J.J COLLEGE OF ENGINEERING AND TECHNOLOGY

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SOWDAMBIKAA GROUP OF INSTITUTIONS

ESTD. 1994

DEPARTMENT OF AERONAUTICAL ENGINEERING

AE3010–AIR TRAFFIC CONTROL

QUESTION BANK

R-2021

INSTITUTE VISION & MISSION

VISION:

To become a globally recognized "Centre of Academic Excellence" providing Quality Education to all students.

MISSION:

To provide Quality Education in the fields of Engineering, Management, Information, Technology and other Engineering areas.

DEPARTMENT VISION & MISSION

VISION:

To prepare technically skilled and competent intellectual professional graduates to meet the challenges in the Aerospace industry.

MISSION:

M1: To produce technologically competent graduates to be front-runner in their profession.

M2: To provide state-of-the-art facilities and laboratories so as to enhance excellence in teaching and learning process.

M3: To provide need-based quality training programmes in the field of the Aerospace industry.

M4: Enhance the students' sound knowledge in the latest technologies by organizing technical programs and encouraging students to make them present papers and participate in technical events.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1	To employ comprehensive knowledge in Aeronautical Engineering and analytical skills to work towards solving complex problems to excel in the professional career.
PEO2	To design, analyze and produce cutting edge engineering solutions by employing modern techniques and adhering to moral values for sustainable development.
PEO3	To assume global careers and leadership responsibilities through consistent learning with idealistic managerial practices.

PROGRAM OUTCOMES (POs)

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineeringfundamentalsandanengineeringspecializationtothesolutionof complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions Using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including the design of experiments, Analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply to reason in formed by the contextual Knowledge to assess societal, health, safety, legal and cultural issues and the Consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8	**Ethics:** Apply ethical principles and commit to professional ethics and Responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a Member or leader in Diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able To comprehend And write effective reports and design documentation, make effective presentations, and give and Receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply These to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to Engage in in dependent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	To gather data using modern tools and apply design techniques to develop solutions for challenges in the domain of Aerodynamics, Propulsion, Aircraft Structures and Aircraft Maintenance with professional ethics.
PSO2	To function as engineering solution providers or entrepreneurs, who are able to manage, innovate, communicate, train and lead a team for continuous improvement.
PSO3	Graduate will be able to work as a team member which will be a main requirement in industry or research organisation or in any business enterprise. This will pave the way for successful career for the graduate and also play a role for the success of the organisation in which the graduate is employed.

AE3010 **AIR TRAFFIC CONTROL** L T P C

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UNIT – I BASIC CONCEPTS 9

Objectives of air traffic control systems - Parts of ATC services – Scope and Provision of ATCs – VFR & IFR operations – Classification of ATS air spaces – Various kinds of separation – Altimeter setting procedures – Establishment, designation and identification of units providing ATS – Division of responsibility of control.

UNIT – II AIR TRAFFIC SYSTEMS 9

Area control service, assignment of cruising levels - minimum flight altitude - ATS routes and significant points – RNAV and RNP – Vertical, lateral and longitudinal separations based on time / distance –ATC clearances – Flight plans – position report

UNIT – III FLIGHT INFORMATION SYSTEMS 9

performance checks – use of radar in area and approach control services – assurance control and co-ordination between radar / non radar control – emergencies – Flight information and advisory service – Alerting service – Co-ordination and emergency procedures – Rules of the air.

UNIT – IV AERODROME DATA 9

Aerodrome data - Basic terminology – Aerodrome reference code – Aerodrome reference point – Aerodrome elevation – Aerodrome reference temperature – Instrument runway, physical Characteristics; length of primary / secondary runway – Width of runways – Minimum distance between parallel runways etc. – obstacles restriction.

UNIT – V NAVIGATION AND OTHER SERVICES 9

Visual aids for navigation Wind direction indicator – Landing direction indicator – Location and characteristics of signal area – Markings, general requirements – Various markings – Lights, general requirements – Aerodrome beacon, identification beacon – Simple approach lighting system and various lighting systems – VASI & PAPI - Visual aids for denoting obstacles; object to be marked and lighter – Emergency and other services.

TOTAL: 45 PERIODS

COURSE OUTCOMES (COs)

On completion of this course, the students expected to be able to:	
CO1	Classify the requirement of air traffic control systems and types of air traffic control system.
CO2	Explain in flight information systems and rules of air traffic systems.
CO3	Explore the emergency procedure and air rules followed by air traffic control systems.
CO4	Describe the aerodrome data.
CO5	Gain the information of navigation and emergency procedures in the air traffic control systems.

CO's – PO's & PSO's MAPPING

Correlation of COs with POs / PSOs															
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	-	-	-	-	1	1	-	-	-	-	1	2	-	-
CO2	3	-	-	-	-	1	1	-	-	-	-	1	2	-	-
CO3	3	-	-	-	-	1	-	1	-	-	-	1	2	-	-
CO4	3	-	-	-	-	1	-	-	-	-	-	1	2	-	-
CO5	3	-	-	-	-	1	1	1	-	1	-	1	2	1	-
AVG	**3**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**2**	**1**	**-**
3 – High; 2 – Medium; 1 – Low; - – No correlation,															

TEXT BOOKS

1. AIP (India) Vol. I & II, "The English Book Store", 17-1, Connaught Place, New Delhi.
2. "Aircraft Manual (India) Volume I", Latest Edition – The English Book Store, 17-1, Connaught Place, New Delhi.

REFERENCE BOOKS

1. "PANS – RAC – ICAO DOC 4444", Latest Edition, The English Book Store, 17-1, Connaught Place, New Delhi.
2. Michael S. Nolan., "Fundamentals of Air Traffic Control", Cengage Learning.
3. Wells.A-Airport Planning and Management, 4th Edition- McGraw-Hill, London-2000.

UNIT– I
BASIC CONCEPT

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Define Air Traffic Control (ATC)**.**	CO1	Remember	Low
2	What are the primary objectives of ATC?	CO1	Understand	Low
3	List the main components of the ATC system.	CO1	Remember	Low
4	Explain the term Controlled Airspace**.**	CO1	Understand	Medium
5	Differentiate between Tower Control and Area Control.	CO1	Understand	Low
6	What is a Flight Information Region (FIR)?	CO1	Understand	Low
7	Describe the purpose of a Notice to Airmen (NOTAM).	CO1	Understand	Low
8	What does Separation Minimum mean in ATC?	CO1	Understand	Low
9	Identify the role of Ground Control in ATC operations.	CO1	Analyze	Medium
10	What is the significance of Visual Flight Rules (VFR)?	CO1	Understand	Low

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Discuss the evolution of Air Traffic Control systems from their inception to modern-day practices.	CO1	Understand	Medium
2	Analyze the challenges faced by ATC in managing increasing air traffic volumes and propose potential solutions	CO1	Analyze	High
3	Explain the different classes of airspace and the corresponding ATC services provided in each.	CO1	Understand	Medium
4	Describe the process and importance of coordination between adjacent ATC units during aircraft handover	CO1	Understand	Medium
5	Evaluate the impact of technological advancements, such as ADS-B and radar systems, on ATC operations.	CO1	Evaluate	High
6	Discuss the role of human factors in ATC and strategies to mitigate human errors.	CO1	Understand	Medium
7	Analyze the procedures involved in managing emergency situations, such as aircraft hijacking or communication failure, within ATC.	CO1	Analyze	High
8	Explain the significance of standard phraseology in ATC communications and its impact on flight safety.	CO1	Understand	Medium

9	Discuss the training and certification process for air traffic controllers and the importance of continuous professional development.	CO1	Understand	Medium
10	Evaluate the role of international organizations, such as ICAO, in standardizing ATC procedures globally.	CO1	Evaluate	High

UNIT – II

AIR TRAFFIC SYSTEMS

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Define Air Traffic Control (ATC).	CO2	Remember	Low
2	What are the major components of an air traffic management (ATM) system?	CO2	Understand	Low
3	Differentiate between controlled and uncontrolled airspace.	CO2	Understand	Low
4	List any four responsibilities of an Air Traffic Controller.	CO2	Remember	Low
5	What is the function of a Flight Information Region (FIR)?	CO2	Understand	Low
6	Define the term “Separation” in air traffic management.	CO2	Remember	Low
7	What is the importance of the Instrument Landing System (ILS) in air traffic control?	CO2	Understand	Low
8	Mention two differences between primary radar and secondary radar.	CO2	Remember	Low
9	What is the role of ICAO in global air traffic systems?	CO2	Understand	Low
10	Explain the purpose of the Automatic Dependent Surveillance-Broadcast (ADS- B) system.	CO2	Understand	Medium

PART–B				
Q.No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Explain the structure and working of an air traffic control (ATC) system with a neat diagram.	CO2	Understand	Medium
2	Discuss the classification of airspace and its significance in air traffic management.	CO2	Understand	Medium
3	Illustrate the functions of different air traffic control centers, such as Tower Control, Approach Control, and Area Control.	CO2	Analyze	High
4	Describe the various methods used for air traffic separation and their importance in aviation safety.	CO2	Understand	Medium
5	Explain in detail the role of Surveillance Radar and Navigation Systems in air traffic management.	CO2	Understand	Medium
6	Compare and contrast different air navigation aids used in air traffic control.	CO2	Evaluate	High
7	Discuss the challenges in managing high-density air traffic and the possible solutions.	CO2	Understand	Medium
8	Explain the role of satellite-based navigation in modern air traffic control systems.	CO2	Understand	Medium
9	Describe the future trends and technological advancements in air traffic management.	CO2	Understand	Medium
10	Analyze the impact of air traffic congestion on airline operations and passenger safety.	CO2	Analyze	High

UNIT – III

FLIGHT INFORMATION SYSTEMS

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Define radar service.	CO3	Remember	Low
2	What is primary radar and how does it differ from secondary radar?	CO3	Understand	Low
3	List any two performance checks of a radar system.	CO3	Remember	Low
4	Explain the importance of identification procedures in radar systems.	CO3	Understand	Medium
5	State two advantages of using radar in approach control services.	CO3	Remember	Low
6	What is the role of the alerting service in aviation?	CO3	Understand	Low
7	Differentiate between area control service and approach control service.	CO3	Understand	Low
8	Mention two emergency procedures followed in radar-based air traffic control.	CO3	Remember	Low
9	How does coordination occur between radar and non-radar control?	CO3	Understand	Low
10	Define the term "Rules of the Air."	CO3	Remember	Low

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Explain the basic radar terminology and the significance of primary and secondary radar in flight control.	CO3	Understand	Medium
2	Describe the process of identification procedures using both primary and secondary radar.	CO3	Understand	Medium
3	Illustrate the performance checks required for an efficient radar system.	CO3	Analyze	High
4	Analyze the role of radar in area and approach control services with real-world examples.	CO3	Analyze	High
5	Discuss the coordination between radar and non-radar control systems and its impact on air traffic management.	CO3	Understand	Medium
6	Evaluate the importance of flight information and advisory services in air traffic control.	CO3	Evaluate	High
7	Examine the role of alerting services and emergency procedures in air traffic management.	CO3	Analyze	High
8	Compare and contrast the different rules of the air and how they ensure flight safety.	CO3	Evaluate	High
9	Design a model for an emergency response system incorporating radar and non-radar control elements.	CO3	Create	High

10	Justify the need for continuous improvements in radar-based identification and coordination systems for aviation safety.	CO3	Analyze	High

UNIT – IV
AERODROME DATA

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Define an aerodrome.	CO4	Remember	Low
2	What are the different types of aerodromes?	CO4	Understand	Low
3	List any two ICAO specifications for aerodrome design.	CO4	Remember	Low
4	What is the function of the Runway End Safety Area (RESA)?	CO4	Understand	Low
5	Differentiate between a taxiway and a runway.	CO4	Understand	Low
6	Define aerodrome reference code.	CO4	Remember	Low
7	What is the importance of obstacle limitation surfaces?	CO4	Understand	Low
8	Mention the role of an Instrument Landing System (ILS) at an aerodrome.	CO4	Remember	Low
9	Explain the term Pavement Classification Number (PCN).	CO4	Understand	Low
10	What are the main components of aerodrome lighting systems?	CO4	Understand	Low

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Explain the classification of aerodromes and their significance in air traffic management.	CO4	Understand	Medium
2	Discuss in detail the ICAO aerodrome design and operational standards.	CO4	Understand	Medium
3	Describe the various aerodrome reference codes and their applications.	CO4	Understand	Medium
4	Illustrate and explain the different runway configurations used in aerodrome planning.	CO4	Analyze	High
5	Analyze the importance of obstacle limitation surfaces in aerodrome safety.	CO4	Analyze	High
6	Explain in detail the principles of runway and taxiway design, considering ICAO recommendations.	CO4	Understand	Medium
7	Evaluate the impact of aerodrome lighting and visual aids on flight operations.	CO4	Evaluate	High
8	Compare and contrast flexible and rigid pavements used in aerodromes, highlighting their advantages and limitations.	CO4	Evaluate	High
9	Discuss the role of safety management systems in aerodrome operations and risk mitigation strategies.	CO4	Understand	Medium

10	Design an ideal aerodrome layout considering ICAO standards and safety requirements.	CO4	Create	High

UNIT – V

NAVIGATION AND OTHER SERVICES

PART–A				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Define air navigation.	CO5	Remember	Low
2	What is the purpose of GPS in aviation?	CO5	Understand	Low
3	List the different types of navigation aids (NAVAIDs).	CO5	Remember	Low
4	What is the difference between VOR and DME?	CO5	Understand	Low
5	Define Area Navigation (RNAV).	CO5	Remember	Low
6	What is the function of ILS (Instrument Landing System)?	CO5	Understand	Low
7	Differentiate between primary and secondary radar**.**	CO5	Understand	Low
8	What are the advantages of satellite-based navigation?	CO5	Understand	Low
9	Explain Automatic Dependent Surveillance-Broadcast (ADS-B) in air navigation.	CO5	Understand	Medium
10	What is Performance-Based Navigation (PBN)?	CO5	Understand	Low

PART–B				
Q. No	**Questions**	**CO Mapping**	**BT Level**	**Complexity**
1	Explain the principles of air navigation and its role in air traffic management.	CO5	Understand	Medium
2	Describe in detail the VOR (VHF Omnidirectional Range) and DME (Distance Measuring Equipment) systems with their working principles.	CO5	Understand	Medium
3	Illustrate the working of the Instrument Landing System (ILS) with a neat diagram.	CO5	Analyze	High
4	Discuss the Global Positioning System (GPS) in aviation. How does it improve air navigation?	CO5	Understand	Medium
5	Compare and contrast ground-based navigation and satellite-based navigation systems**.**	CO5	Evaluate	High
6	Explain Area Navigation (RNAV) and Performance-Based Navigation (PBN) with their applications in modern aviation.	CO5	Understand	Medium
7	How does radar assist air traffic control (ATC) operations? Explain the working principles of primary and secondary radar.	CO5	Understand	Medium
8	Describe the role of Automatic Dependent Surveillance-Broadcast (ADS-B) in modern air traffic control.	CO5	Understand	Medium

9	Discuss the future trends in air navigation and how emerging technologies are improving aviation safety.	CO5	Understand	Medium
10	Explain the concept of navigation errors and their impact on air traffic safety. How can these errors be minimized?	CO5	Understand	Medium

THANK YOU

ALL THE BEST