INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

FLIGHT SCHEDULING AND OPERATIONS								
VIII Semester: AE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
AAED58	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Introduction to Aerospace Engineering								

I. COURSE OVERVIEW:

This course is designed to explore a variety of models and optimization techniques for the solution of airline schedule planning and operations problems. Schedule design, fleet assignment, aircraft maintenance routing, crew, Scheduling, passenger mix, and other topics are covered. Recent models and algorithms addressing issues of model. Integration, robustness, and operations recovery are introduced. Modeling and solution techniques designed specifically for large-scale problems, and state-of-the-art applications of these techniques to airline problems are detailed.

II. COURSES OBJECTIVES:

The students will try to learn

I. The fundamental concepts of various airline network flows and blend the best suitable requirements for various applications.
II. The mathematical formulation-decision variables, objective function, constraints and methods of solution for airline scheduling.
III. The characteristics of stability and performance of an aircraft significance of flight scheduling.
IV. The concept of aircraft boarding strategy and common strategies for aircraft boarding.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO1 Summarize the complexity of airline planning, operations and analyze the problems in aircraft routing.
CO2 Make use of decision variables, objective function, constraints, solution Scenario analysis for flight and fleet scheduling process
CO3 Determine which flight segments should be paired and are assigned to the crew incorporating various rules and regulations for crew scheduling
CO4 Discuss manpower planning for ground crew through the fictitious airline case.
CO5 Analyze the gate assignment mathematical model through a case study and mathematical approach for an efficient aircraft boarding strategy.
CO6 Analyze the irregular operations, delays, cancellations, a mathematical model for irregular operations, and a case study.

IV. COURSE CONTENT:

MODULE-I: AIRLINE NETWORK AND AIRCRAFT ROUTING (10)

Complexity of airline planning, operations and dispatch- need for optimization- Networks definitions, network flow models shortest path problem, minimum cost flow problem maximum flow problem, multi-commodity problem. Integer programming models- set covering/ partitioning problems, traveling salesman problem- mathematical formulation- decision variables, objective function, and constraints. Goal of aircraft routing- maintenance requirements, other constraints Routing cycles, route generators Mathematical models of routing- decision variables, objective functions, alternatives, constraints- flight coverage and aircraft available Example problems and solutions.

MODULE-II: FLIGHT AND FLEET SCHEDULING (10)

Significance of flight scheduling. The route system of the airlines- point-to-point flights, hub and spoke flights Schedule construction- operational feasibility, economic viability Route development and flight scheduling process- load factor and frequency Case study. Purpose of fleet assignment. Fleet types, fleet diversity, fleet availability- performance measures Formulation of the fleet assignment problem- decision variables, objective function, constraints, solution Scenario analysis, fleet assignment models.

MODULE-III: CREW AND MANPOWER SCHEDULING (10)

Crew scheduling process: significance Development of crew pairing- pairing generators mathematical formulation of crew pairing problem- methods of solution. Mathematical Model for B757-200 Fleet, Flight-Coverage Constraints for B757 Fleet, Crew rostering- rostering practices Crew-Rostering Mathematical Model, The crew rostering problem-formulation, solutions.

Man power scheduling: Introduction, mathematical modeling case study- Constraints, formulation of the problem, solutions, mathematical model –sets, index, parameters, decision variable, minimize

MODULE-IV: GATE ASSIGNMENT AND AIRCRAFT BOARDING STRATEGY (09)

Gate assignment - significance- the problem- levels of handling-passenger flow, distance matrix mathematical formulation, solution Common strategies for aircraft boarding process, mathematical model, interferences, model description, aisle interferences.

MODULE-V: AIRLINE IRREGULAR OPERATION, DISRUPTION OF SCHEDULE AND RECOVERY COMUTATIONAL COMPLEXITY-CASE STUDIES (09)

The problem statement, the time band approximation model formulation of the problem the scenarios-solution. Complexity theory, heuristic procedures Case studies of airline operation and scheduling study through simulation modeling- use of available software.

V. TEXT BOOKS:

1. Bazargan M, "Airline Operations and Scheduling", 2nd Edition, Ash gate Publishing Ltd, 2010.
2. BelobabaPodoni, A., Barnhart, C. "The Global Airline Industry", Wiley, 2009.

VI. REFERENCE BOOKS:

1. Wu, Cheng-Lung, "Airline Operations and Delay Management", Ashgate Publishing Ltd, 2010.
2. Wensveen, J.G. "Air Transportation: A Management Perspective", Ashgate Publishing Ltd, 6 th Edition, 2007.
3. Ahuja, R. et al, "Network Flows-Theory, Algorithms and Applications", Prentice-Hall, 1993.

VII. ELECTRONICS RESOURCES:

1. https://ftp.idu.ac.id/wpcontent/uploads/ebook/ip/BUKU%20SCHEDULING/Airline%20Operations%20and%20Scheduling.pdf

VIII.MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation