the phenomenon and systems in the aircraft.
iii. Demonstrate ability to apply one's Aircraft Maintenance knowledge, experimental skills, scientific methods & advanced design, simulation and validation tools to identify and analyze complex real-life problems and frame technological solutions for them.

**Competence**

i. Communicate his or her conclusions, knowledge & arguments effective and professionally both in writing and utilizing presentation to different audiences in both national and international context.
ii. Ability to work collaboratively with others in a team, contributions to the management, planning and implementations.
iii. Ability to independently propose research/developmental projects, plan their implementation, undertake its development, evaluate its outcomes and report its results properly.
iv. Ability to identify the personal need for further knowledge relating to the current and emerging areas of study by engaging in lifelong learning in practices.

## 5. Program learning outcomes

**PL01:** Able to utilize the knowledge of aeronautical/aerospace science in an innovative, dynamic and challenging environment for the design and development of new products and to manage airline operations.

**PL02:** An ability to function on a multidisciplinary team.

**PL03:** An ability to design, troubleshoot system, component, or process to meet desired needs with in realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

**PL04:** An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**PL05:** Knowledge of contemporary issues

**PL06:** Recognition of the need for, and an ability to engage in life-long learning.

**PL07:** The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

**PL08:** Ability to identify, formulate, and solve engineering and operational problems.

**PL09:** An understanding of professional and ethical responsibility.

## 6. TEACHING – LEARNING PROCESS

Teaching-learning process and assessment of student learning levels. Instead, they are intended to allow for flexibility and innovation in

(i) program design and syllabi development by higher education institutions (HEIs),

(ii) Teaching-learning process,

(iii) Assessment of student learning levels, and

(iv) periodic program review within a broad framework of agreed expected graduate attributes, qualification descriptors, program learning outcomes and course learning outcomes. The overall objectives of the learning outcomes-based curriculum frame work are to:

- Formulate graduate attributes, qualification descriptors, program learning outcomes and course learning outcomes that are expected to be demonstrated by the holder of a qualification;
- Enable prospective students, parents, employers and others to understand the nature and level of learning outcomes (knowledge, skills, attitudes and values) or attributes a graduate of a program should be capable of demonstrating on successful completion of the program of study;
- Maintain national standards and international comparability of learning outcomes and academic standards to ensure global competitiveness, and to facilitate student / graduate mobility; and
- Provide higher education institutions with an important point of reference for designing teaching-learning strategies, assessing student learning levels, and periodic review of programs and academic standards.

## 7. ASSESSMENT METHODS

**Examination:**

i) There shall be examinations at the end of each semester, for odd semesters in October / November, for even semesters in April / May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed courses in the subsequent examinations to be held in October / November or April /May.

ii) A candidate should get registered for the first-semester examination. If registration is not possible owing to a shortage of attendance beyond condonation limit / regulations prescribed OR belated joining OR on medical grounds, the candidates are permitted to move to the next semester. Such candidates shall re-do the missed semester after completion of the program.

iii) The results of all the examinations will be published through University Website. In the case of passed out candidates, their arrear results will be published through University Website.

**To Register for all subjects**: Students shall be permitted to proceed from the First Semester up to the Final Semester irrespective of their failure in any of the Semester Examination, except for the shortage of attendance programs. For this purpose, Students shall register for all the arrear subjects of earlier semesters along with the current(subsequent) Semester Subjects.

**Marks for Continuous Internal Assessment** (CIA) Examinations and End Semester Examinations (ESE) for PART I, II, III

There shall be no passing minimum for Continuous Internal Assessment (CIA) Examinations.

For the End Semester Examination, the passing minimum shall be 40% (Forty Percentage) of the maximum marks prescribed for the Course/Practical/Project and Viva-Voce.

In the aggregate (CIA and ESE) the passing minimum shall be 40%.

He / She shall be declared to have passed the whole examination, if he/she passes in all the courses wherever prescribed in the curriculum by earning 50 CREDITS in Part I, II, III

**Question Paper Pattern** for End Semester Examination

| | |
|---|---|
| SECTION – A 10 questions 10 X 3 | = 30 Marks |
| SECTION – B Any 5 questions from 8 questions 5 X 8 | = 40 Marks |
| SECTION – C Any 2 questions from 4 questions 2 X 15 | = 30 Marks |
| | Total 100 Marks |

**SUPPLEMENTARY EXAMINATION:**

Supplementary Examinations are conducted for the students who appeared in the final semester examinations. Eligible criteria for appearing in the Supplementary Examinations are as follows:

Eligibility: A Student who is having a maximum of two arrear papers is eligible to appear for the Supplementary Examination.

Non-eligibility for those who completed the program: Students who have completed their Program duration but having arrears are not eligible to appear for Supplementary Examinations.

## 7.1 RE TOTALLING, REVALUATION AND PHOTOCOPY OF THE ANSWER SCRIPTS:

Re-totaling: All PG Students who appeared for their Semester Examinations are eligible for applying for re-totaling of their answer scripts.

Revaluation: All current batch Students who have appeared for their Semester Examinations are eligible for the Revaluation of their answer scripts. Passed out candidates are not eligible for Revaluation.

Photocopy of the answer scripts: Students who have applied for revaluation and own load their answer scripts from the University Website after fifteen days from the date of publication of the results.

**7.1.1 The examination and evaluation for MOOCs** will be as per the requirements of the regulatory bodies and will be specified at the beginning of the Semester and notified by the university NPTEL-SWAYAM Coordinator (SPOC).

## 7.2 CLASSIFICATION OF SUCCESSFUL STUDENTS

7.2.1 PART I TAMIL / OTHER LANGUAGES; PART II ENGLISH AND PART IIICORE SUBJECTS, ALLIED, ELECTIVES COURSES AND PROJECT: Successful Students passing the Examinations for the Part I, Part II and Part III courses and securing the marks

a) CGPA 9.00 to 10.00 shall be declared to have passed the examination in **First class with Outstanding**.

b) CGPA 7.50 to 8.99 shall be declared to have passed the examination in **First class with distinction**.

c) CGPA 6.00 to 7.49 shall be declared to have passed the examination in **First Class**.

d) CGPA 5.00 to 5.99 in the aggregate shall be declared to have passed the examination in the **Second** Class.

e) CGPA 4.00 to 4.99 shall be declared to have passed the examination in the **THIRD** Class.

## 7.3 MARKS AND GRADES:

The following table shows the marks, grade points, letter grades and classification to indicate the performance of the student:

7.3.1 **Computation of Grade Point Average (GPA)** in a Semester, Cumulative Grade Point Average (CGPA)and Classification.

GPA for a Semester: = ∑iCiGi ÷ ∑iCi That is, GPA is the sum of the multiplication of grade points by the credits of the courses divided by the sum of the credits of the courses in a semester.

7.3.2 Where Ci= Credits earned for course I in any semester,

Gi = Grade Points obtained for course I in any semester = Semester in which such courses were credited.

| Grade Conversion Table–PG | | | |
|---|---|---|---|
| **Range of Marks** | **Grade Points** | **Letter Grade** | **Description** |
| 90 – 100 | 10 | O | Outstanding |
| 82 – 89 | 9 | A+ | Excellent |
| 75 – 81 | 8 | A | Very Good |
| 67 – 74 | 7 | B+ | Good |
| 60 – 66 | 6 | B | Above Average |
| 50 – 59 | 5 | C | Average |
| 40 – 49 | 4 | D | Minimum for pass |
| 0 – 39 | 0 | RA | Reappear |
| | | AAA | Absent |

**Letter Grade and Class CGPA**

| Overall Performance–PG | | |
|---|---|---|
| **CGPA** | **GRADE** | **CLASS** |
| 4.00 -4.99 | D | Third Class |
| 5.00 -5.99 | C | Second Class |
| 6.00 -6.69 | B | First Class |
| 6.70 -7.49 | B+ | |
| 7.50 -8.19 | A | First Class with Distinction* |
| 8.20 -8.99 | A+ | |
| 9.00 -10.00 | O | First Class - Outstanding* |

## 7.4 RANKING

- The students who have passed in the first appearance and within the prescribed semester of the PG Program (Core, Allied and Elective courses only) are eligible.
- Students who pass all the examinations prescribed for the Program in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking /Distinction.
- The case of Students who pass all the examinations prescribed for the Program with a break in the First Appearance is only eligible for Classification.
- Students qualifying during the extended period shall not be eligible for RANKING.

## 7.5 MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMS TO QUALIFY FOR A DEGREE

A Student who for whatever reason is not able to complete the programs within the normal period(N) or the Minimum duration prescribed for the program, may be allowed two years period beyond the normal period to clear the backlog to be qualified for the degree. (Time Span =N+2 years for the completion of program)

In exceptional cases like major accidents and childbirth an extension of one year is considered beyond the maximum period (Time Span = N + 2 + 1 years for the completion of program).

## 7.6 REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The University may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Academic Council with the approval of the Board of Management.

### Structure of Courses in PG Diploma in Aircraft Maintenance

The PG Diploma in Aircraft Maintenance program consists of 50 credits based on the Choice Based Credit System (CBCS) approved by the UGC with 1 hour for each credit for theory / tutorials and 2 hours for each credit for laboratory work. The 50 credit course comprises 36 credits of Core courses (CC) and Discipline-specific courses (DSE) 14 credits. A student must take 50 credits in total to qualify for the grant of the PG Diploma in Aircraft Maintenance after completing them successfully as per rules and regulations of the HEI.

A detailed list of Core Courses, Discipline Specific Courses (DSE), Discipline Elective Course (DE), Generic Elective Courses (GEC), Skill Enhancement Courses (SEC) and Ability Enhancement Compulsory Courses (AECC) are given.

# Structure of UG Courses in PG Diploma in Aircraft Maintenance

## Distribution of different Courses in each semester with their credits

| Semester | Compulsory Core Courses (CC) | Discipline Specific Elective (DSE) each with 05credit | Ability Enhancement Compulsory Courses (AECC) each with 04 credit | Skill Enhancement Course (SEC) each with 02 credit | Generic Elective (GE) each with 02 credit | Total Credits |
|---|---|---|---|---|---|---|
| Sem I | CC – 1 | | | | | 26 |
| | CC – 2 | | | | | |
| | CC – 3 | | | | | |
| | CC – 4 | | | | | |
| | CC – 5 | | | | | |
| | CC – 6 | | | | | |
| Sem II | CC – 7 | DSE-1 | | | | 24 |
| | CC – 8 | DSE-2 | | | | |
| | | DSE-3 | | | | |

**Vels Institute of Science and Technology and Advanced studies (VISTAS)**

PG Diploma in Aircraft Maintenance

**Courses of Study and Scheme of Assessment**

(Minimum Credits to be earned: 50)

PG Diploma in Aircraft Maintenance Course Components

| Component | I Sem | II Sem | Total Credits |
|---|---|---|---|
| Core Courses | 26 | 10 | 36 |
| Ability Enhancement Courses (AEC) | | - | |
| Discipline Specific Elective (DSE) & Generic Elective (GEC) | - | 14 | 14 |
| Skill enhancement Course (SEC) | - | | |
| **Total Credits** | **26** | **24** | **50** |

**VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES(VISTAS)**

## Modules in PG DIPLOMA Aircraft Maintenance

B1.1 Modules –AIRPLANE TURBINE

1. Module 3 Electrical fundamentals
2. Module 4 Electronic fundamentals
3. Module 5 Digital Techniques/Electronic Instrument Systems
4. Module 6 Materials and Hardware
5. Module 7A Maintenance Practices
6. Module 8 Basic Aerodynamics
7. Module 9A Human factors
8. Module 10 Aviation Legislation
9. Module 11A Turbine Airplane Aerodynamics, Structures and Systems
10. Module 15 Gas Turbine Engine
11. Module 17A Propellers

B2 Modules – AVIONICS

1. Module 3 Electrical fundamentals
2. Module 4 Electronic fundamentals
3. Module 5 Digital Techniques/Electronic Instrument Systems
4. Module 6 Materials and Hardware
5. Module 7A Maintenance Practices
6. Module 8 Basic Aerodynamics
7. Module 9A Human factors
8. Module 10 Aviation Legislation
9. Module 13 Aircraft Aerodynamics, Structures and Systems
10. Module 14 Propulsion
11. Radio telephony (RT)

## VELS INSTITUTE OF SCIENCE, TECHNOLOGY AND ADVANCED STUDIES

## (VISTAS)

### PG Diploma in Aircraft Maintenance

#### COURSES OF STUDY AND SCHEME OF ASSESSMENT

**(MINIMUM CREDITS TO BE EARNED: 50)**

| Category | Course | Hours/ Week Lecture | Credits | Internal Marks | External Marks | Total Marks |
|---|---|---|---|---|---|---|
| **SEMESTER 1** | | | | | | |
| CORE | AVIATION LEGISLATION | 5 | 5 | 40 | 60 | 100 |
| CORE | HUMAN FACTORS | 4 | 4 | 40 | 60 | 100 |
| CORE | BASIC AERODYNAMICS | 4 | 4 | 40 | 60 | 100 |
| CORE | ELECTRICAL FUNDAMENTALS | 5 | 5 | 40 | 60 | 100 |
| CORE | MATERIALS AND HARDWARE | 4 | 4 | 40 | 60 | 100 |
| CORE | MAINTENANCE PRACTICES | 4 | 4 | 40 | 60 | 100 |
| | | **26** | **26** | | | |
| **SEMESTER 2** | | | | | | |
| CORE | ELECTRONIC FUNDAMENTALS | 5 | 5 | 40 | 60 | 100 |
| CORE | DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEMS | 5 | 5 | 40 | 60 | 100 |
| DSE | DSE -1 | 5 | 5 | 40 | 60 | 100 |
| DSE | DSE -2 | 5 | 5 | 40 | 60 | 100 |
| DSE | DSE-3 | 4 | 4 | 40 | 60 | 100 |
| | | **24** | **24** | | | |

**LIST OF CORE COURSES**
**(CORE)**

| S.NO | COURSE CODE | COURSETITLE |
|---|---|---|
| **1** | | Aviation Legislation |
| **2** | | Human factors |
| **3** | | Basic Aerodynamics |
| **4** | | Electrical fundamentals |
| **5** | | Materials and Hardware |
| **6** | | Maintenance practices |
| **7** | | Electronic fundamentals |
| **8** | | Digital techniques / electronic instrument system |

**LIST OF DISCIPLINE SPECIFIC ELECTIVE COURSES**
**(DSE)**

| S.NO | COURSE CODE | B1.1/ B2 | COURSETITLE |
|---|---|---|---|
| **1** | | B1.1 | TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS |
| **2** | | B1.1 | GAS TURBINE ENGINE |
| **3** | | B1.1 | PROPELLARS |
| **4** | | B 2 | AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS |
| **5** | | B 2 | PROPULSION |
| **6** | | B 2 | RADIO TELEPHONY |

# Aviation Legislation

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | 40 | |
| Number of Lecture Hours/Week | 5 | Exam Marks | | 60 | |
| Total Number of Lecture Hours | 75 | L | T | P | C |
| Credits | 05 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

The air law course aims to enable the students to understand Civil Aviation Administrations, Civil Aviation Authorities, Airports and Air Navigation Service Providers to support their organization in compliance with national and international air law, through application of appropriate knowledge and advocacy.

| | | |
|---|---|---|
| **UNIT I** | **REGULATORY FRAMEWORK, CAR-66 CERTIFYING STAFF – MAINTENANCE** | **15 Hours** |

Role of International Civil Aviation Organization; The Aircraft Act and Rules made there under Role of the DGCA; Relationship between CAR-21, CAR-M, CAR-145, CAR-66, CAR 147 The Aircraft Rules (Applicable to Aircraft Maintenance and Release) Aeronautical Information Circulars (Applicable to Aircraft Maintenance and Release), CAR Sections 1and 2, Detailed understanding of CAR-66.

| | | |
|---|---|---|
| **UNITII** | **AIRCRAFT OPERATIONS AND CAR-145 Approved Maintenance Organizations** | **15 Hours** |

Commercial Air Transport / Commercial Operations, Air Operators Certificates; Operators Responsibilities, in particular regarding continuing airworthiness and maintenance; Documents to be carried on board; Aircraft Placarding (Markings), Detailed understanding of CAR-145 and CARM Subpart F.

| | | |
|---|---|---|
| **UNITIII** | **AIRCRAFTCERTIFICATION AND CAR M** | **15 Hours** |

General Certification rules: such as FAA & EACS 23/25/27/29; Type Certification; Supplemental Type Certification; CAR-21 Design/Production Organization Approvals. Aircraft Modifications and repairs approval and certification Permit to fly requirements, Documents – Certificate of Airworthiness; Certificate of Registration; Noise Certificate; Weight Schedule; Radio Station License and Approval. Detail understanding of CAR M provisions related to Continuing Airworthiness. Detailed understanding of CAR-M.

| UNIT IV | NATIONALANDINTERNATIONALREQUIREMENTS | 15 Hours |
|---|---|---|

Maintenance Program Maintenance checks and inspections; Master Minimum Equipment Lists, Minimum Equipment List, Dispatch Deviation Lists; Airworthiness Directives; Service Bulletins, Manufacturers service information; Modifications and repairs; Maintenance documentation: maintenance manuals, structural repair manual, illustrated parts catalogue, etc.; Continuing airworthiness; Test flights; ETOPS/EDTO, maintenance and dispatch requirements;
RVSM, maintenance and dispatch requirements RNP, MNPS Operations All Weather Operations, Category2/3 operations and minimum equipment requirements.

| UNITV | SAFETY MANAGEMENT SYSTEM, FUEL TANK SAFETY | 15Hours |
|---|---|---|

State Safety Program, Basic Safety Concepts, Hazards & Safety Risks, SMS Operation, SMS Safety performance, Safety Assurance, Special Federal Aviation Regulations (SFARs) from 14 CFRS FAR 88 of the FAA and of JAA TGL47, Concept of CDCCL, Airworthiness Limitations Items (ALI).

**COURSE OUTCOMES:**

Upon completion of the course, participants will be able to accomplish the following
CO1: Analyze about CAR-66 certifying staff– maintenance.
CO2: Examine about aircraft operations and CAR-145 — Approved Maintenance Organizations CO3: Explain about aircraft certification and CARM.
CO4: Write about national and international requirements for Maintenance Program.
CO5: Describe about safety management system, fuel tank safety

**TEXT BOOKS:**

The Aircraft Act,1934
TheAircraftRules,1937VOL1
TheAircraftRules,1937VOL3
ICAO Annex–8totheconventiononinternationalcivilaviation
International standards and recommended practices

**REFERENCE BOOKS:**

1. Air law Airworthiness (DGCA)
2. Aeronautical Information Circular
3. CAR - Section - 1, 2, & 8 SMS
4. CAR -21, M, 145, 66 & 147
5. Special Federal Aviation Regulations (SFARs)-14 CFR, SFAR88 & JAATGL 47

**WEBLINKS:**

1. http://164.100.60.133/misc/draft%20cars/CAR%2066_Draft(Dec2015).pdf
2. https://soaneemrana.org/onewebmedia/CAR%20145.pdf
3. http://164.100.60.133/ftppub/CAR_M.pdf
4. https://www.easa.europa.eu/sites/default/files/dfu/ws_prod-g-doc-Agency_Mesures-Agency_Decisions-2007-R-2007-002-R-Fuel-Tank-Safety-Part-145.pdf

# HUMAN FACTORS

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 4 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 4 | 4 | 0 | 0 | 4 |

**COURSE OBJECTIVES:**

Human factors course aims to impart knowledge and awareness of human performance limitation and social psychology in workplace, to learn about various factors affecting human performance that leads to human errors, hazardous conditions and accidents. To equip maintenance personnel with knowledge that will improve their inspection and maintenance ability and to avoid errors in workplace

| | | |
|---|---|---|
| **UNIT I** | **GENERAL; HUMAN PERFORMANCE AND LIMITATION; SOCIAL PSYCHOLOGY** | **12 Hours** |

The Need to Take Human Factors into Account; Incidents Attributable to Human Factors/Human Error; 'Murphy's' Law. Vision; Hearing; Information Processing; Attention and Perception Memory; Claustrophobia and Physical Access. Responsibility: Individual and Group; Motivation And De-Motivation; Peer Pressure; 'Culture' Issues; Team Working; Management, Supervision And Leadership

| | | |
|---|---|---|
| **UNIT II** | **FACTORS AFFECTING PERFORMANCE; PHYSICAL ENVIRONMENT; TASKS** | **12 Hours** |

Fitness / health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and under-load; Sleep and fatigue, shiftwork; Alcohol, medication, drug abuse. Noise And fumes; Illumination; Climate and temperature; Motion and vibration; Working environment. Physical work;
Repetitive tasks; Visual inspection; Complex systems.

| | | |
|---|---|---|
| **UNIT III** | **COMMUNICATION; HUMAN ERROR; HAZARDS IN THEWORKPLACE** | **12Hours** |

Within and between teams; Work logging and recording; Keeping upto date, currency; Dissemination of Information; Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents); Avoiding and managing errors; Recognizing and avoiding hazards; Dealing with emergencies.

| UNIT IV | HUMAN FACTORS IN AIRCRAFT MAINTENANCE AND INSPECTION | 12Hours |
|---|---|---|

Human Factors Aircraft Maintenance And Inspection; Contemporary Maintenance Problems; The SHEL Model; The Reason Model; Human Error; Human Error In Aircraft Maintenance And Inspection (An Organizational Perspective); Human Error In The Maintenance Environment; Human Factors Issues Affecting Aircraft Maintenance And Dirty Dozen; Information Exchange And Communication; Training; Aircraft Maintenance Technician Facilities And Work Environment.

| UNITV | TEAMS AND ORGANIZATIONAL ISSUES IN AIRCRAFT MAINTENANCE | 12Hours |
|---|---|---|

Team Work; Job Design; Reward Systems; Selection And Staffing; Training; Automation And Advanced Technology System; Automation And Computerization; Advanced Job Aid Tools; Error Prevention, Considerations And Strategies.

**COURSE OUTCOMES:**

After the course the students are expected to be able to

**CO1:** Apply the knowledge of human performance limitation and social psychology in workplace.

**CO2:** Apply the basic knowledge of effect of factors like visual, auditory and cognitive on performance to design suitable work systems.

**CO3:** Identify the human error and hazardous in the workplace.

**CO4:** Illustrate the roll of human factors in aircraft maintenance and inspection.

**CO5:** Use the techniques, skills, and modern human factors and workplace ergonomics tools necessary for Aircraft maintenance practice.

**TEXT BOOKS:**


1. CAP715-An Introduction to Aircraft Maintenance Engineering Human Factors for JAR66, Civil Aviation Authority, UK.
2. CAP718-HumanFactors in Aircraft Maintenance and Inspection, Civil Aviation Authority, UK.
3. FAA-H-8083-30-AircraftMaintenanceTechnicianHandbook-General, US.
4. Department of Transportation, Federal Aviation Administration ICAO Doc9806.


**REFERENCE BOOKS:**


1. Eduardo Salas, Dan Maurino Captain, “Human Factors in Aviation”, Academic Press; 2nd edition (26March 2010).
2. Demetris Yiannakides, Charalampos Sergiou, “Human Factors in Aircraft Maintenance”, CRC Press,2019.
3. John A. Wise, V. David Hopkin, Daniel J. Garland, “Handbook of Aviation Human Factors”, 2nd Edition, CRC Press, 2010.

4. Monica Martinussen, David R. Hunter, "AviationPsychologyandHumanFactors",2nd Edition, CRCPress,2017.

**WEBLINKS:**

1. https://www.faasafety.gov/files/gslac/courses/content/258/1097/AMT_Handbook_Addendum_Human_Factors.pdf
2. https://soaneemrana.org/onewebmedia/HUMAN%20FACTOR.pdf
3. https://www.faa.gov/about/initiatives/maintenance_hf/library/documents/media/human_factors_maintenance/hf_ops_manual_2014.pdf
4. HumanFactorsInt_2ndrun.qxd(aviationlearning.net)
5. https://youtu.be/wrJstFphalk
6. https://www.slideshare.net/wmughni/human-factors-in-aviation-62599359

## ELECTRICAL FUNDAMENTALS

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IAM arks | | | 40 |
| Number of Lecture Hours/Week | 5 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 5 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

**To understand the fundamental principles of electricity and concept of Aircraft electrical system.**

| | | |
|---|---|---|
| **UNIT I** | **Electron Theory, Static Electricity and Conduction, Electrical Terminology and Generation of Electricity** | **12Hours** |

**Electron Theory**: Structure and distribution of electrical charges within: atoms, molecules, ions, compounds; Molecular structure of conductors, semiconductors and insulators. **Static Electricity and Conduction**: Static electricity and distribution of electrostatic charges; Electrostatic laws of attraction and repulsion; Units of charge, Coulomb's Law; Conduction of electricity in solids, liquids, gases and a vacuum. **Electrical Terminology:** The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow. **Generation of Electricity**: Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.

| | | |
|---|---|---|
| **UNIT II** | **DC Sources of Electricity, DC Circuits, Resistance/Resistor and Power** | **12Hours** |

**DC Sources of Electricity**: Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells; Cells connected in series and parallel; Internal resistance and its effect on a battery; Construction, materials and operation of thermocouples; Operation of photo-cells. **DC Circuits**: Ohms Law, Kirchoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and current; Significance of the internal resistance of a supply. **Resistance/Resistor**: (a) Resistance and affecting factors; Specific resistance; Resistor colour code, values and tolerances, preferred values, wattage ratings; Resistors in series and parallel; Calculation of total resistance using series, parallel and series parallel combinations; Operation and use of potentiometers and rheostats; Operation of Wheatstone Bridge. (b) Positive and negative temperature coefficient conductance; Fixed resistors, stability, tolerance and limitations, methods of construction; Variable resistors, thermistors, voltage dependent resistors; Construction of potentiometers and rheostats; Construction of Wheatstone Bridge; Power, work and energy (kinetic and potential); Dissipation of power by a resistor; Power formula; Calculations involving power, work and energy.

| UNIT III | Capacitance/Capacitor, Magnetism, Inductance/Inductor and DC Motor/Generator Theory. | 12Hours |
|---|---|---|

**Capacitance/Capacitor**: Operation and function of a capacitor; Factors affecting capacitance area of plates, distance between plates, number of plates, dielectric and dielectric constant, working voltage, voltage rating; Capacitor types, construction and function; Capacitor colour coding; Calculations of capacitance and voltage in series and parallel circuits; Exponential charge and discharge of a capacitor, time constants; Testing of capacitors. **Magnetism:** Theory of magnetism; Properties of a magnet Action of a magnet suspended in the Earth's magnetic field; Magnetization and demagnetization; Magnetic shielding; Various types of magnetic material; Electromagnets construction and principles of operation; Hand clasp rules to determine: magnetic field around current carrying conductor. Magnetomotive force, field strength, magnetic flux density, permeability, hysteresis loop, retentivity, coercive force reluctance, saturation point, eddy currents; Precautions for care and storage of magnets. **Inductance/Inductor** :Faraday's Law; Action of inducing a voltage in a conductor moving in a magnetic field; Induction principles; Effects of the following on the magnitude of an induced voltage: magnetic field strength, rate of change of flux, number of conductor turns; Mutual induction; The effect the rate of change of primary current and mutual inductance has on induced voltage; Factors affecting mutual inductance: number of turns in coil, physical size of coil, permeability of coil, position of coils with respect to each other; Lenz's Law and polarity determining rules; Back emf, self-induction; Saturation point; Principle uses of inductors; **DC Motor/Generator Theory**: Basic motor and generator theory; Construction and purpose of components in DC generator; Operation of, and factors affecting output and direction of current flow in DC generators; Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors; Series wound, shunt wound and compound motors; Starter Generator construction.

| UNIT IV | AC Theory Sinusoidal waveform, Resistive (R), Capacitive (C) and Inductive (L) Circuits, Transformers and Filters. | 12Hours |
|---|---|---|

**AC Theory Sinusoidal waveform:** phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power Triangular/Square waves; Single/3 phase principles. **Resistive (R), Capacitive (C) and Inductive (L) Circuits**: Phase relationship of voltage and current in L, C and R circuits, parallel, series and series parallel; Power dissipation in L, C and R circuits; Impedance, phase angle, power factor and current calculations; True power, apparent power and reactive power calculations. **Transformers**: Transformer construction principles and operation; Transformer losses and methods for overcoming them; Transformer action under load and no-load conditions; Power transfer, efficiency, polarity markings; Calculation of line and phase voltages and currents; Calculation of power in a three-phase system; Primary and Secondary current, voltage, turns ratio, power, efficiency; Auto transformers. **Filters**: Operation, application and uses of the following filters: low

pass, high pass, band pass, band stop.

| UNIT V | AC Generators and AC Motors. | 12 Hours |
|---|---|---|

**AC Generators**: Rotation of loop in a magnetic field and waveform produced; Operation and construction of revolving armature and revolving field type AC generators; Single phase, two phase and three phase alternators; Three phase star and delta connections advantages and uses; Permanent Magnet Generators. **AC Motors**: Construction, principles of operation and characteristics of: AC synchronous and induction motors both single and polyphase; Methods of speed control and direction of rotation; Methods of producing a rotating field: capacitor, inductor, shaded or split pole.

**COURSE OUTCOMES:**

After the course the students are expected to be able to

**CO1:** Explain the electron theory, electrical terminology and DC circuits.

**CO2:** Analyze the characteristics of resistor and capacitor.

**CO3:** Comprehend the characteristics & properties of magnetism and interrelation with electricity.

**CO4:** Design the AC circuits, comprehend the characteristics and the principle of each component.

**CO5**: Analyze the working of Transformers and Filters in electrical system.

**TEXT BOOKS**:


1. B L Theraja and AK Theraja, "A Textbook of Electrical Technology - Vol I", S Chand; Twenty Third edition, 1959.
2. E. H. J. Pallett, "Aircraft electrical systems", Pearson Education, Third Edition, 2006.


**REFERENCE BOOKS:**


1. Aircraft Technical Book Company LLC, "EASA Electrical Fundamentals Aviation Maintenance Technician Certification Series, Module 03", 2016.
2. David Wyatt and Mike Tooley, "Aircraft Electrical and Electronic Systems", Routledge; 2nd edition (29 May 2018).
3. Hughes, "Hughes Electrical and Electronic Technology", Pearson Education India; 10th edition (1 January 2010)


**WEBLINKS:**

1. https://soaneemrana.org/onewebmedia/COMPLETE%20MODULE%203%201.pdf
2. http://eng.sut.ac.th/me/box/1_54/437306/ebooksclub.pdf
3. https://www.ksu.lt/wp-content/uploads/2017/04/KSU-M3-Selected-pages.pd

# Basic Aerodynamics

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | 40 | |
| Number of Lecture Hours/Week | 4 | Exam Marks | | 60 | |
| Total Number of Lecture Hours | 50 | L | T | P | C |
| Credits | 04 | 4 | 0 | 0 | 4 |

**COURSE OBJECTIVES:**

The aim of the course is to present theoretical aerodynamics with basic numerical applications of potential flow over basic configurations: airfoil, swept lifting surface, fixed and rotating, and over body of revolution. Furthermore, compressibility effects are considered as well as elementary analysis of the uncompressible boundary layer including boundary layer transition and turbulent layer.

| | | |
|---|---|---|
| **UNIT I** | **Physics of the Atmosphere** | **8 Hours** |

**Physics of the Atmosphere:** International Standard Atmosphere (ISA), application to aerodynamics.

| | | |
|---|---|---|
| **UNITII** | **Basic Aerodynamics** | **10 Hours** |

Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash and downwash, vortices, stagnation; The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure

| | | |
|---|---|---|
| **UNITIII** | **Aerodynamic effect on Airplane** | **12 Hours** |

Thrust, angle of attack, wash in and wash out, fineness ratio, wing shape and aspect ratio; Weight, Aerodynamic Resultant; Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall; Airfoil contamination including ice, snow, frost.

| | | |
|---|---|---|
| **UNIT IV** | **Basic 4 Forces** | **10 Hours** |

Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation.

| | | |
|---|---|---|
| **UNITV** | **Flight Stability and Dynamics** | **8 Hours** |

**Flight Stability and Dynamics**: Longitudinal, lateral and directional stability (active and passive).

**COURSE OUTCOMES:**

At the end of this course the students will be able to,

**CO1**: Determine aerodynamic forces and moments on airfoil, wing and body of revolution in subsonic flow, including compressibility effect.

**CO2:** Analyze boundary layer: velocity profile, thickness and friction coefficient.

**CO3:** Determine basic aerodynamic characteristics of propeller.

**CO4:** Apply presented numerical implementations to basic elements of aircraft configurations.

**CO5**: Critically analyze about the rotary wing aerodynamics.

**TEXT BOOKS:**


1. Anderson, J.D., "Introduction to Flight", 8th edition, McGraw-Hill Higher Education,2015.
2. Clancy, "Aerodynamics", Shroff (1 January 2006).
3. A. C. KERMODE, "Mechanics of Flight", Pearson Education Limited, 11th Edition, 2006.
4. Steven Brandt, "Introduction to Aeronautics: A Design Perspective" 3rd edition, AIAA Education series, 2015.


**REFERENCE BOOKS:**


1. CAE Oxford Aviation Academy, "PRINCIPLES OF FLIGHT", Singapore by KHL Printing Co. Pte Ltd, 2014.
2. Jeppesen, EASA ATPL Training, "Principles of Flight Aeroplanes", Jeppesen Gmbh (1 January 2014).
3. William Rees Sears, "Introduction to Theoretical Aerodynamics and Hydrodynamics" AIAA Education series, 2011.


**WEBLINKS**

1. https://www.ksu.lt/wp-content/uploads/2017/06/M8-Selected-pages-Basic-Aerodynamics.pdf
2. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/07_phak_ch 5.pdf
3. https://nptel.ac.in/courses/101/104/101104062/
4. https://nptel.ac.in/courses/101/105/101105059

# Electronics Fundamentals

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 5 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 5 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

To gain Knowledge on Fundamentals and Application of Electronics in aircraft.

| **UNITI** | **Diodes** | **12Hours** |
|---|---|---|

Diode symbols; Diode characteristics and properties; Diodes in series and parallel; Main characteristics and use of silicon-controlled rectifiers (thyristors), light emitting diode, photo conductive diode, varistor, rectifier diodes; Functional testing of diodes. Materials, electron configuration, electrical properties; P and N type materials: effects of impurities on conduction, majority and minority characters; PN junction in a semiconductor, development of a potential across a PN junction in unbiased, forward biased and reverse biased conditions; Operation and function of diodes in the following circuits: clippers, clampers, full and half wave rectifiers, bridge rectifiers, voltage doublers and triplers; Detailed operation and characteristics of the following devices: silicon controlled rectifier (thyristor), light emitting diode, Schottky diode, photo conductive diode, varactor diode, varistor, rectifier diodes, Zener diode.

| **UNITII** | **Transistors** | **12Hours** |
|---|---|---|

Transistor symbols; Component description and orientation; Transistor characteristics and properties. Construction and operation of PNP and NPN transistors; Base, collector and emitter configurations; Testing of transistors. Basic appreciation of other transistor types and their uses. Application of transistors: classes of amplifier (A, B, C); Simple circuits including: bias, decoupling, feedback and stabilisation; Multistage circuit principles: cascades, push-pull, oscillators, multivibrators, flip-flop circuits.

| **UNITIII** | **Integrated Circuits** | **12Hours** |
|---|---|---|

**Integrated Circuits** Description and operation of logic circuits and linear circuits/operational amplifiers. Description and operation of logic circuits and linear circuits; Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator; Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct; Advantages and disadvantages of positive and negative feedback.

| **UNITIV** | **Printed Circuit Boards** | **12Hours** |
|---|---|---|

Description and use of printed circuit boards. Composition, Layers, Materials – Laminates, Key substrate parameters, Common substrates, Copper thickness. Construction – Design, Panelization, Copper patterning,

Etching, Lamination, Drilling, Plating and coating, Solder resist application, Bare-board test, Assembly. Types - Breakout boards, Multiwire boards

| UNITV | Servo Mechanisms | 12Hours |
|---|---|---|

Understanding of the following terms: Open and closed loop systems, feedback, follow up, analogue transducers; Principles of operation and use of the following synchro system components/features: resolvers, differential, control and torque, transformers, inductance and capacitance transmitters. Understanding of the following terms: Open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, dead band; Construction operation and use of the following synchro system components: resolvers, differential, control and torque, E and I transformers, inductance transmitters, capacitance transmitters, synchronous transmitters; Servomechanism defects, reversal of synchro leads, hunting.

**COURSE OUTCOMES:**

At the end of this course the students will be able to,

CO 1: Explain about diodes
CO 2: Explain about transistors.
CO 3: Explain about Integrated Circuits
CO 4: Explain about PCB.
CO 5: Explain about Servomechanism.

**TEXT BOOKS:**


1. Bernard Grob, “Grob: Basic Electronics”, McGraw-Hill Education; 8th edition (16 May 1997).
2. Donald P. Leach, “Digital Principles and Applications”, McGraw-Hill Education; 5th edition (30 April 1994).
3. V.K Mehta, Rohit Mehta, “Principles of Electronics”, S Chand; 7th Revised edition (3 February 2014)


**REFERENCE BOOKS:**


1. Albert D. Helfrick, “Modern Aviation Electronics”, Pearson; 2nd edition (15 April 1994).
2. Dale Crane, “Basic Electronics and Radio Installation”, Jeppesen Sanderson (1 March 1977).
3. Hughes, “Hughes Electrical and Electronic Technology”, Pearson Education India; 10th edition (1 January 2010).
4. John M. Ferrara, “Every Pilot's Guide to Aviation Electronics”, El-Jac Publishing, 1976 (January 1, 1976). 5. Keith W. Bose, “Aviation Electronics”, Howard W Sams, U.S. (1 January 1982).


WEBLINKS:

1. https://www.ksu.lt/wp-content/uploads/2017/06/M5-Selected-pages.pdf
2. http://eng.sut.ac.th/me/box/1_54/437306/ebooksclub.pdf
3. https://www.youtube.com/watch?v=dIQi8ulQfXY
4. https://www.youtube.com/watch?v=AfQxyVuLeCs&list=PL9F74AFA03AA06A11

## DIGITAL TECHNIQUES /ELECTRONIC INSTRUMENT SYSTEMS

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 5 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 5 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

To Gain Knowledge on Aircraft's digital Electronics systems.

| **UNITI** | **EIS, Numbering systems and data conversion.** | **12Hours** |
|---|---|---|

**Electronic Instrument Systems**: Typical systems arrangements and cockpit layout of electronic instrument systems. **Numbering Systems**: Numbering systems: binary, octal and hexadecimal; Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa. **Data Conversion:** Analogue Data, Digital Data; Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types

| **UNITII** | **Data Buses, Logic circuits and Basic computer structure.** | **12 Hours** |
|---|---|---|

**Data Buses** - Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications. **Logic Circuits** - Identification of common logic gate symbols, tables and equivalent circuits; Applications used for aircraft systems, schematic diagrams. Interpretation of logic diagrams. **Basic Computer Structure -** Computer terminology (including bit, byte, software, hardware, CPU, IC, and various memory devices such as RAM, ROM, PROM); Computer technology (as applied in aircraft systems). Computer related terminology; Operation, layout and interface of the major components in a microcomputer including their associated bus systems; Information contained in single and multi-address instruction words; Memory associated terms; Operation of typical memory devices; Operation, advantages and disadvantages of the various data storage systems.

| **UNITIII** | **Microprocessors; Integrated Circuits and Multiplexing** | **12 Hours** |
|---|---|---|

**Microprocessors**: Functions performed and overall operation of a microprocessor; Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit. **Integrated Circuits**: Operation and use of encoders and decoders Function of encoder types Uses of medium, large and very large-scale integration. **Multiplexing**: Operation, application and identification in logic diagrams of multiplexers and demultiplexers.

| UNITIV | Fibre Optics; Electronic Displays and Electrostatic Sensitive Devices | 12Hours |
|---|---|---|

Fibre Optics: Advantages and disadvantages of fibre optic data transmission over electrical wire propagation; Fibre optic data bus; Fibre optic related terms; Terminations; Couplers, control terminals, remote terminals; Application of fibre optics in aircraft systems. Electronic Displays: Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display. Electrostatic Sensitive Devices: Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel anti-static protection devices.

| UNIT V | Software Management Control; Electromagnetic Environment and Typical Electronic/Digital Aircraft Systems | 12Hours |
|---|---|---|

Software Management Control: Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software program. Electromagnetic Environment: Influence of the following phenomena on maintenance practices for electronic system: EMC-Electromagnetic Compatibility EMI-Electromagnetic Interference HIRF-High Intensity Radiated Field Lightning/lightning protection. Typical Electronic/Digital Aircraft Systems: General arrangement of typical electronic/digital aircraft systems and associated BITE (Built In Test Equipment) testing such as: For B1 and B2 only: ACARS-ARINC Communication and Addressing and Reporting System EICAS-Engine Indication and Crew Alerting System FBW-Fly by Wire FMS-Flight Management System IRS-Inertial reference system. For B1, B2 and B3: ECAM-Electronic Centralized Aircraft Monitoring EFIS-Electronic Flight Instrument System GPS-Global Positioning System TCAS-Traffic Collision Avoidance System Integrated Modular Avionics Cabin System Information system

**COURSE OUTCOMES:**

At the end of this course the students will be able to,

CO 1: Explain about EIS, Numbering systems and data conversion.

CO 2: Explain about Data Buses, Logic circuits and Basic computer structure.

CO 3: Explain about Microprocessors; Integrated Circuits and Multiplexing.

CO 4: Explain about Fibre Optics; Electronic Displays and Electrostatic Sensitive Devices.

CO 5: Explain about Software Management Control; Electromagnetic Environment and Typical Electronic/Digital Aircraft Systems.

TEXT BOOKS:

1. Bernard Grob, “Grob: Basic Electronics”, McGraw-Hill Education; 8th edition (16 May 1997).

2. Donald P. Leach, “Digital Principles and Applications”, McGraw-Hill Education; 5th edition (30 April 1994).

3. V.K Mehta, Rohit Mehta, “Principles of Electronics”, S Chand; 7th Revised edition (3 February 2014).

**REFERENCE BOOKS:**

1. Albert D. Helfrick, “Modern Aviation Electronics”, Pearson; 2nd edition (15 April 1994).

2. Dale Crane, “Basic Electronics and Radio Installation”, Jeppesen Sanderson (1 March 1977).

3. Hughes, “Hughes Electrical and Electronic Technology”, Pearson Education India; 10th edition (1 January 2010).

4. John M. Ferrara, “Every Pilot's Guide to Aviation Electronics”, El-Jac Publishing, 1976 (January 1, 1976). 5. Keith W. Bose, “Aviation Electronics”, Howard W Sams, U.S. (1 January 1982).

WEBLINKS:

1. https://www.ksu.lt/wp-content/uploads/2017/06/M5-Selected-pages.pdf

2. http://eng.sut.ac.th/me/box/1_54/437306/ebooksclub.pdf

3. https://www.youtube.com/watch?v=dIQi8ulQfXY

4. https://www.youtube.com/watch?v=AfQxyVuLeCs&list=PL9F74AFA03AA06A11

| MATERIALS AND HARDWARE | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 4 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 4 | 4 | 0 | 0 | 4 |

**COURSE OBJECTIVES:**

The objective of this course is to develop students' understanding and skills on the aircraft materials hardware and develop hands-on practices on using bolts, screws, cables, gears, belts, etc.

| UNITI | FERROUS and NON-FERROUS material used in Aircraft | 12 Hours |
|---|---|---|

**Aircraft Materials-Ferrous:** Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels; Testing of ferrous materials for hardness, tensile strength, fatigue strength and impact resistance. **Aircraft Materials — Non-Ferrous**: Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials; Testing of non-ferrous material for hardness, tensile strength, fatigue strength and impact resistance.

| UNITII | Aircraft Materials - Composite and Non- Metallic and Corrosion. | 12 Hours |
|---|---|---|

**Aircraft Materials - Composite and Non- Metallic Composite and non-metallic other than wood and fabric** Characteristics, properties and identification of common composite and nonmetallic materials, other than wood, used in aircraft; Sealant and bonding agents. The detection of defects/deterioration in composite and non-metallic material. Repair of composite and non-metallic material. **Wooden structures**: Construction methods of wooden airframe structures; Characteristics, properties and types of wood and glue used in airplanes; Preservation and maintenance of wooden structure; Types of defects in wood material and wooden structures; The detection of defects in wooden structure; Repair of wooden structure. **Fabric covering:** Characteristics, properties and types of fabrics used in airplanes; Inspections methods for fabric; Types of defects in fabric; Repair of fabric covering. **Corrosion**: Chemical fundamentals; Formation by, galvanic action process, microbiological, stress; Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion.

| UNITIII | Fasteners, Pipes and Unions | 12 Hours |
|---|---|---|

**Fasteners - Screw threads**: Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads; **Bolts, studs and screws**: Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self-locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws, dowels. **Locking devices**: Tab and spring washers, locking plates, split pins, palnuts, wire locking,

quick release fasteners, keys, circlips, cotter pins. **Aircraft rivets**: Types of solid and blind rivets: specifications and identification, heat treatment. **Pipes and Unions** Identification of, and types of rigid and flexible pipes and their connectors used in aircraft; Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes

| **UNIT IV** | **Springs, Bearings and Transmissions** | **12 Hours** |
|---|---|---|

**Springs** -Types of springs, materials, characteristics and applications. **Bearings**: Purpose of bearings, loads, material, construction; Types of bearings and their application. **Transmissions**: Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.

| **UNIT V** | **Cables** | **12 Hours** |
|---|---|---|

**Control Cables**: Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems. **Electrical Cables and Connectors**: Cable types, construction and characteristics; High tension and co-axial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes.

**COURSE OUTCOMES:**

At the end of this course the students will be able to,

**CO1:** Explain about the materials used in aircraft construction.

**CO2:** Identify the application of non-metallic and composite materials in aircraft construction.

**CO3:** Examine about the procedure to repair of fabric covering.

**CO4:** Identify the various bolts, studs and screws; locking devices used in aircraft.

**CO5:** Inspect aircraft rivets; riveting, springs, bearings, transmission, control cables, electrical cable connectors

**TEXT BOOKS:**


1. Aircraft handbook FAA (AC 65-15 A ).
2. Civil Aircraft Inspection Procedures (CAIP 459-Part I, Basic)
3. Airframe & Powerplant Mechanics (General Handbook EA-AC 65-9A) FAA
4. CAIP 562


**REFERENCE BOOKS:**


1. Titterton, George F, “Aircraft Materials & Processes”, 1937.
2. A. C. Parkinson, “Machine Drawing”, Pitman, January 1, 1958
3. Jones, R.M, “Mechanics of Composite Materials” Mc Graw-Hill Kogakusha Ltd, Tokyo, 1915.

**WEBLINKS:**

1. **https://www.flight-mechanic.com/basic-aviation-maintenance/aircraft-materials-processesand-hardware/**
2. **https://www.ksu.lt/wp-content/uploads/2017/06/M6-Selected-pages-Materials-andHardware.pdf**
3. **https://soaneemrana.org/onewebmedia/MATERIAL%20&%20HARDWARE.pdf**
4. **https://www.slideshare.net/ShangoGratien/aircraft-materials-and-hardware**

# Maintenance practices

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 5 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 5 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

The objective of this course is to enable students to demonstrate competence in working effectively and safely in an aircraft maintenance organization. The course includes an introduction to Safety Precautions for aircraft and workshops; basic understanding of First Aid at work; the safe use, care and control of tools; standards of workmanship; use of workshop materials, lubrication equipment and methods; precision measuring tools

| | | |
|---|---|---|
| **UNIT I** | **Safety Precautions-Aircraft and Workshop; Tools and Avionic General Test Equipment** | **12 Hours** |

**Safety Precautions-Aircraft and Workshop:** Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents. **Workshop Practices**: Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards. **Tools**: Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods. Operation, function and use of electrical general test equipment; **Avionic General Test Equipment:** Operation, function and use of avionic general test equipment.

| | | |
|---|---|---|
| **UNIT II** | **Engineering Drawings, Diagrams and Standards; Fits and Clearances; Electrical Wiring Interconnection System (EWIS) and Riveting.** | **12 Hours** |

**Engineering Drawings, Diagrams and Standards**: Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information Microfilm, microfiche and computerized presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams. **Fits and Clearances**: Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts. **Electrical Wiring Interconnection System (EWIS)**: Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion;

Co-axial cables: testing and installation precautions; Identification of wire types, their inspection criteria and damage tolerance. Wiring protection techniques: Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding. EWIS installations, inspection, repair, maintenance and cleanliness standards. **Riveting**: Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.

| **UNIT III** | **Pipes and Hoses; Springs; Bearings and Transmissions** | **12 Hours** |
|---|---|---|

**Pipes and Hoses**: Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes. **Springs**: Inspection and testing of springs. **Bearings:** Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes. T**ransmissions**: Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.

| **UNIT IV** | **Control Cables; Material handling and Welding, Brazing, Soldering and Bonding** | **12 Hours** |
|---|---|---|

**Control Cables**: Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems. **Material handling - Sheet Metal** Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work. **Composite and non-metallic** Bonding practices; Environmental conditions Inspection methods **Welding, Brazing, Soldering and Bonding**: Soldering methods; inspection of soldered joints. Welding and brazing methods; Inspection of welded and brazed joints; Bonding methods and inspection of bonded joints.

| **UNIT V** | **Aircraft Weight and Balance; Aircraft Handling and Storage; Disassembly, Inspection, Repair and Assembly Techniques; Abnormal Events; Maintenance Procedures** | **12 Hours** |
|---|---|---|

**Aircraft Weight and Balance**: Centre of Gravity/Balance limits calculation: use of relevant documents; Preparation of aircraft for weighing; Aircraft weighing; **Aircraft Handling and Storage**: Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling/defuelling procedures; De-icing/anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies. Effects of environmental conditions on aircraft handling and operation. **Disassembly, Inspection, Repair and Assembly Techniques**: Types of defects and visual inspection techniques. Corrosion removal, assessment and reprotection. General repair methods, Structural Repair Manual; Ageing, fatigue and corrosion control program; Nondestructive inspection techniques including, penetrant, radiographic, eddy current, ultrasonic and boroscope methods. Disassembly and re-assembly techniques. Trouble shooting techniques. **Abnormal Events**: Inspections following lightning strikes and HIRF penetration. Inspections following abnormal events such as heavy

landings and flight through turbulence. **Maintenance Procedures**: Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures. Control of life limited components.

**COURSE OUTCOMES:**

The students should be able to

**CO1:** Explain the Safety precautions-aircraft & workshop, workshop practices, tools.

**CO2:** Demonstrate Engineering drawings, diagrams and standards, types of corrosion.

**CO3:** Illustrate the Welding, brazing, soldering and bonding, maintenance procedures.

**CO4:** Identify the defects in Bearings, transmission, control cables

**CO5:** Inspect the aircraft Pipes and unions, hoses, springs.

**TEXT BOOKS:**

1. Airframe and Powerplant Mechanics (AC 65-15A)-Airframe Hand Book FAA
2. Civil Aircraft Inspection Procedure (CAP 459) Part II Aircraft
3. Michael Kroes, William Watkins, Frank Delp and Ronald Sterkenburg, "Aircraft Maintenance and Repair", McGraw-Hill Education, 7th Edition, 2013.

**REFERENCE BOOKS:**

1. Acceptable Methods, Techniques and practices (FAA)-EA-AC 43.13-1 A&2A
2. Aviation Maintenance Technician Hand book by FAA

**WEBLINKS:**

1.https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.ksu.lt/wpcontent/uploads/2017/06/M7-vol-1-Selected-pages-maintenancePractices.pdf&ved=2ahUKEwikmyTqpfyAhUOyzgGHaARDHEQFnoECBgQAg&usg=AOvVaw0tVIIFXgrkr7I8RMTdgJlI

2.https://www.google.com/url?sa=t&source=web&rct=j&url=https://m.youtube.com/watch%3Fv%3D3eI8xEOKsq0&ved=2ahUKEwiPyKHOqpfyAhXOF4gKHRANDdwQo7QBegQIChAE&usg=AOvVaw3NIIKq13ejIB_Qd0u1kwIt

3. https://www.slideshare.net/gauravgarv5205/maintenacne-practices-introduction

| TURBINE AEROPLANE AERODYNAMICS, STRUCTURES AND SYSTEMS | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IAMarks | | | 40 |
| Number of Lecture Hours/Week | 5 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 5 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

To learn about aircraft systems aerodynamics, airframe structures and aircraft systems of Turbine airplane

| **UNIT I** | **Aerodynamics & Airframe structures** | **12 Hours** |
|---|---|---|

Theory of Flight: Airplane Aerodynamics and Flight Controls Operation and effect of: — roll control: ailerons and spoilers, — pitch control: elevators, stabilators, variable incidence stabilizers and canards, — yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading edge devices; Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels. **Airframe Structures** — **General Concepts** Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision. Aircraft bonding Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments; Structure assembly techniques: riveting, bolting, bonding Methods of surface protection, such as chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks. **Airframe Structures — Airplanes, Fuselage (ATA 52/53/56)** Construction and pressurization sealing; Wing, stabiliser, pylon and undercarriage attachments; Seat installation and cargo loading system; Doors and emergency exits: construction, mechanisms, operation and safety devices; Windows and windscreen construction and mechanisms. **Wings (ATA 57)** Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments. **Stabilizers (ATA 55)** Construction; Control surface attachment. **Flight Control Surfaces (ATA 55/57)** Construction and attachment; Balancing — mass and aerodynamic. **Nacelles/Pylons (ATA 54)** Construction; Firewalls; Engine mounts.

| UNIT II | ATA-36,21,25,26,27 | 12Hours |
|---|---|---|

**Pneumatic/Vacuum (ATA 36)** System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.

**Air Conditioning and Cabin pressurization (ATA 21**) **Air supply** Sources of air supply including engine bleed, APU and ground cart; **Air-Conditioning** Air-conditioning systems; Air cycle and vapor cycle machines Distribution systems; Flow, temperature and humidity control system. **Pressurizations** systems; Control and indication including control and safety valves; Cabin pressure controllers. **Equipment and Furnishings (ATA 25)** Emergency equipment requirements; Seats, harnesses and belts. Cabin lay-out; Equipment lay-out; Cabin Furnishing Installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Airstairs. **Fire Protection (ATA 26)** Fire and smoke detection and warning systems; Fire extinguishing systems; System tests. Portable fire extinguisher. **Flight Controls (ATA 27)** Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks systems; Balancing and rigging; Stall protection/warning system.

| UNIT III | ATA-28,29,30 and 32. | 12 Hours |
|---|---|---|

**Fuel Systems (ATA 28)** System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refueling and defueling; Longitudinal balance fuel systems. **Hydraulic Power (ATA 29)** System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters Pressure Control; Power distribution; Indication and warning systems; Interface with other systems. **Ice and Rain Protection (ATA 30)** Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air, pneumatic and chemical; Rain repellant; Probe and drain heating. Wiper systems. **Landing Gear (ATA 32)** Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and autobraking; Tires; Steering. Air-ground sensing

| UNIT IV | ATA-24,33,35, and 44 | 12Hours |
|---|---|---|

Electrical Power (ATA 24) Batteries Installation and Operation; DC power generation; AC power generation; Emergency power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power. **Lights (ATA 33)** External: navigation, anti-collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency. **Oxygen (ATA 35)** System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings; **Water/Waste (ATA 38)** Water system lay-out, supply, distribution, servicing and draining;

Toilet system lay-out, flushing and servicing; Corrosion aspects. **Cabin Systems (ATA44)** The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, music and video transmissions. The Cabin Intercommunication Data System provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panels. The Cabin Network Service typically consists on a server, typically interfacing with, among others, the following systems: — Data/Radio Communication, In-Flight Entertainment System. The Cabin Network Service may host functions such as: — Access to pre-departure/departure reports, E-mail/intranet/Internet access, — Passenger database; Cabin Core System; In-flight Entertainment System; External Communication System; Cabin Mass Memory System; Cabin Monitoring System; Miscellaneous Cabin System.

| **UNIT V** | **ATA-42,44,45 and 46** | **12Hours** |
|---|---|---|

**On Board Maintenance Systems (ATA 45)** Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring). **Integrated Modular Avionics (ATA42)** Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc. **Information Systems (ATA46)** The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.

**COURSE OUTCOMES:**

The students should be able to Learn, understand and explain about:

CO1: **Theory of Flight, Airframe Structures general concept &Airframe structure –airplane construction**

CO2: **AIRCRAFT SYSTEMS ATA-36,21,25,26,27**

CO3: **AIRCRAFT SYSTEMS ATA-28,29,30 and 32**

CO4: **AIRCRAFT SYSTEMS ATA-24,33,35, and 44**

CO5: **AIRCRAFT SYSTEMS ATA-42,44,45 and 46**

**TEXT BOOKS:**


1. Airframe and Powerplant Mechanics (AC 65-15A) -Airframe Hand Book FAA
2. Civil Aircraft Inspection Procedure (CAP 459) Part II Aircraft
3. Jeppesen, "A&p Technician Airframe Textbook", Jeppesen Sanderson; Illustrated edition (30 May 2003).
4. Aircraft Repair Manual (FAA-AC-43.13)-By Larry Reithmaier


**REFERENCE BOOKS:**


1. Aviation Maintenance Technician Hand book by FAA.
2. M. Guillon, "Hydraulic Servo Systems", Butterworth & Co Publishers Ltd (1 January 1969).
3. Ian Moir, Allan Seabridge, Malcolm Jukes, "Civil Avionics Systems".


WEBLINKS:

1. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/faa-h-8083-1.pdf
2. https://www.smartcockpit.com/docs/DASSAULT_FALCON_000DX-EXAir_Cond_and_Press.pdf
3. http://part66eu.blogspot.com/p/blog-page_2399.html
4. https://www.youtube.com/watch?v=7Hko40D1CSk
5. https://www.youtube.com/watch?v=p2kM8UXe_1w
6. https://www.smartcockpit.com/docs/DASSAULT_FALCON_000DX-EXElectrical_Power.pdf
7. https://studylib.net/doc/18916812/ata-24-electrical-power

| AIRCRAFT AERODYNAMICS, STRUCTURES AND SYSTEMS | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 5 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 80 | L | T | P | C |
| Credits | 5 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

To Learn about Aircraft Aerodynamics, Structures and avionics Systems

| **UNIT I** | **Theory of Flight; Structures — General Concepts and ATA-22, 23, 34.** | **12 Hours** |
|---|---|---|

**Theory of Flight** airplane Aerodynamics and Flight Controls Operation and effect of: — roll control: ailerons and spoilers, — pitch control: elevators, stabilators, variable incidence stabilisers and canards, — yaw control, rudder limiters; Control using elevons, ruddervators; High lift devices: slots, slats, flaps; Drag inducing devices: spoilers, lift dumpers, speed brakes; Operation and effect of trim tabs, servo tabs, control surface bias; High Speed Flight Speed of sound, subsonic flight, transonic flight, supersonic flight; Mach number, critical Mach number; Rotary Wing Aerodynamics Terminology; Operation and effect of cyclic, collective and anti-torque controls. **Structures — General Concepts** Fundamentals of structural systems; Zonal and station identification systems; Electrical bonding; Lightning strike protection provision. **Autoflight (ATA 22)** Fundamentals of automatic flight control including working principles and current terminology; Command signal processing; Modes of operation: roll, pitch and yaw channels; Yaw dampers; Stability Augmentation System in helicopters; Automatic trim control; Autopilot navigation aids interface; Autothrottle systems; Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions. **Communication/Navigation (ATA 23/34)** Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter; Working principles of following systems: — Very High Frequency (VHF) communication, — High Frequency (HF) communication, — Audio, — Emergency Locator Transmitters, — Cockpit Voice Recorder, — Very High Frequency omnidirectional range (VOR), — Automatic Direction Finding (ADF), — Instrument Landing System (ILS), — Microwave Landing System (MLS), — Flight Director systems, Distance Measuring Equipment (DME), — Very Low Frequency and hyperbolic navigation (VLF/Omega), — Doppler navigation, — Area navigation, RNAV systems, — Flight Management Systems, — Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS), — Inertial Navigation System, — Air Traffic Control transponder, secondary surveillance radar, — Traffic Alert and Collision Avoidance System (TCAS), — Weather avoidance radar, — Radio altimeter, — ARINC communication and reporting. **Electrical Power (ATA 24)** Batteries Installation and Operation; DC power generation; AC power generation; Emergency

power generation; Voltage regulation; Power distribution; Inverters, transformers, rectifiers; Circuit protection; External/Ground power.

| UNIT II | ATA-25, 27, 31, 33, 45. | 12 Hours |
|---|---|---|

**Equipment and Furnishings (ATA 25)** Electronic emergency equipment requirements; Cabin entertainment equipment. **Flight Controls (ATA 27)** Primary controls: aileron, elevator, rudder, spoiler; Trim control; Active load control; High lift devices; Lift dump, speed brakes; System operation: manual, hydraulic, pneumatic; Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks. Stall protection systems; System operation: electrical, fly-by-wire. **Instruments (ATA 31)** Classification; Atmosphere; Terminology; Pressure measuring devices and systems; Pitot static systems; Altimeters; Vertical speed indicators; Airspeed indicators; Machmeters; Altitude reporting/alerting systems; Air data computers; Instrument pneumatic systems; Direct reading pressure and temperature gauges; Temperature indicating systems; Fuel quantity indicating systems; Gyroscopic principles; Artificial horizons; Slip indicators; Directional gyros; Ground Proximity Warning Systems; Compass systems; Flight Data Recording systems; Electronic Flight Instrument Systems; Instrument warning systems including master warning systems and centralized warning panels; Stall warning systems and angle of attack indicating systems; Vibration measurement and indication; Glass cockpit **Lights (ATA 33)** External: navigation, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency. **On Board Maintenance Systems (ATA 45)** Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).

| UNIT III | ATA-21, 26, 28, 29 | 12 Hours |
|---|---|---|

**Air Conditioning and Cabin pressurization (ATA21)** Air supply Sources of air supply including engine bleed, APU and ground cart; Air-Conditioning Air-conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system. pressurization and pressurization systems; Control and indication including control and safety valves; Cabin pressure controllers. Safety and warning devices Protection and warning devices. **13.12 Fire Protection (ATA 26)** Fire and smoke detection and warning systems; Fire extinguishing systems; System tests; Portable fire extinguisher **Fuel Systems (ATA 28)** System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refueling and defueling; Longitudinal balance fuel systems. **Hydraulic Power (ATA 29)** System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electrical, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure control; Power distribution; Indication and warning systems; Interface with other systems.

| UNITIV | ATA-30,32,35,36,38 | 12 Hours |
|---|---|---|

**Ice and Rain Protection (ATA 30)** Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air, pneumatic, chemical; Rain repellent; Probe and drain heating; Wiper Systems. **Landing Gear (ATA 32)** Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warnings; Wheels, brakes, antiskid and autobraking; Tyres; Steering; Air-ground sensing. **Oxygen (ATA 35)** System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings. **Pneumatic/Vacuum (ATA 36**) System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems. **Water/Waste (ATA 38)** Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing.

| UNITV | ATA-42,44 and 46 | 12 Hours |
|---|---|---|

**Integrated Modular Avionics (ATA42)** Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc.; Core System; Network Components. **Cabin Systems (ATA44)** The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, music and video transmissions. The Cabin Intercommunication Data System provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panels. The Cabin Network Service typically consists on a server, typically interfacing with, among others, the following systems: — Data/Radio Communication, In-Flight Entertainment System The Cabin Network Service may host functions such as: — Access to pre-departure/departure reports, — E-mail/intranet/Internet access, — Passenger database; Cabin Core System; In-flight Entertainment System; External Communication System; Cabin Mass Memory System; Cabin Monitoring System; Miscellaneous Cabin System. **Information Systems (ATA46)** The units and components which furnish a means of storing, updating and retrieving digital information traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller. Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general

use display. Typical examples include Air Traffic and Information Management Systems and Network Server Systems. Aircraft General Information System; Flight Deck Information System; Maintenance Information System; Passenger Cabin Information System; Miscellaneous Information System.

**COURSE OUTCOMES:**

The students should be able to Learn, understand and explain about:

CO1: **Theory of Flight; Structures — General Concepts and ATA-22,23,34.**

CO2: **ATA-25,27,31,33,45.**

CO3: **ATA-21,26,28,29**

CO4: **ATA-30,32,35,36,38**

CO5: **ATA-42,44 and 46**

**TEXT BOOKS:**

01.EASA Module-13 Aircraft Structures and Systems

**REFERENCE BOOKS:**


01. Mechanics of Flight-AC Kermode.

02. Modern Aviation Electronics-Albert D Helfrick.

03. Airframe Structures, Vol-I-Dale Crane.

04. Basic Electronics and Radio Installation-Dale Crane.

05. Aviation Maintenance Technician Series (A/F System)-Dale Crane.

06. Transport Category Aircraft System-Thomas. W. Wild.


WEBLINKS:

1. https://youtu.be/dIQi8ulQfXY
2. https://en.wikipedia.org/wiki/Avionics
3. https://www.avionics.bike/

| PROPULSION | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 4 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 50 | L | T | P | C |
| Credits | 4 | 4 | 0 | 0 | 4 |

**COURSE OBJECTIVES:**

1. To acquire the necessary theoretical knowledge of aircraft propulsion units.
2. To understand the workings of the main mechanical and electrical components and systems of an aircraft power plant.

| **UNITI** | **Turbine Engines** | **10Hours** |
|---|---|---|

Turbine Engines - Constructional arrangement and operation of turbojet, turbofan, turbo shaft and turbo propeller engines

| **UNITII** | **EEC and FADEC** | **10 Hours** |
|---|---|---|

Electronic Engine control and fuel metering systems (FADEC).

| **UNITIII** | **Engine Indicating Systems** | **10 Hours** |
|---|---|---|

**Engine Indicating Systems** Exhaust gas temperature/Interstage turbine temperature systems; Engine speed.

| **UNITIV** | **Engine Thrust Indication** | **10 Hours** |
|---|---|---|

**Engine Thrust Indication:** Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure, temperature and flow; Manifold pressure; Engine torque; Propeller speed

| **UNITV** | **Starting and Ignition Systems** | **10 Hours** |
|---|---|---|

**Starting and Ignition Systems** Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements

**COURSE OUTCOMES:**

After the course the students are expected to be able to

CO1: Explain the principle of operation, basic design and construction of gas turbine engines.

CO2: Explain the Electronic controls of engine and fuel metering systems

CO3: To understand about the Engine indicating systems, displays and warnings

CO4: To be able to understand about the Engine Thrust calculation, thrust indications systems of turbine engine

CO5: Explain the operation and working of Engine starting and ignition systems

**WEBLINKS:**

**1. https://www.cfinotebook.net/notebook/operation-of-aircraft-systems/powerplant**

**2. http://www.bits.de/NRANEU/others/amd-us-archive/FM1-506%281990%29.pdf**

**3. https://nptel.ac.in/courses/112/103/112103281/**

**TEXT BOOKS:**


1. IrwineTreager, "Aircraft Gas Turbine Technology by", McGraw Hill Education; Third edition (1 July 2017).
2. The Jet Engine' by "ROLLS ROYCE", Power plant Section Text book- (EA-ITP-P), Wiley; 5thedition (14 August 2015).
3. Dale Crane, "Aviation Maintenance Technician Series" Aviation Supplies & Academics Inc; 3rd edition (17 January 2008).
4. Jack V. Casamassa and Ralph D. Bent, "Jet Aircraft Power Systems", McGraw-Hill, 1965.


**REFERENCE BOOKS:**


1. Ralph D Bent and Mckinley James L, "Aircraft Power Plants", McGraw-Hill; Revised Ed. edition (January 1, 1955).
2. Airframe and Power plant Mechanics (EA-AC 65- 12A) -Power Plant Hand FAA.
3. M.J.Kroes, T.W.Wild, R.D.Bent and J.L.McKinley, "Aircraft Power Plants" McGraw-Hill Education 2014.

| GAS TURBINE ENGINE | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 5 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 5 | 5 | 0 | 0 | 5 |

**COURSE OBJECTIVES:**

1. To acquire the necessary theoretical knowledge of Fundamentals, construction and working of Gas turbine engines
2. To understand the operation and working of various of the mechanical and electrical components and systems of an aircraft power plant.
3. To acquire necessary knowledge about the Ground starting, monitoring and testing, powerplant installation procedure and storage procedures of gas turbine engines
4. To learn about turbo –prop, turbo shaft and auxiliary power unit operations

| **UNIT I** | **Fundamentals; Engine Performance; Inlet; Compressors and Combustion Section** | **12 Hours** |
|---|---|---|

**Fundamentals** Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turbo shaft, turboprop. **Engine Performance** Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption; Engine efficiencies; By-pass ratio and engine pressure ratio; Pressure, temperature and velocity of the gas flow; Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations. **Inlet** Compressor inlet ducts Effects of various inlet configurations; Ice protection. **Compressors** Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation: Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades; Compressor ratio. **Combustion Section** Constructional features and principles of operation.

| **UNIT II** | **Turbine Section; Exhaust Constructional; Bearings and Seals; Lubricants and Fuels and Lubrication Systems** | **12 Hours** |
|---|---|---|

**Turbine Section** Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep. **Exhaust Constructional** features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers. **Bearings and Seals** Constructional features and principles of operation. **Lubricants and Fuels** Properties and specifications; Fuel additives; Safety precautions. **Lubrication**

| | | |
|---|---|---|
| **Systems** System operation/lay-out and components. | | |
| **UNIT III** | **Fuel Systems; Air Systems; Starting and Ignition Systems; Engine Indication Systems and Power Augmentation Systems.** | **12 Hours** |
| **Fuel Systems** Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components. **Air Systems** Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services. **Starting and Ignition Systems** Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements. **Engine Indication Systems** Exhaust Gas Temperature/Interstage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed; Vibration measurement and indication; Torque; Power. **Power Augmentation Systems** Operation and applications; Water injection, water methanol; Afterburner systems. | | |
| **UNIT IV** | **Turbo-prop Engines; Turbo-shaft engines; Auxiliary Power Units (APUs) and Power plant Installation** | **12 Hours** |
| **Turbo-prop Engines** Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Overspeed safety devices. **Turbo-shaft engines** Arrangements, drive systems, reduction gearing, couplings, control systems. **Auxiliary Power Units (APUs)** Purpose, operation, protective systems. **Power plant Installation** Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains. | | |
| **UNIT V** | **Fire Protection Systems; Engine Monitoring and Ground Operation and Engine Storage and Preservation.** | **12 Hours** |
| **Fire Protection Systems** Operation of detection and extinguishing systems. **Engine Monitoring and Ground Operation** Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and boroscope) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage. **Engine Storage and Preservation** preservation and de-preservation for the engine and accessories/ systems. | | |
| **COURSE OUTCOMES:** | | |

After the course the students are expected to be able to:

CO1: Explain the principle of operation, basic design and construction of gas turbine engines.

CO2: Summarize the operation of a gas turbine engine combustion and Exhaust section.

CO3: Analyze the lubrication and ignition system of turbine engines.

CO4: Discuss the principle of operation, basic design and construction of turbo prop and turbo shaft Engines.

CO5: Illustrate the procedure for powerplant installation, engine monitoring and inspection of engines.

**TEXT BOOKS:**


1. IrwineTreager, "Aircraft Gas Turbine Technology by", McGraw Hill Education; Third edition (1 July 2017).
2. The Jet Engine' by "ROLLS ROYCE", Power plant Section Text book- (EA-ITP-P), Wiley; 5th edition (14 August 2015).
3. Dale Crane, "Aviation Maintenance Technician Series" Aviation Supplies & Academics Inc; 3rd edition (17 January 2008).
4. Jack V. Casamassa and Ralph D. Bent, "Jet Aircraft Power Systems", McGraw-Hill, 1965.


**REFERENCE BOOKS:**


1. Ralph D Bent and Mckinley James L, "Aircraft Power Plants", McGraw-Hill; Revised Ed. edition (January 1, 1955).
2. Airframe and Power plant Mechanics (EA-AC 65- 12A) -Power Plant Hand FAA.
3. M.J.Kroes, T.W.Wild, R.D.Bent and J.L.McKinley, "Aircraft Power Plants" McGraw-Hill Education 2014.


**WEBLINKS:**

1. https://www.cfinotebook.net/notebook/operation-of-aircraft-systems/powerplant
2. http://www.bits.de/NRANEU/others/amd-us-archive/FM1-506%281990%29.pdf
3. https://nptel.ac.in/courses/112/103/112103281/

## PROPELLER

| | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 4 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 50 | L | T | P | C |
| Credits | 4 | 4 | 0 | 0 | 4 |

**COURSE OBJECTIVES:**

The aim of the course is to develop the knowledge of fundamental concept of propeller design, function, and construction.

| | | |
|---|---|---|
| **UNIT I** | **Propeller Fundamentals** | **10 Hours** |

**Fundamentals** Blade element theory; High/low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance.

| | | |
|---|---|---|
| **UNIT II** | **Propeller Construction** | **10 Hours** |

**Propeller** Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speeding propeller; Propeller/spinner installation.

| | | |
|---|---|---|
| **UNIT III** | **Propeller Pitch Control and Propeller Synchronizing** | **10 Hours** |

**Propeller Pitch Control** Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Overspeed protection. **Propeller** Synchronizing and synchrophasing equipment.

| | | |
|---|---|---|
| **UNIT IV** | **Propeller Ice Protection** | **10 Hours** |

**Propeller Ice Protection** Fluid and electrical de-icing equipment

| | | |
|---|---|---|
| **UNITV** | **Propeller Maintenance and Propeller Storage and Preservation** | **10 Hours** |

**Propeller Maintenance** Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delamination; Propeller treatment/repair schemes; Propeller engine running. **Propeller Storage and Preservation** Propeller preservation and de-preservation.

**COURSE OUTCOMES:**

After the course the students are expected to be able to

CO1: Explain the effect of blade angle of attack on the propeller performance.

CO2: Describe the shape, construction and performance of a propeller.

CO3: Analyze the propeller pitch control and propeller synchronizing.

CO4: Demonstrate the propeller ice protection system.

CO5: List the propeller maintenance procedure.

**TEXT BOOKS:**


1. Frank Delp, "Aircraft Propellers and Controls", Aviation Maintenance Pub (1 June 1979).
2. Fred Ernest Weick , "Aircraft Propeller Design", McGraw-Hill Book Company, inc; 1st edition (January 1, 1930).


**REFERENCE BOOKS:**


1. Frank E Hitchens, "Propeller Aerodynamics", Auk Academic; Standard ed. edition (4 August 2015).
2. Charles L. Rodriguez, Thomas Forenz, "Module 17 - Propellers for Aircraft Maintenance", Aircraft Technical Book Company, 2016


**WEBLINKS:**

1. **https://www.youtube.com/watch?v=PwDaM_0XjLc**
2. **https://www.faa.gov/documentlibrary/media/advisory_circular/ac_20-37e.pdf**

| RADIO TELEPHONY | | | | | |
|---|---|---|---|---|---|
| Subject Code | | IA Marks | | | 40 |
| Number of Lecture Hours/Week | 4 | Exam Marks | | | 60 |
| Total Number of Lecture Hours | 60 | L | T | P | C |
| Credits | 4 | 4 | 0 | 0 | 4 |

**Course Objective:** To understand various aviation terminologies, Standard Universal Communication Procedures followed by different departments of Aviation.

| UNIT I | Regulations | 12 Hours |
|---|---|---|

Duties of ITU, ICAO, AAI, WPC, ICAO Annexure, Spelling of Alphabets and Transmission of numerical, Aircraft Identification, Location Indicators, Flight Information Regions, Identificationof Ground Services.

| UNIT II | Radio Propagation | 12 Hours |
|---|---|---|

Relationship between wavelength, frequency and speed of light, Frequency bands and ranges Ionosphere layers during day and night, Mode of Propagation MF, HF and VHF & above, Operation of Geostationary Satellites, Operation of Polar orbiting Satellites, Diving, Skip Distance, Choice of Frequencies during Day & Night

| UNIT III | Phraseology | 12 Hours |
|---|---|---|

Phraseology used in Aeronautical Communication Services, Abbreviations used in Aeronautical Communication Services. Distress, Distress Relay, Wrench, Direction Finding, Flight Safety, Metrological, Flight regulatory

| UNIT IV | 'Q' Codes | 12 Hours |
|---|---|---|

'Q' Codes used in Aeronautical Communication Services, QNH, QFE, Height, Elevation, Altitude, Flight Level

| UNIT V | Communication | 12 Hours |
|---|---|---|

Terminal Communication & En-route Communication, NOTAM and SNOWTAM, Need of Primaryand Secondary Frequencies.

**Course Outcomes:**

CO-1 To learn basic regulations of Radio communications.

CO-2 To understand the basic knowledge of Radio waves and its Propagation.

CO-3 To learn Phraseologies used in Aviation sector.

CO-4 To learn about Aviation Code communications.

CO-5 To understand the Notices to Airmen.

**REFERENCE:**

1. Radio telephony by K.D. Tuli, 11th revised edition