Subject Description Form

Subject Code	ME586
Subject Title	Operations Research in Aviation
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	To provide students with knowledge of operations research methods for application in the aviation industry. These methods would equip students with the necessary tools to interpret, analyze and solve aviation operational problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. formulate and solve flight scheduling and aircraft routing problems; b. apply network planning in engine overhaul and resources allocation; c. develop appropriate aircraft maintenance/replacement strategy; d. derive the availability of repairable aircraft systems; e. estimate the number of mechanical installations such as baggage conveyor system in a new airport; and f. forecast air traffic for airport operations management.
Subject Synopsis/ Indicative Syllabus	***Decision Making with Uncertain Demand:*** Decision criteria under uncertainty. Discrete and continuous probability distributions. Uncertain demand examples in airport operations and maintenance planning. ***Linear Programming:*** The linear programming model and assumptions. Sensitivity analysis. Advantages and cautions of linear programming methods. Application in production and service scheduling. ***Transportation Methods:*** Methods of solving the transportation problem. Optimization of distribution schedules. Applications in aircraft routing and placement of aircraft orders. ***Network Analysis for Maintenance Planning:*** The basics of network planning. The case of computerized maintenance planning. Resource utilization. Development of scheduled engine shutdown/removal programme. ***Dynamic Programming:*** Characteristics and structure of dynamic programming problems. Optimization of aircraft overhaul, repair and replacement policies. ***Markov Analysis:*** State classification of a Markov chain. First passage times. Long-run properties of Markov chains. Absorption states. Applications in aircraft system availability assessment. ***Queueing Theory:*** Fundamentals. Arrival and service distributions. Simple and multi-channel queueing models. Estimation of parking bays or baggage conveyors in airport. ***Forecasting:*** Judgmental techniques. Time series. Forecasting procedure for linear trend model. Forecasting errors. Air traffic forecasting.

Teaching/Learning Methodology

1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for advanced materials and structural design.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.

Teaching/Learning Methodology	Intended subject learning outcomes					
	a	b	c	d	e	f
1. Lecture	√	√	√	√	√	√
2. Tutorial	√	√	√	√	√	√
3. Homework assignment	√	√	√	√	√	√
4. Case study report and presentation	√	√	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Homework assignment	20%	√	√	√	√	√	√
2. Test	20%	√	√	√	√	√	√
3. Case study report and presentation	20%			√		√	√
4. Examination	40%	√	√	√	√	√	√
Total	100%						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.40 \times$ End of Subject Examination + $0.60 \times$ Continuous Assessment

The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.

The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	24 Hrs.
▪ Tutorial/Case study/Laboratory	15 Hrs.
Other student study effort:	
▪ Self Study	45 Hrs.
▪ Case study report preparation and presentation	21 Hrs.
Total student study effort	105 Hrs.

Reading List and References

1. Taha, Hamdy A. Operations Research : An introduction, Upper Saddle River, NJ: Prentice Hall/Pearson, latest edition.
2. Wells, A.T. & S.B. Young, Airport Planning & Management, New York: McGraw-Hill, latest edition.