



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

COURSE DESCRIPTION FORM

Course Title	AIRCRAFT MAINTENANCE ENGINEERING			
Course Code	A72117			
Class	IV B.Tech I Semester			
Regulation	R15-JNTUH			
Course Structure	Lectures	Tutorials	Practical's	Credits
	4	-	-	4
Course Coordinator	Ms D. Anitha, Assistant Professor, Department of AE			
Team of Instructors	Ms D. Anitha, Assistant Professor, Department of AE			

I. COURSE OVERVIEW

The course is structured to provide a thorough understanding of the different maintenance concerns, inspection, and analysis techniques that are associated with light-weight air vehicle (aircraft, helicopters) and space vehicles (launch vehicles, spacecraft). The course builds upon a student ability to apply the knowledge and skills required to enter a career as an Aircraft Maintenance Engineer.

II. PREREQUISITE(S)

Level	Credits	Periods	Prerequisite
UG	4	5	Introduction to Aerospace engineering

III. MARKS DISTRIBUTION

Sessional Marks	University End Exam Marks	Total Marks
<p>Mid Semester Test There shall be two midterm examinations. Each midterm examination consists of subjective type and objective type tests. The subjective test is for 10 marks of 60 minutes duration. Subjective test of shall contain 4 questions; the student has to answer 2 questions, each carrying 5 marks. The objective type test is for 10 marks of 20 minutes duration. It consists of 10 Multiple choice and 10 objective type questions, the student has to answer all the questions and each carries half mark. First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion.</p> <p>Assignment Five marks are marked for assignments. There shall be two assignments in every theory course. Marks shall be awarded considering the average of two assignments in each course</p>	75	100

IV. EVALUATION SCHEME

S No	Component	Duration	Marks
1	I Mid examination	80 minutes	20
2	I Assignment	--	05
3	II Mid examination	80 minutes	20
4	II Assignment	--	05
5	External examination	3 hours	75

V. COURSE OBJECTIVES:

The objective of the teacher is to impart knowledge and abilities to the students to:

- I. Ensure graduates obtain a comprehensive engineering education combined with specialist knowledge of Aircraft Maintenance
- II. Understand the maintenance practices of a commercial aircraft operator.
- III. Furnish students with a detailed understanding of the principles of aircraft systems, enabling the rational selection of the most appropriate technology mix to solve engineering problems.
- IV. Produce graduates capable of meeting the industry demand for maintaining both commercial and military aircraft fleets keeping in par with the regulations set forth by regulatory bodies
- V. Provide awareness about the regulatory standards for aircraft maintenance and airworthiness.

VI. COURSE OUTCOMES

At the end of the course the students are able to:

1. Understand how airworthiness of airframe, piston and turbine engines, electrical/electronic systems, propellers and rotary systems are certified.
2. Understand how the problems are identified by troubleshooting aircraft structural, mechanical or electrical systems.
3. Understand procedures for adjusting and repairing systems according to specifications, technical drawings and manuals.
4. Analyze when repairing and overhauling aircraft structural, mechanical or electrical systems are required.
5. Understand how installing or modifying are done for aircraft engines, mechanical, hydraulic, electrical, flight control, fuel and pneumatic systems.
6. Understand how dismantling airframes, aircraft engines or other aircraft systems are done for repair, overhaul, inspection and reassembly.
7. Analyze how to supervise and document routine maintenance.
8. Classifying the general groupings, managerial level function-technical services aircraft maintenance, overhaul shops, material.
9. Memorizing the engineering department functions.
10. Discussing the types of documentation, Regular documentation, Airline generated documentation, ATA document standards
11. Understand the maintenance intervals defined, change in maintenance intervals, maintenance program
12. Memorize the maintenance program evaluation directorates and summary of management levels
13. Interpret the production planning & control fore-casting.
14. Understand the process-oriented maintenance, task-oriented maintenance, current MSG process-MSG-3 and maintenance program documents
15. Understand the differences Federal Aviation Administration and JAA.

VII. HOW PROGRAM OUTCOMES ARE ASSESSED

	Program outcomes	Level	Proficiency assessed by
PO1	General knowledge: An ability to apply the knowledge of mathematics, science and Engineering for solving multifaceted issues of Aeronautical Engineering	--	--
PO2	Problem Analysis: An ability to communicate effectively and to prepare formal technical plans leading to solutions and detailed reports for Aeronautical systems	S	Assignments
PO3	Design/Development of solutions: To develop Broad theoretical knowledge in Aeronautical Engineering and learn the methods of applying them to identify, formulate and solve practical problems involving Aerodynamics	--	--
PO4	Conduct investigations of complex problems: An ability to apply the techniques of using appropriate technologies to investigate, analyze, design, simulate and/or fabricate/commission complete systems involving complex aerodynamics flow situations.	--	--
PO5	Modern tool usage: An ability to model real life problems using different hardware and software platforms, both offline and real-time with the help of various tools along with upgraded versions.	--	--
PO6	The engineer and society: An Ability to design and fabricate modules, control systems and relevant processes to meet desired performance needs, within realistic constraints for social needs	S	Exercise
PO7	Environment and sustainability: An ability To estimate the feasibility, applicability, optimality and future scope of power networks and apparatus for design of eco-friendly with sustainability	S	Discussion, Seminars
PO8	Ethics: To Possess an appreciation of professional, societal, environmental and ethical issues and proper use of renewable resources	--	--
PO9	Individual and team work: An Ability to design schemes involving signal sensing and processing leading to decision making for real time Aeronautical systems and processes at individual and team levels.	--	--
PO10	Communication: an Ability to work in a team and comprehend his/her scope of work, deliverables, issues and be able to communicate both in verbal, written for effective technical presentation	--	--
PO11	Project management and finance: To be familiar with project management problems and basic financial principles for a multi-disciplinary work	--	--
PO12	Life-long learning: An ability to align with and upgrade to higher learning and research activities along with engaging in life-long learning.	--	--

S – Supportive

H – Highly Related

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED

	Program Specific Outcomes	Level	Proficiency assessed by
PSO1	Professional skills: Able to utilize the knowledge of aeronautical/aerospace engineering in innovative, dynamic and challenging environment for design and development of new products	H	Lectures, Assignments
PSO2	Problem solving skills: imparted through simulation language skills and general purpose CAE packages to solve practical, design and analysis problems of components to complete the challenge of airworthiness for flight vehicles	--	--
PSO3	Practical implementation and testing skills: Providing different types of in house and training and industry practice to fabricate and test and develop the products with more innovative technologies	S	Seminars and Projects
PSO4	Successful career and entrepreneurship: To prepare the students with broad aerospace knowledge to design and develop systems and subsystems of aerospace and allied systems and become technocrats	--	--

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IX. SYLLABUS

UNIT – I

NECESSITY TO DO MAINTENANCE

Definition of maintenance, Objectives of a maintenance program, Outline of aviation maintenance program, summary of FAA requirements, additional maintenance program requirements; Organization of maintenance and engineering, organization structure, M&E organization chart, general groupings, Managerial Level Functions-technical services, aircraft maintenance, overhaul shops, material, maintenance program evaluation directorates, summary of management levels, organization structure and TPPM, variations from the typical organization, role of the engineer, role of the mechanic, two types of maintenance, reliability, redesign, failure rate patterns, other maintenance considerations, establishing a maintenance program. Goals and objectives of maintenance, discussion of the five objectives.

UNIT- II

DEVELOPMENT OF MAINTENANCE PROGRAMS

Maintenance Steering Group (MSG) Approach, Process-Oriented maintenance, Task-oriented maintenance, Current MSG process-MSG-3, Maintenance program documents, maintenance intervals defined, changing basic maintenance intervals, maintenance program content.

UNIT- III

TECHNICAL SERVICES

Engineering: makeup of engineering, mechanics and engineers, engineering department functions, engineering order preparation; Production Planning & Control-forecasting, production planning, production control, feedback for planning, organization of PP&C.

Technical Publications-functions of technical publications, airline libraries, control of publications, document distribution; Technical Training-organization, training for aviation maintenance, airframe manufacturer's training courses, other airline training courses; Computer support-airlines uses of computers

UNIT- IV

MAINTENANCE AND MATERIAL SUPPORT

Line Maintenance(on-aircraft)-makeup of line maintenance, functions that control maintenance, maintenance control centre responsibilities, general line maintenance operations, aircraft logbook, ramp and terminal operations, other line maintenance activities, line station activities, maintenance crew requirements, morning meeting; Hangar Maintenance(on-aircraft)-organization of hangar maintenance, problem areas in hangar maintenance, maintenance support shops, ground support equipment, typical C-check; Maintenance overhaul shops(off-aircraft)-organization, types and operation of overhaul shops, Shop data collection.

UNIT- V

OVERSIGHT FUNCTIONS

Aircraft certification, delivery inspection, operator certification, certification of personnel, aviation industry interaction; Types of documentation, manufacturer's documentation, regulatory documentation, airline generated documentation, ATA document standards, closer look of TPPM, Quality Assurance-requirements for QA, quality audits, ISO 9000 quality standard, technical records, other functions of QA; Quality Control-quality control organization, FAA and JAA differences, QC inspector qualifications, basic inspection policies, other QC activities; Reliability-definition and types of reliability, elements of a reliability program

TEXT BOOKS:

1. Kinnison, H.A., "Aviation Maintenance Management", McGraw-Hill, 2004.
2. J. L. McKinley, R.D. Bent, "Maintenance and Repair of Aerospace Vehicles", Northrop Institute of Technology, McGraw Hill, 1967.

REFERENCES:

1. C. H. Friend, "Aircraft Maintenance Management", Longman, 1992.

2. M. Kroes, W. Watkins, F. Delp, "Aircraft Maintenance and Repair", Tata McGraw-Hill, 2010.
3. M. S. Patankar, J. C. Taylor, "Risk Management and Error Reduction in Aviation Maintenance", Ashgate, 2004, ISBN 0-7546-1941-9.

X. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No	Course Learning Outcomes	Topics to be covered	Reference
1	Explain the basics and introduction of Aircraft Maintenance	Introduction of Aircraft Maintenance	T1:1.1
2	Remembering the definition of maintenance and objectives of a maintenance program	Definition of maintenance, objectives of a maintenance program	T1:1.2
3	Memorizing the aviation maintenance program outlined and summary of FAA requirements	Outline of aviation maintenance program, summary of FAA requirements	T1:6.1
4	Interpreting the additional maintenance program requirements	Additional maintenance program requirements	T1:6.3
5	Explaining what is organization of maintenance and engineering, organization structure M&E organization chart	Organization of maintenance and engineering, organization structure M&E organization chart	T1:7.1-7.3
6-7	Classifying the general groupings, managerial level function-technical services aircraft maintenance, overhaul shops, material	General groupings, managerial level function-technical services aircraft maintenance, overhaul shops, material	T1:7.4-7.5
8	Memorizing the maintenance program evaluation directorates and summary of management levels	Maintenance program evaluation directorates, summary of management levels	T1:7.6
9-10	Understanding the organization structure and TPPM, variations from the typical organization.	Organization structure and TPPM, variations from the typical organization-engineer, mechanic	T1:7.8
11-12	Understanding the two types of maintenance.	Two types of maintenance, reliability, redesign, failure rate patterns	T1:1.3
13-14	Understanding the other maintenance considerations, establishing maintenance program	Other maintenance considerations, establishing maintenance program	T1:1.5
15-16	Identifying the goals and objectives of maintenance. Discussing the five objectives	Goals and objectives of maintenance-five objectives	T1:3.1
17-18	Understanding the maintenance steering group(MSG) approach	Maintenance steering group(MSG) approach	T1:2.1-2.3
19-22	Understanding the process-oriented maintenance, task-oriented maintenance, current MSG process-MSG-3 and maintenance program documents	Process-oriented maintenance Task-oriented maintenance Current MSG process-MSG-3 maintenance program documents	T1:2.4-2.6
23-26	Understanding the maintenance intervals defined, change in maintenance intervals, maintenance program content makeup of engineering, mechanics and engineers	Maintenance intervals defined, change in maintenance intervals, maintenance program content, Makeup of engineering, mechanics and engineers	T1:2.7
27	Memorizing the engineering department functions	Engineering department functions	T1: 8.1

28-29	Reviewing the engineering order preparation	Engineering order preparation	T1:8.2
30-31	Interpreting the production planning & control fore-casting	Production planning & control forecasting	T1:4.8-4.9
32-34	Discussing the production planning, production control, feedback for planning and organization of PP&C	Production planning, Production control, Feedback for planning, organization of PP&C	T1:9.1-9.4
35-37	Understanding the technical publications-functions of technical publications, airline libraries, control of publications, document distribution	Technical publications-functions of technical publications, airline libraries, control of publications, document distribution	T1:10.1-10.3
38-40	Understanding the technical training-organization, aviation maintenance, air frame manufacturers, other airline training courses	Technical training-organization, aviation maintenance, air frame manufacturers, other airline training courses	T1:11.1
41	Reviewing the computer support-airlines uses of computers	Computer support-airlines uses of computers	T1:12.1
42-43	Understanding the line maintenance-makeup, functions that control maintenance, maintenance control centre responsibilities, general line maintenance operations, aircraft logbook, ramp and terminal operations	Line maintenance-makeup, functions that control maintenance, maintenance control centre responsibilities, General line maintenance operations, aircraft logbook, ramp and terminal operations	T1:13.1-13.3
44	Understanding the other airline maintenance activities, line station activities, maintenance crew requirements, morning meeting	Other airline maintenance activities, line station activities, Maintenance crew requirements, morning meeting	T1:13.4
45	Understanding the Hangar maintenance-organization of hangar maintenance, problem areas in hangar maintenance	Hangar maintenance-organization of hangar maintenance, problem areas in hangar maintenance	T1:14.1
46	Understanding the maintenance support shops, ground support equipment, typical C-check	Maintenance support shops, ground support equipment, typical C-check	T1:14.2
47	Understanding the maintenance overhaul shops organization, types and operation of overhaul shops, shop data collection	Maintenance overhaul shops organization, types and operation of overhaul shops, shop data collection	T1:15.1-15.4
48-50	Explaining the aircraft certification Delivery inspection, operator certification Certification personnel, aviation industry interaction	Aircraft certification, Delivery inspection, operator certification, Certification personnel, aviation industry interaction	T1:15.5-15.7
51-52	Discussing the types of documentation, Regular documentation, Airline generated documentation, ATA document standards	Types of documentation, Regular documentation, Airline generated documentation, ATA document standards	T1:5.1
53	Understanding the closer loop of TPPM, quality assurance	Closer loop of TPPM, quality assurance	T1:5.2
54	Understanding the requirements for QA	Requirements for QA	T1:17.1
55	Understanding the quality audits	Quality audits	T1:17.2
56-57	Understanding the ISO 9000 quality standard, technical records, other functions of QA	ISO 9000 quality standard, technical records, other functions of QA	T1:17.3

58	Understanding the Quality control-organization	Quality control-organization	T1:18.1
59	Understanding the FAA and JAA differences	FAA and JAA differences	T1:18.2
60	Understanding the QC inspector qualifications	QC inspector qualifications	T1:18.3

XI. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Course Objectives	Program Objectives												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
I		S				S	S								H	
II						H							H			
III		S					S								H	
IV						S									S	
V		S				H	S						S			

S – Supportive

H - Highly related

XII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1						S	S						S		S	
2		S				S										
3		S					S						S		S	
4						S										
5		S					S								H	
6		S											S			
7						H	S								S	
8						S									S	
9		S					S									
10						S							S		S	
11		S				H	S									
12													S		S	
13						S	S						H			
14		S				S									H	
15		H											S			

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Prepared by: Ms D Anitha, Assistant Professor

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