INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

AERONAUTICAL ENGINEERING

COURSE DESCRIPTION FORM

Course Title	**AIR TRANSPORTATION SYSTEMS**			
Course Code	**A52110**			
Regulation	**R15-JNTUH**			
Course Structure	**Lectures**	**Tutorials**	**Practical's**	**Credits**
	4	-	-	4
Course Coordinator	M.Mary Thraza, Assistant Professor			
Team of Instructors	R.Suresh Kumar, Assistant Professor, Mary Thraza, Assistant Professor			

I. COURSE OVERVIEW

Study key issues, concepts and developments in the aviation industry, and improve your understanding of a range of specialized subjects and global best practices. Learn how aviation business planning interrelates with current regulatory and evolving state policy issues. Evaluate current air transport economic issues and the industry value chain, and learn how to apply your air transport economic knowledge in the workplace. Some prior industry experience is useful to fully understand course content, although sessions are accessible to new industry professionals.

II. PREREQUISITE(S)

Level	Credits	Periods	Prerequisite
UG	4	4	Basic Concepts Of Aviation Management

III. MARKS DISTRIBUTION

Sessional Marks	University End Exam Marks	Total Marks
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. **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	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:

I. **Explain** how aviation players usually act and compete in different market structures (monopolies and oligopolies)
II. **Learn** tools and methods to design, plan, and analyze air transportation systems,
III. **Understand** the technology and basic performance of aircraft as they operate in the air transport system,
IV. **Understand** the operating principles of Air Traffic Control (ATC) and the future of the National Airspace System (NAS),
V. **Provide** a foundation of airline operations research,
VI. **Understand** the principle of operation of large-scale airspace and airfield simulation models and their application in NAS studies.

VI. COURSE OUTCOMES

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

1. **Describe** airport layout incorporating its different features
2. **Explain** construction of runway and taxiway and aprons as per geometric design for all parameters.
3. **Describe** desire quality in construction of runway
4. **Define** the requirements of terminal area as per drawing and design
5. **Describe** the visual aids for air traffic control system.
6. **Explain** various elements of Heliports and its planning aspects
7. **Explain** Air Traffic Services
8. **Describe** the history and development of Air Traffic Services (ATS);
9. **Explain** the airway structure and aids to navigation
10. **Explain** air traffic rules and procedures;
11. **Explain** radio and radio navigation, including radar and radar facilities, and Instrument Landing systems
12. **Explain** program is designed to help you enhance your knowledge of your key duties, responsibilities and potential liabilities in the area of Air Law and Air Transport Management

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	H	Assignments, Tutorials
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	H	Mini Projects
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.	H	Projects

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.	S	Mini Projects
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	--	--
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	--	--
PO8	**Ethics**: To Possess an appreciation of professional, societal, environmental and ethical issues and proper use of renewable resources	S	--
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	S	Tutorials
PO11	**Project management and finance**: To be familiar with project management problems and basic financial principles for a multi-disciplinary work	S	Projects
PO12	**Life-long learning**: An ability to align with and upgrade to higher learning and research activities along with engaging in life-long learning.	H	Projects

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	S	Tutorials
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	H	Lectures, Assignments

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IX. SYLLABUS

UNIT – I

AVIATION INDUSTRY AND ITS REGULATORY ENVIRONMENT

Introduction, history of aviation- evolution, development, growth, challenges. Aerospace industry, air transportation industry- economic impact- types and causes. Airline Industry-structure and economic characteristics. The breadth of regulation- ICAO, IATA, national authorities (DGCA, FAA). Safety regulations- risk assessment- human factors and safety, security regulations, environmental regulations.

UNIT- II

AIRSPACE

Categories of airspace- separation minima, airspace sectors- capacity, demand and delay. Evolution of air traffic control system- procedural ATC system, procedural ATC with radar assistance, first generation ‘automated’ ATC system, current generation radar and computer-based ATC systems.

Aerodrome air traffic control equipment and operation - ICAO future air-navigation systems (FANS). Air-navigation service providers as businesses. Communication, navigation and surveillance systems(CNSS). Radio communications-VHF,HF,ACARS,SSR,ADS, NAVIGATION – NDB,VOR,DME,area-navigation systems(R-nav),ILS,MLS,GPS,INS.

UNIT- III

AIRCRAFT

Costs- project cash-flow, aircraft price. Compatibility with the operational infrastructure. Direct and indirect operating costs. Balancing efficiency and effectiveness- payload-range, fuel efficiency, technical contribution to performance, operating speed and altitude, aircraft field length performance. typical operating costs. Effectiveness- wake-vortices, cabin dimensions, flight deck.

UNIT- IV

AIRPORTS

Setting up an airport- airport demand, airport siting, runway characteristics- length, declared distances, aerodrome areas, obstacle safeguarding. Runway capacity- evaluating runway capacity-sustainable runway capacity. Runway pavement length, Manoeuvring area- airfield lighting, aprons, Passenger terminals-terminal sizing and configuration. Airport demand, capacity and delay. .

UNIT- V

AIRLINES

Setting up an airline- modern airline objectives. Route selection and development, airline fleet planning, annual utilization and aircraft size, seating arrangements. Indirect operating costs. Aircraft-buy or lease. Revenue generation, Computerized reservation systems, yield management. Integrating service quality into the revenue-generation process. Marketing the seats. Airline scheduling. Evaluating success- financial viability, regulatory compliance, efficient use of resources, effective service.

TEXT BOOKS:

1. Hirst, M., "The Air Transport System", Woodhead Publishing Ltd, Cambridge, England, 2008.

REFERENCES:

1. Wensven, J.G., "Air Transportation: A Management Perspective", Ashgate, 2007.
2. Belobaba, P., Odoni, A. and Barnhart, C., "Global Airline Industry", Wiley, 2009.
3. M. Bazargan, M., "Airline Operations and Scheduling", Ashgate, 2004.
4. Nolan, M.S., "Fundamentals of Air Traffic Control", 4th edn., Thomson Learning, 2004.
5. Wells, A. and Young, S., "Airport Planning and Management", 5th edn., McGraw-Hill, 1986.

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
1-2	**Describe** the history of aviation	Introduction history of aviation	T:1
2-3	**What** is history of aviation- evolution,	History of aviation- evolution.	T:1
3-4	**Write** about the Development, growth,	Development, growth.	T:1
4-5	**What** are the challenges of aviation industry	Challenges	T:1
5-6	**Describe** Aerospace industry	Aerospace industry	T:1

6-7	**What** air transportation industry	Air transportation industry	T:1
7-8	**What** is the economic impact- types and causes.	Economic impact- types and causes.	T:1
8-9	**Discuss** Airline Industry-structure and economic characteristics.	Airline Industry-structure and economic characteristics.	T:1
9-10	**Discuss** Aerospace industry, air transportation industry	Aerospace industry, air transportation industry	T:1
10-11	**Explain** economic impact- types and causes.	Economic impact- types and causes.	T:1
11-12	**Discuss** Aerospace industry,	Aerospace industry,	T:1
12-13	**Evaluate** air transportation industry-	Air transportation industry-	T:1
13-14	**Define** Analyze economic impact- types and causes.	Economic impact- types and causes.	T:1
14-15	**Discuss** Airline Industry	Airline Industry	T:1
15-16	**Discuss** the structure and economic characteristics.	Structure and economi characteristics.	T:1
16-17	**Describe** the breadth of regulation	The breadth of regulation	T:1
17-18	**Define** ICAO IATA national authorities DGCA	ICAO IATA national authoritie DGCA	T:1
18-19	**Understand** FAA Safety regulations risk assessment- human factors safety, security regulations	FAA Safety regulations ris assessment- human factors safety security regulations	T:1
19-20	**Explain** Environmental regulations. Environmental regulations. Safety regulations	Environmental regulations Environmental regulations. Safet regulations	T:1
20-21	**Understand** Categories of airspace separation Minima, airspace sectors	AIRSPACE Categories of airspac separation Minima, airspace sectors	T:1
21-22	**What** are capacity, demand and delay.	Capacity, demand and delay.	T:1
22-23	**Explain** Evolution of air traffic control system procedural ATC system,	Evolution of air traffic contro system procedural ATC system,	T:1
23-24	**Explain** the procedural ATC with radar assistance,	Procedural ATC with rada assistance,	T:1
24-25	**Explain** first generation automated'	First generation automated'	T:1
25-26	**Define** ATC system current generation rada	ATC system current generation rada	T:1
27-28	**Explain** computer-based ATC systems, Aerodrome air traffic control equipment	Computer-based ATC systems Aerodrome air traffic contro equipment	T:1
28-29	**Define** (FANS). Air-navigation service	(FANS). Air-navigation servic	T:1

	providers as businesses	providers as businesses	
29-30	**Define** Communication, Navigation and surveillance systems(CNSS)	Communication, Navigation an surveillance systems(CNSS)	T:1
30-31	**Define And Describe** Radio communications-VHF, HF,ACARS,SSR,ADS,NDB,VOR,DME	Radio communications - VHF, HF ACARS, SSR, ADS,NDB, VOR DME	T:1
31-32	**Describe** area-navigation systems(R-nav)	Area-navigation systems(R-nav)	T:1
32-33	**Define** ILS,MLS,GPS,INS	ILS,MLS,GPS,INS	T:1
33-34	**Explain** Costs- project cash-flow, aircraft price. Compatibility	AIRCRAFT Costs- project cash-flow, aircraft price. Compatibility	T:1
34-35	**Explain** the concept of the operational infrastructure.	The operational infrastructure.	T:1
35-36	**Describe** the Direct and indirect operating costs	Direct and indirect operating costs	T:1
36-37	**Define** Balancing efficiency and effectiveness- payload-range	Balancing efficiency an effectiveness- payload-range	T:1
37-38	**Remember** fuel efficiency, technical contribution to performance,	Fuel efficiency, technica contribution to performance,	T:1
38-39	**Understand** the operating speed and altitude, aircraft field length performance	Operating speed and altitude, aircra field length performance	T:1
39-40	**Write** the typical operating costs. Effectiveness- wake-vortices,	Typical operating costs Effectiveness- wake-vortices,	T:1
40-41	**Evaluate** cabin dimensions, flight deck	Cabin dimensions, flight deck	T:1
41-42	**Discuss** Setting up an airport airport demand,	AIRPORTS Setting up an airport- airport demand,	T:1
43-44	**Discuss** the airport sitting, runway characteristics-length, declared distances	Airport sitting, runway characteristics-length, declared distances	T:1
44-45	**Remember** aerodrome areas, obstacle safeguarding.	Aerodrome areas, obstacle safeguarding.	T:1
45-46	**What** is Runway capacity-evaluating runway capacity-	Runway capacity-evaluating runway capacity-	T:1
46-47	**What** is sustainable runway capacity	Sustainable runway capacity	T:1
47-48	**What** Runway pavement length, Maneuvering area- airfield lighting	Runway pavement length Maneuvering area- airfield lighting	T:1

48-49	**Define** aprons, Passenger terminals-terminal sizing and configuration.	Aprons, Passenger terminals terminal sizing and configuration.	T:1
49-50	**Define** Airport demand, capacity and delay.	Airport demand, capacity and delay.	T:1
50-51	**Define** Setting up an airline modern airline objectives.	AIRLINES: Setting up an airline modern airline objectives.	T:1
51-52	**Explain** Route selection and development, airline fleet planning,	Route selection and development, airline fleet planning,	T:1
52-53	**Define** Annual utilization and aircraft size, seating arrangements.	Annual utilization and aircraft size seating arrangements.	T:1
53-54	**Explain** Indirect operating costs.	Indirect operating costs.	T:1
54-55	**Explain** Aircraft- buy or lease. Revenue generation	Aircraft- buy or lease. Revenu generation	T:1
55-56	**Remember** Computerized reservation systems	Computerized reservation systems	T:1
56-57	**Explain** yield management	Yield management	T:1
58-59	**Explain** Integrating service quality into the revenue-	Integrating service quality into th revenue-	T:1
59-60	**Explain** generation process.	Generation process.	T:1
60-61	**Explain** Marketing the seats	Marketing the seats	T:1
61-62	**Explain** Airline scheduling	Airline scheduling	T:1
62-63	**Explain** Evaluating success.	Evaluating success.	T:1
63-64	**Explain** financial viability	Financial viability	T:1
64-65	**Describe** regulatory compliance,	Regulatory compliance,	T:1
65-66	**Explain** efficient use of resources, effective service	Efficient use of resources, effectiv service	T:1
66-67	**Describe** the efficient use of resources, effective service	Efficient use of resources, effectiv service	T:1
67-68	**Analyze** the Integrating service quality into the revenue-	Integrating service quality into th revenue-	T:1
68-69	**What** is the efficient use of resources, effective service	Efficient use of resources, effectiv service	T:1
69-70	**Describe** the efficient use of resources, effective service	Efficient use of resources, effectiv service	T:1
70-71	**Describe** the Route selection and development, airline fleet planning	Route selection and development airline fleet planning	T:1

71-72	**Describe** the Route selection and development, airline fleet planning	Route selection and development airline fleet planning	T:1

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

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

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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		H		S	H							H		H		
2									S							
3	S												S		S	H
4			S										H			
5		H		H										H		
6			S										H		S	
7		S			H											H
8	H			S					H			S				
9	H								S			H				

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Prepared by: M Mary Thraza, Assistant Professor
R Suresh Kumar, Assistant Professor

HOD, AE