Bachelor of Science (B.Sc.) Aviation

SYLLABUS

OUTCOME-BASED EDUCATION BASED ON

REVISED BLOOM'S TAXONOMY

(Under Choice Based Credit System)

For the Students Admitted in the Academic Year2022-2023

DEPARTMENT OF AVIATION

BISHOP HEBER COLLEGE (Autonomous)

(Affiliated to Bharathidasan University)

(Reaccredited with 'A' Grade (CGPA – 3.58/4.0) by the NAAC & IdentifiedasCollegeofExcellencebytheUGC)

DST – FIST Sponsored College & DBT Star College

TIRUCHIRAPPALLI – 620 017
TAMIL NADU, INDIA

VISION

Our vision is to uphold and advance the standard of aviation training thereby producing graduates who can increase the safety and profitability of aviation and to make our students professional aviation personnel in global aviation industry.

MISSION

- By consistently elevate our training programs to be at per with international requirements in aviation industry.
- By inculcate professional discipline through academic experience to boost practical skills enhanced by intensive yet friendly learning environment.
- By inculcating everyday discipline and values.
- By keeping the students updated by training them in latest invention in aviation

PROGRAM OUTCOMES – B.Sc. - AVIATION

On Successful completion of the Program the under grandaunt of aviation will beableto,

KNOWLEDGE

PO1 Exhibit knowledge on difference element used together for sale conduct of flight.

PO2 Comprehend knowledge on working principles of aviation tools, instruments and equipment's.

PO3 Exhibit advanced knowledge of functions and importance of various aviation department such as meteorology department and air traffic service department in streamlined flow of airline business

SKILLS

PO4 Demonstrate skill in handling & operating various aviation tools, instruments & equipment's.

PO5 Exhibit intra and interpersonal skills including wide knowledge of Indian and international air law.

PO6 Demonstrates soft communication skill that uplifts passenger handling.

ATTITUDES

PO7 Demonstrate importance teamwork decision making and crew coordination.

ETHICAL AND SOCIAL VALUES

PO8 Practice airmanship and work together for the safety and well-being of coworker, uphold ethical and social values in personal and in work environment

PO9 Practice and exhibit time management and quick decision making thereby reducing unwanted delays as a byproduct reducing carbon emission and helping to make a green environment

PROGRAM SPECIFIC OUTCOMES Knowledge &Skills

PSO1 Advanced knowledge about the various equipment's and instruments used in and around airport.

PSO2 Interpret aviation phraseology markings, difference lightings signage used in airport and decode meteorological reports and importance coded aviation information's.

PSO3 Evaluate plan construct a flight plan, gather all necessary information and convey it to the concerned person for successful conduct of flight from departure to destination.

PSO4 Get a clear knowledge to choose their field of interest in aviation sector.

SYLLABUS

ForStudentsadmittedfrom2022-2023 BatchOnwards

BachelorofScience (B.Sc.) Aviation

SEMESTERI

Part	Course	Course Title	Course Code	Hours/ Week	Credits	Marks		
						CIA	ESE	Total
I	Language	Language	U22TM1L1			25	75	100
II	English I	Englishcommunicationskills -I	U22EGNL1			40	60	100
III	Core Paper I	Familiarization Of Airport	U21AV101	**5**	**5**	25	75	100
	Allied I	Aviation Calculation and Numerical	U21AV1Y1	5	5	25	75	100
	Allied II	Radio Telephony (Theory)	U21AV1Y2	4	4	25	75	100
CREDITS					**21**			

SEMESTERII

Part	Course	Course Title	Course Code	Hours/ Week	Credits	Marks		
						CIA	ESE	Total
I	LanguageII	Language I				25	75	100
II	English II	EnglishCommunicationSkills-I				40	60	100
III	Core Paper II	THEORY OF FLIGHT (AERODYNAMICS)	U21AV202	6	5	25	75	100
	Allied III	FAMILIARIZATION OF AIRCARFT	U21AV2Y3	5	5	25	75	100
	Allied IV	BASIC ELECRICITYAND AIRCRAFT ELECTRICAL SYSTEM	U21AV2Y4	5	4	25	75	100
	SBEC – I	AIRLINE PASSENGERHANDLING	21AV2S1	2	2	25	75	100
CREDITS					**21**			

SEMESTERIII								
Part	Course	Course Title	Course Code	Hours/ Week	Credits	Marks		
						CIA	ESE	Total
I	Language III	Language III	U18TM3L3			25	75	100
II	English III	EnglishCommunicationSkills-III	U21EGNL3			40	60	100
III	Core Paper III	Air Regulation-1	U21AV303	3	3	25	75	100
	Core Paper IV	Air Navigation	U21AV304	3	3	25	75	100
	Core Paper V	Meteorology-1	U21AV305	3	3	25	75	100
IV	Allied V	Human Factors	U21AV3Y5	2	2	25	75	100
	Core Practical I	ATC Communication and Its Units (Practical)	U21AV3P1	2	2	40	60	100
	ELECTIVE I	Piston Engines and Propellers	U21AV3:1	3	3	25	75	100
V	NMEC – I	Familiarization Of Airport	U21AV3E1	2	2	25	75	100
CREDITS					**22**			

SEMESTERIV								
Part	Course	Course Title	Corse Code	Hours/ Week	Credits	Marks		
						CIA	ESE	Total
I	Language IV	Language IV				25	75	100
II	English IV	English IV				40	60	100
III	CORE PAPER VI	Air Regulation-II	U21AV406	4	3	25	75	100
	CORE PAPER VII	Radio Aids	U21AV407	4	3	25	75	100
	Core Practical II	Practical Hangar Workshop-I	U21AV2P2	4	3	25	75	100
IV	ALLIED VI	Aero Engines	U21AV4Y6	4	3	40	60	100
	NMEC – II	Radio Telephony	U21AV4E2	2	2	25	75	100
CREDITS					**25**			

SEMESTERV								
Part	**Course**	**Course Title**	**Course Code**	**Hours/ Week**	**Credits**	**Marks**		
						CIA	**ESE**	**Total**
I	Language V	Language V				25	75	100
II	English V	English V				40	60	100
III	CORE PAPER VIII	Flight Performance and Planning	U21AV508	5	4	25	75	100
	CORE PAPER IX	Aircraft Instruments	U21AV509	5	4	25	75	100
	CORE PAPER X	Meteorology - II	U21AV510	4	4	25	75	100
	ELECTIVE II	Aircraft Systems	U21AV5:2	4	4	25	75	100
	ELECTIVE III	Civil Aviation Requirements (Car) And Safety Management systems	U21AV5:3	4	4	25	75	100
	SBEC – II	Aviation Security	U21AV5S2	2	2	25	75	100
	SBEC – III	Introduction To Aviation	U21AV5S3	2	2	25	75	100
IV	CORE PRACTICAL LAB III	Practical Hangar Workshop - II	U21AV5P3	4	3	25	75	100
CREDITS					27			

SEMESTERVI								
Part	**Course**	**Course Title**	**Course Code**	**Hours/ Week**	**Credits**	**Marks**		
						CIA	**ESE**	**Total**
I	CORE PRACTICAL IV	FLIGHT PLANNING (PRACTICAL)	U21AV6P4	6	5	25	75	100
	CORE PRACTICAL V	FLIGHT OPERATIONS (PRACTICAL)	U21AV6P5	6	5	40	60	100
II	CORE PRACTICAL VI	MAINTENANCE WORKSHOP (PRACTICAL)	U21AV6P6	6	5	25	75	100
III	CORE PRACTICAL VII	FLYING SYNTHETIC (PRACTIAL)	U21AV6P7	6	5	25	75	100
CREDITS					**24**			
Total Credits					**140**			

OTHER LANGUAGES:

	Hindi	Sanskrit	French		Hindi	Sanskrit	French
Semester I				Semester III			
Semester II				Semester IV			

Part1	
Part II	
Core Theory	
Allied	
Elective	
NMEC	
SBEC	
Env.Studies	
Extension Activities	
Value Education	
Soft Skills	
Gender Studies	
Core Project	

NMEC offered by the Department:

1. Familiarization of Airport - U21AV3E1

2. Radio Telephony - U21AV4E2

PROGRAMME ARTICULATION MATRIX - B.SC AVIATION

Course Name	Course code	Correlation with Programme outcomes and Programme specific outcomes												
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
Familiarizatio n of Airport	U21AV101	H	M	H	M	M	L	M	H	M	H	H	M	M
Allied I- Aviation Calculation and Numerical	U21AV1Y1	H	M	L	H	L	L	L	L	M	H	M	H	H
Allied II - Radio Telephony	U21AV1Y2	H	H	H	H	H	H	H	H	M	H	H	H	H
Theory of flight	U21AV202	H	H	L	H	M	L	M	M	H	H	M	M	H
Allied III- Familiarization of Aircraft	U21AV2Y3	H	H	M	H	M	L	M	M	H	H	M	H	H
Allied IV - Basic Electricity and aircraft electrical system	U21AV2Y4	M	H	M	H	M	L	L	M	L	H	L	L	M
SBEC I – Airline passenger handling	U21AV2S1	H	H	H	M	M	H	H	H	H	H	H	M	H
Air Regulation 1	U21AV303	H	L	M	L	H	L	M	M	L	L	H	H	M
Air Navigation	U21AV304	H	H	M	H	M	L	M	M	H	H	H	H	H
Meteorology 1	U21AV305	H	H	H	H	M	M	M	L	H	H	H	M	H
Core practical I – ATC communicatio n and Its Units	U21AV3P1	H	H	H	H	H	H	H	H	H	H	H	H	H
Elective 1 – Piston engine and propellers	U21AV3:1	H	H	L	H	L	L	M	M	M	H	L	M	H
Allied V – Human Factors	U21AV3Y5	L	L	M	L	H	H	H	H	H	L	L	M	L

NMEC I - Familiarization of Airport	U21AV3E1	H	M	H	M	M	L	M	H	M	H	H	M	M
Air Regulation II	U21AV406	H	L	M	L	H	L	M	M	L	L	H	H	M
Radio Aids	U21AV407	H	H	H	H	M	L	M	H	H	H	H	H	H
Core practical II – practical hanger workshop – I	U21AV4P2	M	H	M	H	M	L	M	M	M	H	H	M	H
Allied VI – Aero engine	U21AV4Y6	H	H	L	H	L	L	M	M	M	H	H	L	M
NMEC II – Radio Telephony	U21AV4E2	H	H	H	H	H	H	H	H	M	H	H	H	H
Flight performance and planning	U21AV508	M	M	M	M	L	L	H	H	M	H	H	M	H
Aircraft Instruments	U21AV509	M	H	L	H	M	L	M	M	M	H	M	L	H
Meteorology II	U21AV510	H	H	H	H	M	M	M	L	H	H	H	M	H
Elective II – Aircraft System	U21AV5:2	M	H	L	H	L	L	H	H	M	H	H	L	M
Elective III – Civil Aviation Requirements (CAR) Safety Management System	U21AV5:3	H	H	H	M	M	M	H	H	H	H	M	L	M
Core Practical III – practical Hanger workshop II	U21AV5P3	M	H	M	H	M	L	M	M	M	H	H	M	H
SBEC II – Aviation security	U21AV5S2	H	H	H	M	M	M	H	H	H	H	M	L	M
SBEC III – Introduction to Aviation	U21AV5S3	H	M	M	M	M	L	M	M	L	M	M	L	M
Core Practical IV – flight planning	U21AV6P4	H	H	H	M	H	L	L	M	H	H	H	H	H
Core practical V – Flight operations	U21AV6P5	H	M	H	M	H	L	M	M	H	M	H	H	M

Core practical VI – Maintenance workshop	U21AV6P6	M	H	L	H	L	L	M	M	M	H	M	L	H
Core practical VII – Flying Synthetic	U21AV6P7	H	H	L	H	H	L	H	H	H	H	H	H	M

SEMESTER–I

S.NO	Course Title	Course Code
1.	Language I	
2.	EnglishCommunicationSkills-I	
3.	FAMILIARIZATION OF AIRPORT	U21AV101
4.	AVIATION CALCULATION AND NUMERICAL	U21AV1Y1
5.	RADIO TELEPHONY (THEORY)	U21AV1Y2

COURE PAPER- 1 FAMILIARIZATION OF AIRPORT

SEMESTER: I **CODE: U21AV101**

TOTAL HOURS: 5 **CREDITS: 5**

COURSE OUTCOMES:

On Completion of this course, the student will be able to,

S. No	Course Outcomes	Level	Unit Covered
1	Explain the different areas in airport and its functions	K2	I
2	Interpret the meaning of markings and lightings in airport	K2	II
3	Categorize the different navigation and communication equipment used in Airport	K4	III
4	Compare the different Air Traffic Control Unit and its functions	K4	IV
5	Outline the different Important organization for safe and efficient conduct of flight	K2	V
6	Explain the basic about RADAR principle	K2	III

COURSE OBJECTIVE:

To acquire basic understanding of the layout at airport its building facilities installation and their functioning.

COURSE CONTENT:

UNIT 1: BUILDINGS & INSTALLATIONS

Basic definitions and understanding of Terminals, Security, Apron, Hangar, Taxiway, Runway, Fire Station, Airport Vehicles, Fuel depot. Regulations related to each of airport services. Purpose hanger, apron, aircraft stand, taxiway and runway.

UNIT 2: MARKINGS& LIGHTINGS

Difference between markings, Lightings and Signboards, Apron markings- aerobridge movement area markings, stand lead in line, Apron edge marking, Aircraft stand identification marking, Taxiway centerline and edge marking & lighting, Runway centerline and edge line marking & lighting, Threshold, aiming point, touch down zone marking & lighting Declared distances, PCN, Lighting system, Aerodrome Beacon, Obstacle Lighting & Marking. Location, Direction & Destination signboard.

UNIT 3: FACILITIES&EQUIPMENT'S

Basic understanding of Navigational facilities. Basic radio principle, frequency used and introduction about various navigational equipment's VOR, NDB/ADF, DME; Basic radar principle, Primary and secondary radar, Surveillance equipment's: Primary Radar, SSR, Surface Movement Radar, ADS; GPS, VHF antennae, ILS

UNIT 4: AIR TRAFFIC CONTROL

Different Air Traffic Control Units, Concept of Flight Information Region, Role of Flight Information Centre, five different Flight information region in India, Roles and responsibilities of Various air traffic control units- Ground control, Tower, Approach, Area control, Flight Plan briefing and filling, Flight Dispatch, ATC briefing

UNIT 5: IMPORTANT ORGANIZATIONS

Roles and Responsibility of International Air Transport Association (IATA), International Civil Aviation Organization (ICAO), Director General Civil Aviation (DGCA), Airport Authority of India (AAI)& its wings, Ministry of Civil Aviation, Bureau of Civil Aviation Security, Central Industrial Security Force. Important convention with these organization

FOR SELF STUDY

S. No	Topics	Web Links
1	Airport Marking Aids and Signs	https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap2_section_3.html
2	Air traffic control position	https://mediawiki.ivao.aero/index.php?title=Air_traffic_control_position
3	Important Aviation organization	https://www.civilaviation.gov.in/en/aboutus/orgsetup

REFERENCE BOOKS

1. ICAO Annex 14 Volume 1 Aerodrome Design and Operations
2. Civil Aviation Requirements Section-4, Aerodrome Standards & Air Traffic Services.
3. R.K. Bali Air Regulations.
4. Airport council international (Second Edition)

LEARNING OUTCOMES:

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Buildings & Installations**		
1.1	Basic definitions and understanding of Terminals, Apron, Hangar, Taxiway, Runway, Fire Station, Airport Vehicles, Fuel depot	Explain the definitions of Terminals, Security, Apron, Hangar, Taxiway, Runway, Fire Station, Airport Vehicles, Fuel depot	**K2**
1.2	Regulations related to each of airport services	Identify the relevant air regulations related to a particular airport service	**K3**
1.3	Purpose hanger, apron, aircraft stand, taxiway and runway	Analyse the work done in a particular area in an airport	**K4**
II	**Markings & Lightings**		
2.1.0	Difference between markings, Lightings and Signboards	Distinguish the purpose of marking, lighting and signage	**K4**
2.1.1	Apron markings- movement area markings, stand lead in line, Apron edge marking, Aircraft stand identification marking, Taxiway centreline and edge marking & lighting, Runway marking & lighting	Interpret apron, Taxiway, Runway marling and lightings	**K2**
2.1.2	Declared distances	Identify the different declared distances	**K3**
2.1.3	PCN	Solve PCN calculations	**K3**
2.1.4	Lighting system, Aerodrome Beacon, Obstacle Lighting & Marking.	Distinguish different lights used in and around airport	**K4**
2.1.5	Location, Direction & Destination signboard.	Interpret the meaning of different sign board	**K2**
III	**Facilities &Equipment's**		
3.1.0	Basic understanding of Navigational facilities	Outline the purpose and uses of navigation facilities	**K2**
3.1.1	Basic radio principle	Explain the basic principle of radio aids	**K2**

3.1.2	Frequency used	Choose the appropriate Radio frequency	**K5**
3.1.3	introduction about various navigational equipment VOR, NDB/ADF, DME	Explain the functions of various Navigation Equipment's	**K2**
3.1.4	Basic radar principle	Summarize the basic Principle of RADAR	**K2**
3.1.5	Primary and secondary radar	List out the principle, advantages and disadvantages of primary and secondary RADAR	**K4**
3.1.6	SSR, Surface Movement Radar, ADS; GPS, VHF antennae, ILS	Make use of different Navigation Instrument for safe and efficient conduct of flight	**K3**
IV	**Air Traffic Control**		
4.1.0	Different Air Traffic Control Units	Compare the different air traffic control unit	**K4**
4.1.1	Concept of FIR	List out the boundaries and functions of FIR	**K4**
4.1.2	Role of FIC	Identify a particular FIC to obtain Information service	**K3**
4.1.3	Five different Flight information region in India	Identify a particular region comes under which FIR	**K3**
4.1.4	Roles and responsibilities of Various air traffic control units- Ground control, Tower, Approach, Area control	List out the roles and responsibilities of various ATC control unit	**K3**
4.1.5	Flight Plan briefing and filling	Built a fully filled flight plan	**K3**
4.1.6	Flight Dispatch	Explain the functions of flight Dispatch	**K2**
4.1.7	ATC briefing	Interpret ATC briefing	**K2**
V	**Important Organizations**		
5.1.0	Roles and Responsibility of International Air Transport Association (IATA)	List out the Roles and Responsibilities of IATA	**K4**
5.1.1	International Civil Aviation Organization (ICAO)	Explain the various functions of ICAO	**K2**
5.1.2	DGCA	Categorize the roles and functions of DGCA	**K4**
5.1.3	AAI and its wings	Explain the functions of AAI and its Units	**K2**

5.1.4	Ministry of Civil Aviation	Outline the functions of civil Aviation ministry	**K2**
5.1.5	BCAS	Analyse how security is maintained in Aviation	**K4**
5.1.6	CISF	Summarize the function of CISF under the guidance of BCAS	**K2**
5.1.7	Important convention with these organization	List out the important convention made by the important organization	**K4**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	M	-	-	-	-	L	L	-	M	-	-	H
CO2	L	H	M	-	-	-	-	-	-	M	H	-	M
CO3	M	H	H	M	-	L	M	H	H	H	L	M	-
CO4	H	M	H	M	L	M	H	H	H	L	-	L	M
CO5	L	-	H	L	H	H	H	M	H	-	-	L	H
CO6	-	H	M	L	-	-	M	M	M	M	-	L	L

COURSEASSESSMENTMETHODS:

Direct
1. Continuous Assessment Test I, II **2. Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

ALLIED – 1: INTRODUCTION TO AVIATION CALCULATION AND NUMERICALS

SEMESTER: I **CODE: U21AV1Y1**

TOTAL HOURS: 5 **CREDITS: 5**

COURSE OUTCOMES:

On Completion of this course, the student will be able to,

T. No	Course Outcomes	Level	Unit Covered
1	Construct and analyzing graphs of Trigonometric functions and their inverse	K4	I
2	Distinguish the different metric units and understand how to convert from one metric unit to another	K2	II
3	Demonstrate the ability to use the Compass rose to indicate directions, create and use map symbols	K2	III
4	Basic understanding of calculating speed, distance, time, Rate of climb (ROC), Rate of descent (ROD)	K4	IV
5	Explanation about fuel and Time management	K3	V
6	Develop a basic fuel management to track all aspects of fuel consumption	K1	V

COURSE OBJECTIVE:

To understand the importance of various calculation and the implementation of the same in aviation industry.

COURSE CONTENT:

UNIT 1: BASIC TRIGONOMETRY & PYTHAGORAS THEOREM

Revision of trigonometric Ratios and Pythagoras theorem and their applications, Revision of Mathematical calculations, BODMAS Rule, Algebra calculations, Percentage calculation.

UNIT 2: CONVERSIONS

Conversions between units, Basic definitions of Kilometer, Statute mile, Nautical Mile, feet, meter and conversion between each other. Temperature Conversions, Kelvin to Celsius, Celsius to Kelvin, Fahrenheit to Celsius and its importance in aviation and their applications

UNIT 3: COMPASS

Basic understanding of Compass it's working Principle, Basic understanding about magnetism, Earth magnetism, Understanding Compass errors- Variation and deviation, Calculating Aircraft direction, Relative heading, True Heading magnetic heading, compass heading and Heading Calculation

UNIT4: RELATIVE MOTION AND VERTICAL SPEED

Calculation of Speed in relation to speed, distance, time. Calculating Estimated Time of Arrival (ETA), Estimated Time of Departure (ETD), Estimated Elapsed Time (EET), Calculating Endurance and Still Air Range (SAR)

Calculation of Rate of Climb (ROC), Rate of Descent (ROD)& selection of Altitude according to the flight path, Top of Climb (TOC)&Top of Descent (TOD), its understanding and Implementation.

UNIT 5: TIME CALCULATION AND FUEL CALCULATION

Understanding Coordinated Universal Time (UTC), Calculation of LMT at any given place, longitude, latitude, meridians, Standard meridian, rhumb line, Indian Standard Time(IST), Difference in longitude, Difference in latitude. Calculating IST and LMT from GMT. Selection of alternate aerodrome, Different alternate, Take off alternate, Enroute Alternate, Destination Alternate, Fuel calculation for the flight, minimum fuel requirement and payload.

TOPICS FOR SELF STUDY:

S. No	Topics	Web Links
1	Study about Algebraic equation	**https://en.m.wikipedia.org/wiki/Algebraic_equation**
2	Study about CDMVT and wind corrections	**https://youtu.be/-HIx7i5eEwQ**
3	Study about importance of fuel cost index in aviation	**https://youtu.be/6GBf1keuwhY**

REFERENCE BOOKS:

1. Aviation's Mathematics, Oxford Publications
2. Oxford General navigation.
3. Ground Studies for Pilots (General Navigation)
4. General navigation by R.K. Bali

LEARNING OUTCOMES:

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Basic Trigonometry & Pythagoras theorem**		
1.1	Trigonometric Ratios	To find the measure of an angle of a right triangle	**K2**
1.2	Pythagoras theorem	Learn to use the Pythagoras Theorem to identify right triangles.	**K2**
1.3	BODMAS Rule	How to break down a calculation using the order of operations	**K3**
1.4	Algebra calculation	Be able to read and write expressions, and to be skilled in computations and manipulations of algebraic expressions	**K5**
1.5	Percentage calculation	Convert the percentage into a decimal. convert the percentage into a fraction	**K4**
II	**Conversions**		
2.1	Conversions between units	Identify the metric system, Know the basic prefixes associated with metric units and understand how to convert from one metric unit to another	**K4**
2.2	Basic definitions of Kilometre, Statute mile, Nautical Mile, feet, metre and conversion between each other	Understand the basic units for distance calculations and how to convert the units	**K5**
2.3	Temperature Conversions and its importance in aviation	Definition of different types of Temperature Measurement	**K3**
2.4	Conversion of Kelvin to Celsius, Celsius to Kelvin, Fahrenheit to Celsius	Calculations of Temperature Conversions from one unit to another	**K2**
III	**Compass**		
3.1	Basic understanding of Compass it's working Principle	Explained the Compass and its working in detail	**K3**
3.2	Basic understanding about magnetism	Basic law of magnetism	**K2**

3.3	Earth magnetism	Understand the earth magnetic field determine the location of a magnet's poles.	**K2**
3.4	Understanding Compass errors	How Compass errors affect the Compass readings and make difference for flying aircraft	**K1**
3.5	Variation and deviation	Define and calculate the Compass Errors	**K2**
3.6	Calculating Aircraft direction	Understand the directions and bearing	**K1**
3.7	Relative heading	Calculations for finding Aircraft Relative bearing in relation to station	**K4**
3.8	True Heading magnetic heading, compass heading	Different types of Norths and Calculation of their respective headings	**K1**
IV	**Relative Motion and Vertical Speed**		
4.1	Calculation of Speed in relation to speed, distance, time	Basic calculations of speed, distance and time	**K6**
4.2	Calculating Estimated Time of Arrival (ETA), Estimated Time of Departure (ETD), Estimated Elapsed Time (EET)	Understanding the Calculations of Estimated Time for different phases of Flight	**K3**
4.3	Calculating Endurance and Still Air Range (SAR)	Basic calculations of time and range	**K3**
4.4	Calculation of Rate of Climb (ROC)	Analyse the fastest and steepest climbing Rate	**K3**
4.5	Calculation of Rage of descent (ROD)	Calculate at what rate aircraft can descent with time	**K3**
4.6	Selection of Altitude according to the flight path	Understanding optimal cruising altitude range that is the best trade-off of speed and fuel efficiency	**K3**
4.7	Top Of Climb (TOC) &Top of Descent (TOD)	Calculations of TOC & TOD	**K3**

V	Time Calculation and Fuel Calculation		
5.1	Understanding Coordinated Universal Time (UTC)	Basic time standard used in aviation	**K3**
5.2	Definition of Longitude, latitude, meridians, Standard meridian	Understanding the geographic coordinate system of earth spheroid	**K6**
5.3	Rhumb lines	To compare the lengths of different paths connecting two points on the Earth's surface.	**K6**
5.4	Difference in longitude and Difference in latitude	Calculate the Delta and DeLong of different positions	**K6**
5.5	Calculating IST and LMT from GMT	Conversions of different time zones	**K6**
5.6	Selection of alternate aerodrome	Importance of Alternate aerodrome	**K3**
5.7	Different alternate, Take off alternate, Enroute Alternate, Destination Alternate, Fuel calculation for the flight plan	Fuel calculations for different phases of Flight path	**K5**
5.8	Minimum fuel requirement and payload	Detailed information of payload	**K6**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	L	L	-	-	-	-	-	-	-	-	-	H	-
CO2	L	M	L	L	-	-	-	-	-	-	-	M	-
CO3	M	H	M	M	L	L	L	-	-	H	-	L	-
CO4	L	-	-	L	-	-	L	-	-	-	-	L	L
CO5	H	L	-	L	-	L	L	L	M	-	L	M	-
CO6	M	L	-	-	-	-	-	L	-	-	-	M	-

COURSE ASSESSMENT METHODS:

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

ALLIED-II RADIO TELEPHONY (THEORY)

SEMESTER: I **CODE: U21AV1Y2**

TOTAL HOURS: 4 **CREDITS: 4**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Explain the duties of different bodies in aviation and the rules made by them.	**K2**	I
2	Outlines the modes of radio propagation and its application.	**K2**	II
3	Interprets the appropriate phraseology as per the situations.	**K5**	III
4	Assess the pressure value and appropriate solves the Q – codes problems associated with Px difference	**K5**	IV
5	Analyze basic commercial between aircrafts ATC & Aircraft	**K4**	V
6	Gain the knowledge about ATC to aircraft cockpit radio communication.	**K4**	V

COURSE OBJECTIVE:

Understand Various Aviation Terminologies Standard Universal Communication Procedures Followed by Different Department of Aviation.

CONTENT:

UNIT 1: REGULATIONS

Duties of International Telecommunication Union (ITU), International Civil Aviation Organization (ICAO), Airport Authority of India (AAI), Wireless Planning and Coordinating Wing (WPC), ICAO Annexure, Spelling of Alphabets and Transmission of numerical, Aircraft Identification, Location Indicators, Flight Information Regions (FIR), Identification of Ground Services.

UNIT 2: RADIO PROPAGATION

- Relationship between wavelength, frequency and speed of light
- Frequency bands and ranges
- Ionosphere layers during day and night
- Mode of Propagation MF, HF and VHF & above
- Operation of Geostationary Satellites
- Operation of Polar orbiting Satellites
- Skip Distance
- Choice of Frequencies during Day & Night

UNIT 3: PHRASEOLOGY

Phraseology used in Aeronautical Communication Services; Abbreviations used in Aeronautical Communication Services.

- Distress
- Distress Relay
- Direction Finding
- Flight Safety
- Metrological Information
- Flight regulatory

UNIT 4: 'Q' CODES

' Q' Codes used in Aeronautical Communication Services, Basic Understanding of atmospheric pressure, QNH, QFE, QFF, QNE, Understanding difference between Height, Elevation, Altitude and Flight Level, QDR, QDM, QUJ, QTE, Relative bearing, Radial, Magnetic Heading, Compass Heading, True Heading, Variation & Deviation

UNIT 5: COMMUNICATION

Introduction to radio call format, Radio strength check call, Startup clearance and pushback clearance call, Taxi clearance call, ATC clearance call.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Regulations ICAO, AAI, WPC ICAO	https://www.aai.aero
2	Phraseology	https://www.phraseexpress.com
3	'Q' Codes, Communication	https://en.wikipedia.org

REFERENCE BOOKS

1. Radio telephony, K.D. Tuli
2. Radio telephony manual by R.K. Bali
3. Air Regulation by R.K Bali

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Regulations**		
1.1	Duties of ITU	Analysis's duties of ITU	**K4**
1.2	ICAO	Develops and understanding of their rules & regulation	**K3**
1.3	AAI	Develops and understanding of their rules & regulation	**K3**
1.4	WPC	Develops and understanding of their rules & regulation	**K3**
1.5	ICAO annexure	Classifies contents of difference annexure	**K2**
1.6	Spelling of alphabets & transmission of numerical	Demonstrates the pronunciation of alphabet & numerical	**K2**
1.7	Aircraft ident	Interprets basic ident	**K2**
1.8	Location indicators	Interprets basic ident	**K2**
1.9	FIR	Analyses difference FIR & ground services	**K4**
1.10	Identification of ground services	Analyses difference FIR & ground services	**K4**
II	**Radio Propagation**		
2.1	wavelength, frequency and speed of light	Analyses the relationship between wavelength, frequency, & speed of light	**K4**
2.2	Frequency bands and ranges	Compares the bonds & ranges	**K2**
2.3	Ionosphere layers	Explains the ionosphere layer during day & night	**K2**
2.4	Mode of Propagation	Compares MF, HF, VHF & above	**K4**
2.5	Operation of Geostationary Satellites	Analyses the OPS of geostationary	**K4**
2.6	Polar orbiting Satellites	Analyses the OPS of polar	**K4**
2.7	Skip Distance	Explain about skip distance	**K2**

2.8	Frequencies during Day & Night	Summarizes about the frequency used at night	**K2**
III	**Phraseology**		
3.1.0	Phraseology abbreviations	Choose appropriate phrases	**K3**
3.1.1	Aeronautical Communication Services.	Outlines the type of call to be given during emergency	**K2**
3.1.2	Distress Distress Relay	Explains about type of commercial during RCF unable for each ATC	**K2**
3.1.3	Direction Finding	Identifies the methods of direction finding from station	**K2**
3.1.4	Flight Safety	Examines the safety on board	**K4**
3.1.5	Metrological Information	Analyses met condition	**K4**
3.1.6	Flight regulatory	Develops basic regulation & rules of fit	**K3**
IV	**'Q' Codes**		
4.1.0	Q- Codes	Illustrates the difference types of Q codes	**K2**
4.1.1	atmospheric pressure	Understanding of atmospheric pressure	**K2**
4.1.2	Height, Elevation, Flight Level, Altitude	Classifies the difference between Altitude Elevation, Height, Flight Level	**K4**
4.1.3	QDR, QDM, QUJ, QTE	Classifies the variation of QDR, QDM, QUJ, QTE	**K4**
4.1.4	Relative bearing, Radial, Magnetic Heading, Compass Heading, True Heading, Variation & Deviation	What the Relative bearing, Radial, Magnetic Heading, Compass Heading, True Heading, Variation & Deviation	**K3**
V	**Communication**		
5.1.0	Intro to radio call format	Explains basic RT	**K2**
5.1.1	Radio strength check	Demonstrates how to check quality of call	**K3**

5.1.2	S/UP clearance	Outlines the type of call for S/U & pushback based on aircraft cat	**K2**
5.1.3	P/B clearance	Outlines the type of call for S/U & pushback based on aircraft cat	**K2**
5.1.4	Taxi clearance	Explains RT call	**K2**
5.1.5	ATC clearance	Explains RT call	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMME SPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M		H	L	M	L	-	-	-	-	-	L	M
CO2	M	L	L	L	L	L	L	-	-	L	-	-	L
CO3	-	-	-	-	L	M	M	-	-	-	L	L	-
CO4	M	M	M	M	-	-	-	-	-	M	L	L	-
CO5	M	L	M	L	L	M	M	M	M	L	-	L	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

SEMESTERII

S. No	Course Title	Course Code
1.	LanguageII	
2.	EnglishCommunicationSkills-II	
3.	THEORY OF FLIGHT (AERODYNAMICS)	U21AV202
4	Familiarization Of Aircraft	U21AV2Y3
5	Basic Electricity and Aircraft Electrical System	U21AV2Y4
6	Airline Passenger Handling	U21AV2S1

CORE PAPER II: THEORY OF FLIGHT (AERODYNAMICS)

SEMESTER: II **CODE: U21AV202**

TOTAL HOURS: 6 **CREDITS: 5**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Basic understanding of airflow around the airframe	**K1**	I
2	To understand the aircraft flight controls	**K3**	II
3	To learn about aircraft stability and its controllability	**K3**	III
4	To learn about aircraft ability and dynamics	**K4**	IV
5	To learn about aircraft stability and dynamics	**K4**	IV
6	To understand basic knowledge of subsonic flight and supersonic	**K1**	V

COURSE OBJECTIVE:

Under The Principles of Flying Application at Theory Is Subsonic and Transonic Operation

COURSE CONTENT:

UNIT 1: AERODYNAMICS

Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, up wash and downwash, vortices, stagnation; The terms: camber, chord mean aerodynamic chord, aerodynamic center, center of pressure, stagnation point, profile (parasite) drag, induced drag, wash in and wash out, fineness ratio, wing shape and aspect ratio; Thrust, Weight, Aerodynamic Resultant; Generation of Life and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall.

UNIT 2: AERODYNAMICS AND FLIGHT CONTROLS.

Operation and effect of: roll control: ailerons and spoilers pitch control: elevators, stabilators, variable incidence stabilizers and canards; yaw control, rudder limiters; Control using elevons, rudder, elevators; High lift devices, slots, slats, flaps, flaperons; Drag inducing devices, spoilers, lift dumpers, speed brakes; Effects of wing fences, saw tooth leading edges; Boundary layer control using, vortex generators, stall wedges or leading-edge devices; Operation and effect of trim tabs, balance and anti-balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels; Pressure measuring devices and systems

UNIT 3: THEORY OF FLIGHT

Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: Stall, flight envelope and structural limitations; Lift augmentation.

UNIT 4: FLIGHT STABILITY AND DYNAMICS.

Definition of Stability, Different type of Stability- Static stability, Dynamic Stability, Positive, Neutral and Negative stability, Longitudinal, lateral, and directional stability, Explanation of Controllability, Relationship between stability and Controllability

UNIT 5: HIGH SPEED FLIGHT

Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number, compressibility effect, buffet, shock wave, aerodynamic heating, Factors affecting airflow in engine intakes of high-speed aircraft; Effects of sweepback on critical Mach number.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Aerodynamics & flight controls	**https://en.wikipedia.org**
2	Theory of flight	**https://web.mit.edu**
3	High speed flight	**https://en.wikipedia.org**

REFERENCE BOOKS

1. Oxford – Principles of flight
2. The professional pilot study guide 01series by mike burton

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Aerodynamics**		
1.1	Airflow around a body	Define Boundary layer, laminar and turbulent flow, free stream flow, relative airflow	**K1**
1.2	The terms	Define camber, chord mean aerodynamic chord, aerodynamic canter	**K4**
1.3	pressure	centre of pressure, stagnation point, profile (parasite) drags, induced drag, wash in and wash out	**K2**
1.4	ratio	incenses ratio, wing shape and aspect ratio	**K1**
1.5	Aerodynamic Resultant	Thrust, Weight, Life and Drag	**K2**
1.6	Life and drag	Lift coefficient, Drag coefficient, polar curve, stall Angle of Attack	**K3**
II	**Aerodynamics and Flight Controls.**		
2.1	Operation and effect	roll control pitch control yaw control	**K2**
2.2	Flight Controls	Working principal of elevons, rudder, elevators	**K2**
2.3	Effects of wing fences	Explain effects of wing fences, saw tooth leading edges	**K2**
2.4	Operation and effect of trim tabs	Define trim tabs, balance and anti-balance spring tabs, mass balance	**K1**
2.5	aerodynamic balance panels	Explain Pressure measuring devices and systems	**K4**
III	**Theory of Flight**		
3.1.0	lift, weight, thrust drag	Relationship between lift, weight, thrust and drag	**K2**
3.1.1	Glide ratio	Steady state flights, performance	**K3**
3.1.2	Theory of the turn	Explain Influence of load factor	**K3**
3.1.3	Influence of load factor	Stall, flight envelope and structural limitations;	**K2**
3.1.4	Lift.	What is Lift augmentation.	**K1**

IV	**Flight Stability and Dynamics.**		
4.1.0	Stability	Definition of Stability	**K1**
4.1.1	type of Stability	Static stability, Dynamic Stability	**K2**
4.1.2	types of Stability	Positive, Neutral and Negative stability, Longitudinal, lateral, and directional stability	**K2**
4.1.3	Controllability	Explain of Controllability	**K3**
4.1.4	stability and Controllability	Relationship between stability and Controllability	**K2**
V	**High Speed Flight**		
5.1.0	Speed of sound	Define Speed of sound	**K3**
5.1.1	Types of flight,	subsonic flight, transonic flight, supersonic flight	**K2**
5.1.2	Mach number	Define Mach number, critical Mach number	**K1**
5.1.3	compressibility effect	buffet, shock wave, aerodynamic heating	**K1**
5.1.4	Factors affecting	Factors affecting airflow in engine intakes of high-speed	**K3**
5.1.5	sweepback	Effects of sweepback on critical Mach number.	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	L	M	-	-	-	-	L	-	-	-	L	-	-
CO2	M		H	-	H	-	L	-	-	M	-	-	-
CO3	L	L	-	L	-	-	-	L	-	M	L	-	-
CO4	L	-	L	-	-	L	-	L	L	-	L	-	-
CO5	M	L	-	L	-	-	-	-	L	L	L	M	-
CO6	L	L	L	-	-	-	-	-	L	L	L	-	-

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

ALLIED III: FAMILIARIZATION OF AIRCARFT

SEMESTER: II **CODE: U21AV2Y3**

TOTAL HOURS: 5 **CREDITS: 5**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Understanding basic fluid mechanisms	**K2**	I
2	To understand the basic components of aircraft airframe	**K2**	II
3	To be familiar with aircraft controls	**K4**	III
4	To know the various purposes of landing gear	**K2**	III
5	Able to understand the basic working principles of aircraft engines. (piston)	**K1**	IV
6	Able to understand the basic working principles of aircraft engines. (piston)	**K1**	V

COURSE OBJECTIVE:

To know the various system and their utilization / involvement in a aircraft.

COURSE CONTENT:

UNIT1: UNDERSTANDINGOF BASIC MECHANICS, THERMODYNAMICS AND FLUID MECHANICS

Speed, Velocity, Newton's laws of motion, Friction, Centre of Mass, Centre of Gravity, Torque, Work, Energy, Power, Pressure, Stress, Elasticity of Material, Principle of the Gyroscope;

Laws of Thermodynamics, Heat Transfer, Specific Heat, Calorific values of fuels; Viscosity, Fluid Resistance, Specific Gravity, Absolute and relative humidity, Pascal's law &its application in Hydraulic press, Hydraulic and Pneumatic system, Bernoulli's Theorem, Venturi's tube theory, Streamline, Laminar and turbulent flow.

UNIT 2: AIRFRAME & SYSTEMS

Types of Fuselages, Load transfer technique, Various Wing Structures- Rectangular, Elliptical, swept back, swept forward, Anhedral, Dihedral; Definition of Control Surfaces, Primary control surface, Secondary control Surface, Working of Aileron, Elevator, Rudder, Flaperons; Airframe, fuel system, Cooling System

UNIT 3: LANDING GEAR, WHEEL BRAKES

Purpose of landing gear, Types of Landing Gear- Retractable and Non-Retractable landing gear, Tri cycle type, Tail Dragger Landing Gear, Main Landing Gears and different types of Shock Strut- Rigid struts, Spring Steel Struts, Bungee cords, Shock struts, oleo struts; Brake System.

UNIT 4: AIRCRAFT ENGINE (PISTON)

Basic understanding of Piston engine components: Crankcase, Crankshaft, Camshaft, Bearings, Connecting Rod, Piston, Piston Rings, Four-Stroke engine cycle, carburetor, Engine Handling, normally aspirated, Turbo charging, Supercharging.

UNIT5: AIRCRAFT ENGINE (JET)

Basic understanding of Jet engines, Propeller, Parts of Propeller, Difference between jet engine and piston engine, Types of Compressors: Axial, Centrifugal, Fuel injection, Types of Combustion Chambers, gas turbine engine.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	**Basic Mechanics, Thermodynamics and Fluid Mechanics**	**https://iubtgedu.org.com**
2	**Airframe & systems**	https://www.aircraftsystemstech.com
3	**Aircraft Engine**	https://www.sciencedirect.com

Reference Books

1. Oxford – Aircraft General Knowledge 1(Airframe and systems)
2. Oxford – Aircraft General Knowledge 3(powerplant)
3. Aero plane Technical by Trevor Thom

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Understanding of Basic Mechanics, Thermodynamics and Fluid Mechanics**		
1.1	Speed, Velocity	What is Speed, Velocity	**K1**
1.2	Newton's laws of motion	Explain Newton's laws of motion	**K3**
1.3	Centre of Mass Centre of Gravity	Comparisons of Centre of Mass Centre of Gravity	**K2**
1.4	Torque, Work, Energy, Power, Pressure, Stress, Elasticity of Material	Define	**K1**
1.5	Principle of the Gyroscope	Explain the working	**K3**
1.6	Laws of Thermodynamics	Define	**K3**
1.7	Heat Transfer, Specific Heat	What	**K1**
1.8	values of fuels; Viscosity, Fluid Resistance, Specific Gravity	What	**K2**
1.9	Pascal's law & its application	Hydraulic press, Hydraulic and Pneumatic system	**K3**
1.10	Bernoulli's Theorem	Explain	**K3**
1.11	Venturi's tube theory	Define	**K2**
1.12	Laminar and turbulent flow. Streamline,	Compare	**K2**
II	**Airframe & systems**		
2.1	Types of Fuselages	Load transfer technique in Fuselages	**K1**
2.2	Various Wing Structures	Rectangular, Elliptical, Swept back, Swept forward, Anhedral, Dihedral	**K2**
2.3	Control Surfaces	Primary control surface, Secondary control Surface	**K1**
2.4	Aileron, Elevator, Rudder	Working Of Aileron, Elevator, Rudder	**K2**
2.5	fuel system	What is Fuel system	**K1**

2.6	Cooling System	Define Cooling System	**K1**
III	**Landing Gear, Wheel brakes**		
3.1.0	Types of Landing Gear	Retractable and Non-Retractable landing gear	**K2**
3.1.1	landing gear	Purpose of landing gear	**K1**
3.1.2	Types of Landing Gear	Tri cycle type	**K2**
.1.3	Types of Landing Gear	Tail Dragger Landing Gear, Main Landing Gears	**K4**
3.1.4	Shock Strut	Define Shock Strut	**K1**
3.1.5	types of Shock Strut	Rigid struts, Spring Steel Struts	**K2**
3.1.6	Brake System	Define Brake System	**K1**
IV	**Aircraft Engine (Piston)**		
4.1.0	Basic Piston engine components:	Crankcase, Crankshaft, Camshaft, Bearings, Connecting Rod, Piston, Piston Rings	**K2**
4.1.1	Four-Stroke engine	Explain Four-Stroke engine	**K4**
4.1.2	Engine components	Define engine Handling	**K4**
	charging	Compare Turbo charging, Supercharging	**K1**
V	**Aircraft Engine (Jet)**		
5.1.0	Basic Jet engines	Propeller, Parts of Propeller	**K2**
5.1.1	Comparisons of Jet engines, piston engine	Difference between Jet engines, piston engine	**K2**
5.1.2	Types of Compressors	Compare Axial, Centrifugal	**K2**
5.1.3	Fuel injection	Define Fuel injection	**K1**
5.1.4	Types of Combustion Chambers	Types of Combustion Chambers	**K2**
5.1.5	gas turbine engine	What is gas turbine engine	**K1**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	H	M	L	M	-	-	L	L	L	H	L	L	L
CO2	M	M	L	M	-	-	-	L	-	M	L	-	L
CO3	H	H	M	M	-	-	L	-	-	H	L	L	L
CO4	H	H	M	M	-	-	-	L	L	H	M	L	M
CO5	H	H	M	M	-	L	L	L	L	H	M	M	H
CO6	H	H	M	M	-	-	-	L	M	H	M	-	-

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

ALLIED IV: BASIC ELECRICITYAND AIRCRAFT ELECTRICAL SYSTEM

SEMESTER: II **CODE: U21AV2Y4**

TOTAL HOURS: 5 **CREDITS: 4**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	To understand structure and distribution of electrical charges within atoms molecules ions compounds	**K3**	I
2	To understand about the behavior of charge in various states of matter i.e., solid liquid gas and vacuum	**K2**	II
3	To learn about the following terms their units and factors affecting them potential difference electromotive force conventional current flow electron flow	**K4**	III
4	To learn about the laws used for studying static charges	**K3**	IV
5	To learn about various laws and its application ohms law Kirchhoff's voltage and current laws	**K3**	V
6	Calculation using the above laws to find resistance voltage and current	**K5**	V

COURSE OBJECTIVE:

To understand the theory concepts and working of ac and dc circuit.

COURSE CONTENT:

UNIT 1: STATIC ELECTRICITY AND CONDUCTION

Distribution of electrostatic charges; Unit of charge; Polarity of a charge; Electric Field of Static Charge; Electrostatic laws of attraction and repulsion- Coulomb's Law; Electrostatic induction; Conduction of electricity through Solid, liquid and gas.

UNIT 2: ELECTRICAL TERMINOLOGIES

The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, Power, Work, conventional current flow, electron flow, Sources of Electricity, Meters used for measurement; Direct Current and Alternating Current.

UNIT 3: RESISTANCE/RESISTOR

Ohm's law, Resistors in series and parallel; Calculation of total resistance using series, parallel and series parallel combinations; Conductance in series and parallel; Open and short circuits; Operation of Wheatstone Bridge. Fixed resistors, Variable resistors, stability, tolerance and limitations, methods of construction; Construction and operation of potentiometers and rheostats.

UNIT 4: DC CIRCUITS AND CIRCUIT PROTECTION

Electric circuit terminologies; Kirchhoff's Voltage and Current Laws; Calculations using the above laws to find resistance, voltage and currents; Significance of the internal resistance of a supply; Electrical faults; Circuit protection devices.

UNIT 5: AC THEORIES AND AIRCRAFT ELECTRICAL SYSTEM

Capacitance; Inductance; Electromagnetic induction; Sinusoidal waveform: phase, period, frequency, cycle; Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, Single/3 phase principles.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	**Static Electricity and Conduction**	**https://stickmanphysics.com**
2	**Resistance/Resistor DC Circuits and Circuit Protection**	**https://ecstudiosystems.com**
3	**AC Theories and Aircraft Electrical System**	**https://aerotoolbox.com › electrical**

REFERENCE BOOKS

1. Basic Electronics- BernadGrob
2. Electrical systems- BL Thereja
3. Oxford ATPL ground training series- Electrics

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Static Electricity and Conduction**		
1.1	electrostatic charges	Distribution of electrostatic charges	**K3**
1.2	Unit of charge	Define Polarity of a charge	**K2**
1.3	Electric Field	Define Electric Field of electronic charger	**K3**
1.4	Electrostatic laws	Electrostatic laws of attraction and repulsion	**K3**
1.5	Coulomb's Law	Explain Coulomb's Law	**K3**
1.6	Conduction of electricity	What Conduction of electricity through Solid	**K1**
II	**Electrical Terminologies**		
2.1	terms, their units	potential difference, electromotive force, voltage, current, resistance, conductance, charge, Power, Work,	**K2**
2.2	factors affecting	conventional current flow	**K1**
2.3	Sources of Electricity	Define Sources of Electricity	**K2**
2.4	Types of Current	Direct Current and Alternating Current.	**K3**
III	**Resistance/Resistor**		
3.1.0	Ohm's law	Define Ohm's law	**K3**
3.1.1	Resistors in series and parallel	Explain Resistors in series and parallel	**K1**
3.1.2	resistance	Calculation of total resistance using series	**K4**
3.1.3	Conductance	Conductance in series and parallel	**K2**
3.1.4	Open and short circuits	Define Open and short circuits	**K1**
3.1.5	operation of wheat shone bridge	Explain wheat shone bridge	**K3**
3.1.6	Types of rheostats.	Variable resistors, stability, tolerance and limitations	**K2**
3.1.7	Potentiometers and rheostats.	Construction and operation of potentiometers and rheostats.	**K3**

IV	**DC Circuits and Circuit Protectionk3**		
4.1.0	Electric circuit terminologies	Kirchhoff's Voltage and Current Laws	**K3**
4.1.1	Kirchhoff's Voltage and Current Laws	Calculations using the laws to find resistance and voltage	**K4**
4.1.2	internal resistance	Significance of the internal resistance of a supply	**K1**
	Circuit protection	Circuit protection; Electrical faults	**K1**
V	**AC Theories and Aircraft Electrical System**		
5.1.0	Capacitance; Inductance; Electromagnetic induction	Define Capacitance; Inductance; Electromagnetic induction	**K1**
5.1.1	Sinusoidal waveform	Define Sinusoidal waveform: phase, period, frequency, cycle	**K1**
5.1.2	Instantaneous, average, root mean square	Explain Instantaneous, average, root mean square	**K2**
5.1.3	peak, peak to peak current values and calculations	Explain peak, peak to peak current values and calculations	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	L	M	M	M	-	-	-	-	-	L	M	-	L
CO2	L	L	H	L	-	L	-	-	L	L	M	-	L
CO3	M	M	H	M	-	L	L	-	M	H	M	M	M
CO4	-	L	M	L	-	L	-	-	L	L	M	L	-
CO5	M	M	M	M	-	-	-	L	L	L	L	L	-
CO6	M	L	L	L	-	-	-	-	-	-	M	H	-

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

SBEC – I: AIRLINE PASSENGERHANDLING

SEMESTER: II **CODE:21AV2S1**

TOTAL HOURS: 2 **CREDITS: 2**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Gain relevant knowledge and understanding in passenger handling and requirement	**K1**	I
2	Familiarize with check in procedure in airport carry the process in handling the baggage ticketing monitor track illegal immigration in order to promote security	**K2**	II
3	To gain the relevant knowledge of the situation handling in crew and passenger	**K2**	III
4	To gain the knowledge of situation handling in regulatory and procedure in emergency situation	**K4**	III
5	To gain the relevant knowledge and understanding of the crew person such as cabin and cockpit crew to get better understanding between crew though communication	**K4**	IV
6	Manage irregular operation and passenger required special handling	**K2**	V

COURSE OBJECTIVE:

The aim of course is to:

Gain relevant knowledge understanding and practical skills for passenger handing standards and requirement

Provide information of the pass anger handling standards and requirement

Help standards gain compliance with current requirement and recommendation

Familiarize with check in gate and arrival service procedures

Manage irregular operation and passengers requiring special handling

COURSE CONTENT:

UNIT 1: ROLES OF CSA

Passenger reception at check in desk – luggage at ticket checks in – delay and irregularity management – airline services management – passenger boarding and disembark at the gate – management of passenger with difficulty – escort service for unaccompanied minors.

UNIT 2: CHECK IN PROCEDURE, BAGGAGE AND TICKETING

Why passenger has to check in? – where to check in? – passenger identity registration – baggage registration – seating arrangements - Responsibilities & duties of ticketing officer – how does ticketing work? – checking baggage inside airport – baggage sorting

oversize baggage - Understanding of immigration – purpose of immigration – laws and ethics – impact of undocumented immigrants – impact on the sending countries

UNIT 3: SITIUATION HANDLING

Comprehend the probability and severity of emergency situations - take action to deal with emergencies, incidents or accidents in line with the organization's procedures and regulatory

guidelines - consider the needs of others when taking action - get help from the appropriate sources in situation that are outside your own authority or ability - document all actions taken to mitigate risks/emergencies in line with organization procedures and regulatory guidelines

UNIT 4: MULTI CREW COORDINATION (MCC)

Enhance the level of assistance offered to colleagues - meet all reasonable requests for assistance within acceptable workplace timeframes - seek assistance when difficulties arise - use questioning techniques to clarify instructions or responsibilities - identify and display a non-discriminatory attitude in all contacts with customers and other staff members.

UNIT 5: PERSONALITY DEVELOPMENT

Communication – confidence – leadership – group discussion – presentation – personal hygiene and grooming – hair and skin care – motivation – interview techniques – resume writing

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Airport CSA	**https://www.collegedekho.com**
2	Check In Procedure Multi Crew Coordination	**https://www.cae.com**
3	Personality Development	**https://www.artofliving.org**

REFERENCE BOOKS

- A Practical Guide to Airline Customer Service: From Airline Operations to Passenger Services by Collin c Law.
- ICAO annex 9

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**ROLES OF CSA**		
1.1	Passenger reception	Define check in desk – luggage at ticket checks	**K1**
1.2	Passenger management	Aircraft delay and irregularity management	**K2**
1.3	airline services management	Define airline services management	**K1**
1.4	Passenger management	passenger boarding and disembark at the gate and passenger difficulty	**K3**
1.5	escort service	escort service for unaccompanied minors.	**K1**
II	**CHECK IN PROCEDURE, BAGGAGE AND TICKETING**		
2.1	CHECK IN PROCEDURE	Why passenger has to check in	**K1**
2.2	Passenger identity	What is passenger identity registration baggage registration	**K1**
2.3	Responsibilities & duties of ticketing officer	Define Responsibilities & duties of ticketing officer	**K2**
2.4	Baggage details	Explain ticketing checking baggage inside airport baggage sorting over size baggage	**K3**

2.5	Understanding of immigration	purpose of immigration – laws and ethics	**K3**
2.6	Understanding	impact of undocumented immigrants	**K2**
2.7	Impact on the sending countries.	Define Impact on the sending countries.	**K2**
III	**SITUATION HANDLING**		
3.1.0	Comprehend the probability	Comprehend the probability and severity of emergency situations	**K1**
3.1.1	Emergency & guide lines	take action to deal with emergencies, incidents or accidents in line with the organization's procedures and regulatory	**K3**
3.1.2	Action plan	consider the needs of others when taking action	**K2**
3.1.3	sources in situation	How to get help from the appropriate sources in situation	**K1**
3.1.4	Document emergencies and guidelines	actions taken to mitigate risks/emergencies in line with organization procedures and regulatory guidelines	**K2**
IV	**MULTI CREW COORDINATION (MCC)**		
4.1.0	the level of assistance offered to colleagues	Enhance the level of assistance offered to colleagues	**K1**
4.1.1	reasonable acceptable	meet all reasonable requests for assistance within acceptable workplace timeframes -	**K2**
4.1.2	instructions or responsibilities	use questioning techniques to clarify instructions or responsibilities	**K2**
4.1.3	identify and display	identify and display a non-discriminatory attitude in all contacts with customers and other staff members	**K4**
V	**PERSONALITY DEVELOPMENT**		
5.1.0	Personality Development	How to Communication who must confidence level	**K1**

5.1.1	leadership	explain leadership quality	**K3**
5.1.2	presentation	How to presentation your self	**K4**
5.1.3	personal things	Define personal hygiene and grooming – hair and skin care	**K2**
5.1.4	Personal motivation	How to motivate yourself and prepare for – interview techniques – resume writing	**K3**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	L	L	-	L	H	H	H	M	M	L	L	H
CO2	H	M	M	-	M	H	M	M	M	M	-	M	M
CO3	M	L	-	-	-	M	M	M	M	-	-	M	H
CO4	L	L	M	-	L	H	H	H	M	L	L	H	L
CO5	L	-	L	L	-	H	H	H	H	M	-	-	H
CO6	M	-	-	-	-	H	H	H	H	-	-	H	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

SEMESTERIII

S. No	Course Title	Course Code
1.	LanguageII	
2.	EnglishCommunicationSkills-II	
3.	air regulation-1	U21AV303
4.	air navigation	U21AV304
5.	meteorology-1	U21AV305
6	Human Factors	U21AV3Y5
7	ATC Communication and Its Units (Practical)	U21AV3P1
8	Piston Engines and Propellers	U21AV3:1
9	Familiarization Of Airport	U21AV3E1

CORE PAPER III: AIR REGULATION-1

SEMESTER: III **CODE: U21AV303**

TOTAL HOURS: 3 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Study about Indian aircraft act 1934	**K3**	I
2	Study about Indian aircraft rule 1937	**K3**	II
3	Explain the ATC rules and regulation	**K4**	III
4	Operation of ATC and aircraft communication	**K2**	III
5	To understand the aerodrome operation and aerodrome traffic operation	**K4**	IV
6	To understand operational procedure air plane and manual	**K1**	V

COURSE OBJECTIVE:

To gain the knowledge about the rules and regulation for those who are contribution to the Indian industry.

COURSE CONTENT:

UNIT 1: INDIAN AIRCRAFT ACT, 1934

Short title and extent, Power of Central Government to exempt certain aircraft, Power of Central Government to make rules, Power of Central Government to make orders in emergency, Power of Central Government to make rules for investigation of accidents, Power to detain aircraft, Power of Central Government to prohibit or regulate construction of buildings, planting of trees, Payment of compensation, Penalty for act in contravention of rule made under this Act, Penalty for flying so as to cause danger, Penalty for abetment of offences and attempted offences, Laying of rules before Parliament, Use of patented invention on aircraft not registered in India, Saving for acts done in good faith under the Act.

UNIT 2: INDIAN AIRCRAFT RULES, 1937

Short title and extent, Nationality of aircraft, Definitions and Interpretation, General condition of flying, General safety condition, Personal of aircraft, Airworthiness, Radio telegraph Apparatus Aeronautical beacon, Ground lights and false lights, Log book, Investigation of accidents, Investigation of Incidents.

UNIT 3: SEPARATION METHODS AND MINIMA

Air traffic control clearances-Scope & Purpose- Emergencies, General provisions for the separation of controlled traffic, Vertical separation during climb and descend, Horizontal Separation, Lateral Separation- By using same navigation aid or method-VOR, NDB, DR, RNAV, Longitudinal Separation- Same track, Reciprocal tracks, Crossing tracks, Longitudinal Separation minima based on time-Aircraft at same level, Aircraft flying on crossing track, Aircraft Climbing or descending –Same track, crossing track, reciprocal track

UNIT 4: AERODROME CONTROL SERVICE

Functions of aerodrome control tower, alerting service provided by aerodrome control tower, Control of aerodrome traffic, Selection of runway in use, Essential information on aerodrome conditions on, Control of traffic in the traffic circuit, Control of departing & arriving aircraft, Aeronautical Ground Lights.

UNIT 5: OPERATIONAL PROCEDURES

General Requirements, Operator Certification, Operational requirements, Minimum Equipment List, Aero-plane flight manual, Fire/Smoke-Classifications-Fire Extinguisher-Locations, Ground De-icing, Icing Conditions, De-icing, Anti-icing, Types of De-icing fluids, NOTAMs, Wake turbulence-categories-wake turbulence separation minima-time, distance-dealing with wake turbulence

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	ICAO annex	https://www.icao.int/safety/airnavigation/nationalitymarks/annexes_booklet_en.pdf
2	Airspace classification in India	https://aim-india.aai.aero/eaip/PUB/2012-04-01/html/eAIP/EC-ENR-1.4-en-GB.html
3	Documents to be carried on board by Indian registered aircraft	http://164.100.60.133/ftppub/D2X-X7.pdf

REFERENCE BOOKS

1. Indian Aviation Act 1934 by Ministry of Civil Aviation, Govt. of India.

2. Indian Aircraft Manual by Ministry of Civil aviation, Govt. of India.

3. Air Regulation Part 1 by R.K Bali.

4. Air Regulation Part 2 by R.K Bali.

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Indian Aircraft Act, 1934**		
1.1	Short title and extent	Short title and extent, Power of Central Government to exempt certain aircraft	**K4**
1.2	rules	Power of Central Government to make rules orders in emergency rules for investigation of accidents	**K3**
1.3	Power of Central Government	Power to detain aircraft, Power of Central Government to prohibit or regulate construction of buildings, planting of trees, Payment of compensation	**K3**
1.4	Penalty Act,	Penalty for act in contravention of rule made under this Act, Penalty for flying so as to cause danger Penalty for abetment of offences and attempted offences	**K3**
1.5	invention on aircraft	Use of patented invention on aircraft not registered in India, Saving for acts done in good faith under the Act	**K2**
II	**Indian Aircraft Rules, 1937**		
2.1	title and extent	Short note and on Nationality of aircraft	**K2**
2.2	Flying details	Definitions and Interpretation, General condition of flying	**K2**
2.3	safety condition	Define general safety condition	**K1**
2.4	Airworthiness	Define Personal of aircraft, Airworthiness	**K3**
2.5	Aeronautical beacon, lights	Radio telegraph Apparatus Aeronautical beacon, Ground lights	**K2**
2.6	Investigation	Compare Investigation of accidents, Investigation of Incidents.	**K2**
III	**SEPARATION METHODS AND MINIMA**		
3.1.0	ATC	Explain ATC clearances-Scope &amp	**K4**
3.1.1	traffic control	Emergencies, General provisions for the separation of controlled traffic	**K2**

3.1.2	Horizontal Separation, Lateral Separation	Define navigation aide VOR, NDB, DR, RNAV	**K3**
3.1.3	Longitudinal Separation	Same track, Reciprocal tracks,	**K3**
3.1.4	Aircraft flying	What is crossing track, Aircraft Climbing or descending –Same track, crossing track, reciprocal track	**K2**
IV	**AERODROME CONTROL SERVICE**		
4.1.0	aerodrome control tower	Functions of aerodrome control tower, alerting service	**K3**
4.1.1	Selection of runway in use	Discuss about Selection of runway in use	**K1**
4.1.2	Essential information	Explain about Essential information on aerodrome conditions on, Control of traffic in the traffic circuit, Control of departing & arriving aircraft	**K4**
4.1.3	Aeronautical Ground Lights.	Define Aeronautical Ground Lights.	**K1**
V	**OPERATIONAL PROCEDURES**		
5.1.0	Requirements	General Requirements, Operator Certification, Operational requirements	**K2**
5.1.1	Minimum Equipment List	Define Aero-plane flight manual, Fire/Smoke-Classifications-Fire Extinguisher-Locations, Ground De-icing, Icing Conditions, De-icing, Anti-icing	**K3**
5.1.2	Types of De-icing fluids	What is the Types of De-icing fluids	**K2**
5.1.3	Wake turbulence	NOTAMs, Wake turbulence-categories-wake turbulence separation minima-time	**K3**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	-	-	L	-	H	-	-	-	-	-	-	-	-
CO2	-	-	L	-	H	-	-	-	-	-	-	-	-
CO3	M	-	H	-	H	M	H	-	-	L	L	-	H
CO4	M	-	H	-	M	M	M	M	L	-	-	L	H
CO5	L	-	H	-	L	-	L	L	-	M	-	-	L
CO6	M	M	M	M	-	-	L	-	-	H	M	L	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **1. 3. End Semester Examination**
Indirect
1. course – end survey feed back

CORE PAPER IV: AIR NAVIGATION

SEMESTER: III **CODE: U21AV304**

TOTAL HOURS: 3 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Explain various terms of imagination line over globe	**K2**	I
2	Solve the problem related to speed conversion	**K4**	II
3	Explain the different measurement of airspeed	**K3**	II
4	explain the triangle of velocity	**K4**	III
5	Select a particular chart for a particular region	**K2**	IV
6	Choose the efficient fuel and detail at the navigation emergency data	**K2**	V

COURSE OBJECTIVE:

To gain the knowledge about the art of navigation an aircraft from any given points understands the geographical positions their relation and effects in navigation

COURSE CONTENT:

UNIT 1: THE EARTH

The cardinal Points, The Earth Graticule, Great Circles, Rhumb Line, Meridians and Anti Meridians, Small Circles, The Equator, Latitude, Longitude, The Prime Meridian, Difference in Latitude and Longitude, Great Circle Tracks, Rhumb Line Tracks.,360-degree notation, True Direction, Magnetic Direction and Variation, Isogonal, Agonal, Magnetic Direction, Compass Direction and Deviation, Convergence angle, Convergency, Grid Direction and Grivation, Isogrivs.

UNIT 2: SPEED CONVERSIONS

Statute Mile, Nautical Mile, Kilometer, Conversion between Units, Departure, Meters and Feet, Basic principles of Circular Slide Rule., units of Speed, Knots, Miles per Hour, Kilometers per Hour, Indicated Airspeed, Rectified Airspeed, True Airspeed, Equivalent Airspeed, Ground Speed, Mach Number, Calibrated Airspeed, Correct Outside Air Temperature, Conversion of Rectified Airspeed to True Airspeed, Conversion of Mach number to True Airspeed, Speed, Distance and Time; Relationships and Calculations.

UNIT 3: TRIANGLE OF VELOCITIES

The Three basic velocity vectors- Drift- The Basic Vector Triangle Problems, Introduction to Flight Computer, Geometrical Solution and Solutions on the Navigation Computer, Finding the wind Velocity at a turning point, Head and Crosswind on a Runway, 1 in 60 Rule. Top Of Climb (TOC), Top Of descent (TOD), Track Error, Track, Tack Made Good (TMG), Aircraft Air Velocity, Aircraft Ground Velocity.

UNIT 4: MAPS AND CHARTS

Definition and differences about Maps and Charts, Types of charts on the basis of placement of paper and placement of light in reduced earth, Different types of projection, Mercator projection, Lambert Conical, Polar stereographic projection, Orthomorphism, Scale, Representation of Scale factor, The Reduced Earth, Topographical Maps

UNIT 5: FUEL AND NAVIGATIONAL EMERGENCY DATA

Different Units of Measurements, Liters, Imperial Gallons and US Gallons, Conversion factors, specific gravity, fuel flow and fuel consumption, Endurance, Still Air Range (SAR), Fuel economy, selecting the most economical cruising level, Payload

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	**Latitudes and longitudes**	**https://www.techtarget.com/whatis/definition/latitude-and-longitude**
2	**Different measurements at airspeed**	**https://commons.erau.edu/cgi/viewcontent.cgi?article=1178&context=bollinger-rosado**
3	**Comparison between different chart & maps and its properties**	**http://www.differencebetween.net/miscellaneous/geography-miscellaneous/difference-between-maps-and-charts/**

REFERENCE BOOKS

1. Air Navigation by R.K. Bali
2. Oxford – Navigation 1(General Navigation

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**The Earth**		
1.1	Cardinal points	List intercardinal directions	**K4**
1.2	Theearthgraticule	Illustrate graticule	**K2**
1.3	Great circle	Explaingreatcircle	**K2**
1.4	Meridian&anti-meridian	Classifymeridianand anti-meridian	**K4**
1.5	Small circle	Definesmallcircle	**K1**
1.6	Great direction	Classification Great direction	**K2**
1.7	Grivation,	Classification Grivation,	**K1**
1.8	Isogrivs.	Classification Isogrivs.	**K1**
II	**Speed Conversions**		
2.1	Stoudemire	Definestatutemile	**K1**
2.2	Nautical mile	Define nautical mile	**K1**
2.3	Kilometre	Recall thedefinitionofkilometer	**K1**
2.4	Conversionbetweenunits	Solvetheproblemofunit conversion	**K6**
2.5	Departure	Define departure	**K1**
2.6	Basicprinciple of semi circular rule	Outlinetheprinciple of semi circular rule	**K2**
2.7	IAS, TAS, Aground Speed, Mach.No, CAS	Explainthedifferentmethodsof measurementsofairspeed	**K2**
2.8	Correctedoutsideair temperature	Explainthepurpose of measuring outsideairtemperature	**K2**
2.9	ConversionofRASto TAS, MacNutt's	Solvetheairspeedconversion	**K6**
2.10	Speed, Distance, Time, Relationship calculation	Comparetherelationshipbetween speed, distanceandtime	**K2**
III	**Triangle of Velocities**		
3.1.0	Three basic velocity vectors-	Define Three basic velocity vectors	**K2**

3.1.1	Vector Triangle	Solve Vector Triangle	**K4**
3.1.2	Introduction to Flight Computer	Explain Introduction to Flight Computer	**K2**
3.1.3	Navigation Computer	Explain Geometrical Solution and Solutions on the Navigation Computer,	**K2**
3.1.4	wind Velocity	Finding the wind Velocity at a turning point	**K2**
3.1.5	Head and Crosswind	Find the Head and Crosswind on a Runway	**K1**
3.1.6	TOC, TOD, TMG Aircraft Air Velocity	Explain Aircraft Air Velocity	**K1**
IV	**Maps and Charts**		
4.1.0	Mercator projection	ElaborateMercatorprojection	**K4**
4.1.1	Lamberts conical	Explaintheplaces wheelsman bemused	**K2**
4.1.2	Polar stereographic	Choosetheappropriatechart for appropriate area	**K4**
	Orthomorphism scale	Explainorthomorphismscale	**K2**
	Reduced earth	Constructreducedearth	**K4**
	Topographical maps	Explaintopographicalmaps	**K2**
V	**Fuel and Navigational Emergency Data**		
5.1.0	Imperial and US gallons	DistinguishbetweenImperialand US gallons	**K4**
5.1.1	Conversion factor	Solvetheproblems relatedtounit conversion	**K4**
5.1.2	Specific gravity	Explainspecificgravity	**K2**
5.1.3	Fuelflowandfuel consumption	Compareflowoffueland consumptionoffuel	**K4**
5.1.4	Selectthemosteconomical cruising level	Choosetheeconomicalcruising level	**K4**
5.1.5	Payload	Explain Payload	**K2**
5.1.6	Imperial and US gallons	DistinguishbetweenImperialand US gallons	**K4**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	L	-	L	L	-	-	-	-	-	-	L	-	L
CO2	M	L	L	L	-	-	L	-	-	-	-	L	L
CO3	M	M	-	M	-	-	-	-	-	-	-	-	-
CO4	L	M	-	M	-	-	-	-	-	-	-	L	-
CO5	M	M	M	M	-	-	M	L	L-	-	M	L	M
CO6	M	L	L	L	-	-	L	L	L	-	-	-	L

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. Course – end survey feed back

CORE PAPER V: METEOROLOGY-1

SEMESTER: III **CODE: U21AV305**

TOTAL HOURS: 3 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Study about different types of layers in atmospheres	**K3**	I
2	Study about temperature reduction on earth surface	**K4**	II
3	To understand the knowledge about avid effect	**K2**	II
4	To understand the atmospheric density and pressure	**K3**	III
5	To understand the knowledge about want	**K3**	IV
6	To understand the aircraft visibility and runway visual	**K4**	V

COURSE OBJECTIVE:

To understand the various aspects of weather in aviation.

COURSE CONTENT:

UNIT 1: THE ATMOSPHERE

Different Layers of Atmosphere, Composition of gases in atmosphere, Vertical extent of atmosphere, vertical classification of atmosphere, Properties of each layer of atmosphere, physical properties of air, atmosphere, pressure, temperature, density, humidity, Newton law of motion, Bernoulli's principles

UNIT 2: TEMPERATURE

Definition of temperature, different units of measurements, Vertical distribution of temperature, Different mode of transfer of heat, solar and terrestrial Radiation, Nocturnal cooling, Conduction, convection, Advection and Turbulence, Lapse rate, stability and instability, Development of inversions, type of inversions, temperature near the earth's surface, Surface effects, Diurnal variation, Effect of clouds, Effect of wind.

UNIT 3: ATMOSPHERIC DENSITY AND PRESSURE

Inter-relationship of pressure, Temperature and Density, International Standard Atmosphere, Altimetry Pressure, True Altitude, Height, Altitude, Flight Level, Altimeter settings, QNH, QFE, QNE, QFF, Density affecting the performance of aircraft, Low Pressure system, High pressure system, cold, Difference in wind pattern, visibility and weather in different pressure system, Density altitude.

UNIT4: WINDS

Definition and measurement of Wind, Primary cause of Wind, Pressure Gradient, Coriolis Force, Gradient Wind, General circulation of Wind, Turbulence, gustiness, type of turbulence, Origin and Location of Turbulence, Variation of Wind with height, Variation of wind in the friction layer, Variation of the wind caused by fronts, Wind related to pressure system, Local winds, Anabatic and Katabatic, Land and sea breezes, Vertical movements, Mountain waves, Windshear, Turbulence.

UNIT5: VISIBILITY

Definition of Visibility, Visibility reducing phenomenon, Reduction and visibility caused by mist, smoke, dust, sand, Haze and precipitation, Reduction of visibility caused by low drifting and blowing snow, Difference between mist, fog and haze, dust storm, Runway Visual Range (RVR), Horizontal Visibility, Vertical Visibility, Slant Visibility.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Meteorology	**https://mausam.imd.gov.in/imd_latest/contents/pdf/aviation_sop.pdf**
2	Layers of atmosphere	**https://climate.nasa.gov/news/2919/earths-atmosphere-a-multi-layered-cake/#:~:text=Earth's%20atmosphere%20has%20five%20major,%2C%20mesosphere%2C%20thermosphere%20and%20exosphere.**
3	Detail of winds	**https://education.nationalgeographic.org/resource/wind**

REFERENCE BOOKS

1. Aviation meteorology by I.C Joshi
2. Ground studies for pilots – Aviation Meteorology
3. Oxford - Meteorology

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**The Atmosphere**		
1.1	Different layers of atmosphere	Demonstrate the layer of atmosphere	**K2**
1.2	Composition of gases in atmosphere	Categorize the gases present in atmosphere.	**K4**
1.3	Vertical extent of atmosphere	Illustrate the vertical of Atmos four.	**K2**
1.4	Vertical clarification atmosphere	Classify the vertical la years of Atm.	**K4**
1.5	Properties of each layer's atmosphere	Explained the properties of each layer of atm.	**K2**
1.6	Physical properties of air, atmosphere, Px, Tamp, excellently	Summarise the proper lies of atm. Px, temp, density	**K2**
1.7	Newton law of motion	Define all the newtons laws of motion.	**K1**
1.8	Baronially springless	Explained Banuelos forma in derail	**K2**
II	**Temperature**		
2.1	Different of temp	Explained the temp in detail	**K2**
2.2	Different units of measure.	Classify different units of measurement for temp	**K4**
2.3	Vertical distribution of limp.	Categorise the distribution of temp with vertical enter	**K4**
2.4	Different mode of transfer of heat	Illustrate the modes of heat transfer in ATM	**K2**
2.5	Solar & radiation	Define the solar radiation & Ter rad.	**K1**
2.6	Nocturnal cooling	Explained in detail	**K2**
2.7	Condition, convection, advection & to, laps late & instability	Desta different types of heat transfer methods	**K4**
2.8	Development of Inver of inversion	Types	**K2**
2.9	Temp mean the earth's surface, surface effect	Explained the temp metre earth surface	**K5**
2.10	Effect of clues	Evaluate the effect of clouds	**K5**

2.11	Effect of wind	Evaluate the effect of wind	**K5**
III	**Atmospheric Density and Pressure**		
3.1.0	Enter – relationship of px, temp & density	Analyse the inter relationship px temp	**K4**
3.1.1	International standard atmosphere	List out the standard atmosphere used international	**K4**
3.1.2	Altimetry pressure, true altitude, height altitude fl altimetry settings	Determine altimetry px system & altimeter settings	**K5**
3.1.3	QNH, QFE, QNE, QFF	Explained all the Q-words used in altimetric system	**K2**
3.1.4	Density affects the performance & aircraft	Demonstrated affects a/c performance	**K2**
3.1.5	Low px system, high px system	Composition of L system	**K2**
3.1.6	Col, difference in wind pattern visibility & weather in different & x system	The weather in different px system	**K4**
IV	**Winds**		
4.1.0	Definition & measurement of wind	Explained about wind of instruments used to measure	**K2**
4.1.1	Primary cause of wind	Demonstrated the causes of wind	**K2**
4.1.2	Pressure gradient	Explained detailed information about pressure gradient	**K5**
4.1.3	Coriolis force	Define & explanation of corolisforce formation	**K1**
4.1.5	Gradient wind	What is gradient wind? Explained	**K1**
4.1.6	Types Of wind	Illustrated general circulation of wind	**K2**
4.1.7	Turbel, gust, type of origin & location of tubule	Categorized the types of turbulence with its origin location	**K4**
4.1.8	Variation of wind with height	Analyse the variation of winds with height	**K2**
4.1.9	Variation of wind in the friction layer	Distinguish the variation winds in the friction layer	**K4**

4.1.10	Variation of wind caused by fronts	Classify the variation of winds caused by fronts	**K4**
4.1.11	Wind related to px system	Demonstrated wind related to Px system	**K2**
4.1.12	Local wind, anabatic &katabatic wind. Land & sea breeze	List out & explained about difference typed of winds present in the atmosphere	**K4**
4.1.13	Vertical movements, mouth waves	Functions of mountain waves	**K4**
4.1.14	Wend she, turbulence	Define wire shear & Turbulence	**K2**
V	**Visibility**		
5.1.0	Definition of visibility	Explained about mountain waves	**K5**
5.1.1	Reducing phenomenon	Demonstrated the phenomenon of visual reduction	**K2**
5.1.2	Reduction vis used by mist smoke dust, sand, haze & par	Illustrated the reduction of visual due to must smoke dust etc	**K2**
5.1.3	Red action of vis used by low drifting & blowing snow	Explained reduction of visual by low	**K3**
5.1.4	Difference between must, fog & dust storm	Summarize the difference between must, fog, haze & dust storm	**K2**
5.1.5	Runway visual range, horizontal visual recital visual, visual	Explained RUR in detail	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	-	H	-	-	-	L	-	-	-	M	L	H
CO2	M	-	H	-	-	-	-	-	-	-	M	L	H
CO3	H	L	H	L	-	-	L	L	-	-	H	-	H
CO4	L	L	H	L	-	-	-	-	-	-	M	-	H
CO5	M	L	H	L	-	-	-	-	-	-	H	-	H
CO6	H	L	H	L	-	-	-	-	-	L	H	-	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

ALLIED V: HUMAN FACTORS

SEMESTER: III **CODE: U21AV3Y5**

TOTAL HOURS: 2 **CREDITS: 2**

COURSE OUTCOMES

On completion of this course, the students will be able to:

S.No	Course Outcomes	Level	Unit Covered
1	Explain basic physiology in human factors	**K2**	I
2	Discuss about social psychology	**K2**	II
3	Outline of the human affecting factors	**K2**	III
4	Comparison of error and asks in human in aviation	**K3**	IV
5	Explain the memory skill mental working human factors	**K2**	V
6	Our line of the human information processing	**K1**	V

COURSE OBJECTIVE

- Understand the role of human cognition and physiological effects affecting performance in aviation

COURSE CONTENT:

UNIT1: BASIC PHYSIOLOGY

The need to take human factors into account; Incidents attributable to human factors/human error; 'Murphy's Law. Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access. Hyperventilation, Hypoxia, Decompression Sickness anatomy & physiology of the ear, Vision.

UNIT 2: SOCIAL PSYCHOLOGY

Responsibility: individual and group; Motivation and de-motivation; Peer pressure; 'Culture' issues; Team working; Management, supervision and leadership, Interacting with ATC, Cabin Crew, Passengers.

UNIT 3: FACTORS AFFECTING PERFORMANCE

Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and under-load; Sleep and fatigue, shift work; Alcohol, medication, drug abuse.

UNIT 4: COGNITION IN AVIATION

Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e., accidents); avoiding and managing errors.

UNIT 5: HUMAN INFORMATION PROCESSING.

Introduction, Basic plan, Sensation & Sensory memory, perception & mental models, working of long-term memory, motor memory (Skills).

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Basic physiology and physiology	
2	Cog nation in aviation	
3	Human information processing	

REFERENCE BOOKS

1. Human Factors for Pilots, Roger G Green, Helen Muir et al., Ash gate Publishing Limited.
2. Air Regulation by R.K. Bhali
3. Air regulations by K.D. Tuli

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Basic Physiology**		
1.1	human factors into account	What need to take human factors into account	**K2**
1.2	human error	Incidents attributable to human factors/human error;	**K2**
1.3	Murphy's Law	Explain Murphy's Law	**K3**
1.4	Hearing Vision	Explain Hearing Vision	**K2**
1.5	Information processing; Attention and perception	What Information processing; Attention and perception	**K1**
1.6	physical access	Hyperventilation, Hypoxia, Decompression Sickness anatomy	**K2**
1.7	physiology	physiology of the ear, Vision.	**K3**

II	**Social Psychologyk2**		
2.1	Responsibility	Explain Responsibility of social psychology	**K2**
2.2	individual and group	Define individual and group Psychology	**K1**
2.3	Motivation and de-motivation	Short note of Motivation and de-motivation	**K2**
2.4	Peer pressure	What is Peer pressure	**K1**
2.5	'Culture' issues	Define 'Culture' issues	**K3**
2.6	Team working	How to Management, supervision and leadership, Interacting with ATC, Cabin Crew, Passengers.	**K2**
III	**Factors Affecting Performance**		
3.1.0	Fitness/health	How to maintain Fitness/health	**K1**
3.1.1	Stress	Work stress companyk3 domestic and work related	**K2**
3.1.2	pressure	Explain pressure relk1ated time and dead line	**K3**
3.1.3	Workload	Define overload and under-load	**K2**
3.1.4	shift work	What are all the factor Alcohol, medication, drug abuse.	**K1**
IV	**Cognition in Aviation**		
4.1.0	Error models	What is Error models	**K1**
4.1.1	Types of error	**Classification** error in maintenance tasks	**K2**
4.1.2	Theories of error	What is error managing in aviation	**K1**
V	**Human Information Processing**		
5.1.0	Introduction	Introduction about human information	**K1**
5.1.1	Basic plan	What is basic plan in Introduction	**K1**
5.1.2	Sensation & Sensory memory	Deference between Sensation & Sensory memory	**K2**
5.1.3	perception & mental	What is perception & mental	**K2**
5.1.4	memory	Types of memory long-term memory, motor memory	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	L	-	-	-	-	L	M	L	L	-	-	-	-
CO2	L	-	-	-	-	L	M	L	L	-	-	-	L
CO3	L	-	-	-	-	L	L	-	-	-	-	-	L
CO4	L	-	-	-	-	L	M	M	M	-	-	-	L
CO5	L	-	-	-	-	L	L	L	L	-	-	-	L
CO6	L	-	-	-	-	L	L	M	M	-	-	-	L

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

CORE PRACTICALI: ATC COMMUNICATION AND ITS UNITS (PRACTICAL)

SEMESTER: III **CODE: U21AV3P1**

TOTAL HOURS: 2 **CREDITS: 2**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Study of regulation	**K4**	I
2	Outline of radio propagation	**K2**	II
3	Explain phraseology used in aeronautical communication service	**K3**	III
4	Codes used in aeronautical communication service	**K3**	IV
5	Outline the communication and frequencies	**K2**	V
6	Outline The ATC communication	**K3**	I

COURSE OBJECTIVE

The aim of course is to:

- Understand basic aviation RT phonetics
- Understand different phraseology in RT communication
- Make students familiarize with different aviation charts
- Introduce to various radio equipment's.

COURSE CONTENT:

UNIT-1: REGULATIONS:

Duties of ITU, ICAO, AAI, WPC, ICAO Annexure, Spelling of Alphabets and Transmission of numerical, Aircraft Identification, Location Indicators, Flight Information Regions, Identification of Ground Services.

UNIT 2: RADIO PROPAGATION:

(a) Relationship between wavelength, frequency and speed of light

(b) Frequency bands and ranges
(c) Ionosphere layers during day and night
(d) Mode of Propagation MF, HF and VHF & amp; amp; above
(e) Operation of Geostationary Satellites
(f) Operation of Polar orbiting Satellites
(h) Skip Distance
(i) Choice of Frequencies during Day & amp; amp; Night 12

UNIT 3: PHRASEOLOGY:

Phraseology used in Aeronautical Communication Services; Abbreviations used in Aeronautical Communication Services.
(a) Distress
(b) Distress Relay
(d) Direction Finding
(e) Flight Safety
(f) Metrological
(g) Flight regulatory

UNIT 4: 'Q' CODES:

'Q' Codes used in Aeronautical Communication Services, QNH, QFE, Height, Elevation, Altitude, Flight Level

UNIT 5: COMMUNICATION:

Terminal Communication & amp; amp; En-route Communication, NOTAM and SNOWTAM, Need of Primary and Secondary Frequencies

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	ATC communication	https://www.aerospace-technology.com/contractors/training/atc-comm/#:~:text=ATC%2DCommunications%20is%20provider%20of,flight%20including%20vision%20and%20sounds.
2	Radio Propagation	https://en.wikipedia.org/wiki/Radio_propagation
3	Phraseology & Q codes	https://en.wikipedia.org/wiki/Q_code

REFERENCE BOOKS

- Radio telephony by K.D. Tuli

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Regulations**		
1.1	Duties of ITU	Analysis's duties of ITU	**K4**
1.2	ICAO	Develops and understanding of their rules & regulation	**K3**
1.3	AAI	Develops and understanding of their rules & regulation	**K3**
1.4	WPC	Develops and understanding of their rules & regulation	**K3**
1.5	ICAO annexure	Classifies contents of difference annexure	**K2**
1.6	Spelling of alphabets & transmission of numerical	Demonstrates the pronunciation of alphabet & numerical	**K2**
1.7	Aircraft ident	Interprets basic ident	**K2**
1.8	Location indicators	Interprets basic ident	**K2**
1.9	FIR	Analyses difference FIR & ground services	**K4**
1.10	Identification of ground services	Analyses difference FIR & ground services	**K4**
II	**Radio Propagation**		
2.1	wavelength, frequency and speed of light	Analyses the relationship between wavelength, frequency, & speed of light	**K4**
2.2	Frequency bands and ranges	Compares the bonds & ranges	**K2**
2.3	Ionosphere layers	Explains the ionosphere layer during day & night	**K2**
2.4	Mode of Propagation	Compares MF, HF, VHF & above	**K4**
2.5	Operation of Geostationary Satellites	Analyses the OPS of geostationary	**K4**
2.6	Polar orbiting Satellites	Analyses the OPS of polar	**K4**
	Skip Distance	Explain about skip distance	**K2**
	Frequencies during Day & Night	Summarizes about the frequency used at night	**K2**

III	**Phraseology**		
3.1.0	Phraseology abbreviations	Choose appropriate phrases	**K3**
3.1.1	Aeronautical Communication Services.	Outlines the type of call to be given during emergency	**K2**
3.1.2	Distress Distress Relay	Explains about type of commercial during RCF unable for each ATC	**K2**
3.1.3	Direction Finding	Identifies the methods of direction finding from station	**K2**
3.1.4	Flight Safety	Examines the safety on board	**K4**
3.1.5	Metrological Information	Analyses met condition	**K4**
3.1.6	Flight regulatory	Develops basic regulation & rules of fit	**K3**
IV	**'Q' Codes**		
4.1.0	Q- Codes	Illustrates the difference types of Q codes	**K2**
4.1.1	atmospheric pressure	Understanding of atmospheric pressure	**K2**
4.1.2	Height, Elevation, Flight Level, Altitude	Classifies the difference between Altitude Elevation, Height, Flight Level	**K4**
4.1.3	QDR, QDM, QUJ, QTE	Classifies the variation of QDR, QDM, QUJ, QTE	**K4**
4.1.4	Relative bearing, Radial, Magnetic Heading, Compass Heading, True Heading, Variation & Deviation	What the Relative bearing, Radial, Magnetic Heading, Compass Heading, True Heading, Variation & Deviation	**K3**
V	**Communication**		
5.1.0	Intro to radio call format	Explains basic RT	**K2**
5.1.1	Radio strength check	Demonstrates how to check quality of call	**K3**
5.1.2	S/UP clearance	Outlines the type of call for S/U & pushback based on aircraft cat	**K2**

5.1.3	P/B clearance	Outlines the type of call for S/U & pushback based on aircraft cat	**K2**
5.1.4	Taxi clearance	Explains RT call	**K2**
5.1.5	ATC clearance	Explains RT call	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M		H	L	M	L	-	-	-	-	-	L	M
CO2	M	L	L	L	L	L	L	-	-	L	-	-	L
CO3	-	-	-	-	L	M	M	-	-	-	L	L	-
CO4	M	M	M	M	-	-	-	-	-	M	L	L	-
CO5	M	L	M	L	L	M	M	M	M	L	-	L	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1course – end survey feed back

ELECTIVE I: PISTON ENGINESAND PROPELLERS

SEMESTER: III **CODE: U21AV3:1**

TOTAL HOURS: 3 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

S.No	Course Outcomes	Level	Unit Covered
1	DETAIL about the fundamentals and working principle at piston engines	**K4**	I
2	Explain the working principle of 2 stroke 4 stroke otto and easel engine	**K3**	I
3	Define engine construction and performance	**K3**	II
4	Study the carburetor and lubrication	**K2**	III
5	Explain about chargers	**K4**	IV
6	Explain bridely about propeller	**K3**	V

COURSE OBJECTIVE:

Understand basic working of piston engines and propellers effects on performance

COURSE CONTENT:

UNIT 1: PISTON ENGINE

Fundamentals, Mechanical, thermal and Volumetric efficiencies operating principles -2 stroke, 4 stroke, Otto and Diesel, Piston displacement and Compression ratio, Engine configuration and firing order

UNIT 2 ENGINE CONSTRUCTION AND PERFORMANCE

Crank case, Crank shaft, Cam shafts, Sumps, Cylinder and piston assemblies, connecting rods, inlet and exhaust manifolds, valve mechanism, power calculation measurement, factors affecting engine power, mixture rich-lean, pre-ignition.

UNIT 3: CARBURETOR AND LUBRICATIONS

Working principle simple Carburetor, Advantages and Disadvantages of Carburetor, Introduction to Fuel injector, Wet sump and dry lubrication, properties of Lubrication Liquid

UNIT 4: SUPERCHARGING AND TURBO CHARGING

Principle and Purpose of Super Charging and it's Effect on Engine Parameters, Construction and Operation of Super charging/ Turbo charging Systems Terminology,

UNIT 5: PROPELLER

Fundamentals, high-low blade angle, reverse angle, Angle of attack, Rotational speed, Propeller slip, Aerodynamic, Centrifugal and Thrust Forces, Torque, Relative airflow on Blade angle of attack, Blade phase, Blade shank, Blade back and Hub assembly, fixed pitch, Control pitch, Constant speeding Propeller, Propeller Pitch Control, Propeller ice Protection.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	**Piston Engine**	**https://en.wikipedia.org/wiki/Piston**
2	**Carburetor and Lubrications**	**https://en.wikipedia.org/wiki/Carburetor**
3	**Propeller**	**https://en.wikipedia.org/wiki/Propeller**

Reference Books

1. Oxford – General knowledge 3 (power plant)
2. Airframe and power plant mechanics – power plant hand FAA

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**PISTON ENGINE**		
1.1	Fundamentals, Mechanical, thermal and Volumetric efficiencies	Explain About 2 strokes	**K3**
1.2	Fundamentals, Mechanical, thermal and Volumetric efficiencies	Explain About 4 strokes,	**K3**
1.3	Fundamentals, Mechanical, thermal and Volumetric efficiencies	Explain About Otto and Diesel	**K3**
1.4	Piston displacement and Compression ratio	Define Piston displacement and Compression ratio	**K2**
1.5	Engine configuration and firing order	What is Engine configuration and firing order	**K2**
II	**ENGINE CONSTRUCTION AND PERFORMANCE**		

2.1	Crank case	What is Crank case	**K2**
2.2	Crank shaft	What is Crank shaft	**K2**
2.3	Cam shafts	What is Cam shafts	**K2**
2.4	Sumps, Cylinder and piston assemblies	Define Sumps, Cylinder and piston assemblies	**K2**
2.5	connecting rods,	Define connecting rods	**K2**
2.6	inlet and exhaust manifolds	Define inlet and exhaust manifolds	**K2**
2.7	valve mechanism	Explain valve mechanism	**K3**
2.8	power calculation measurement	Explain power calculation measurement	**K4**
2.9	factors affecting engine power	Explain factors affecting engine power	**K3**
2.10	mixture rich-lean, pre-ignition.	Define mixture rich-lean, pre-ignition.	**K2**
III	**CARBURETOR AND LUBRICATIONS**		
3.1.0	Carburettor	Working principle simple Carburettor	**K3**
3.1.1	Carburettor	Advantages and Disadvantages of Carburettor	**K2**
3.1.2	Introduction to Fuel injector	Introduction to Fuel injector	**K1**
3.1.3	Wet sump and dry lubrication	Explain Wet sump and dry lubrication	**K3**
3.1.4	Lubrication Liquid	properties of Lubrication Liquid	**K2**
IV	**SUPERCHARGING AND TURBO CHARGING**		
4.1.0	Super Charging	What is Principle and Purpose of Super Charging	**K3**
4.1.1	Super Charging	Explain its Effect on Engine Parameters, Construction and Operation	**K3**
4.1.2	Turbo charging	What is Principle and Purpose of Turbo Charging	**K3**
4.1.3	Turbo charging	Explain its Effect on Engine Parameters, Construction and Operation, Terminology	**K3**
V	**PROPELLER**		
5.1.0	Propeller	Fundamentals of Propeller	**K3**

5.1.1	Propeller angle	Define high-low blade angle	**K1**
5.1.2	Angle of attack	Explain Angle of attack	**K3**
5.1.3	Rotational speed	Define Rotational speed	**K1**
5.1.4	Propeller slip	What is Propeller slip	**K1**
5.1.5	Aerodynamic	Define Aerodynamic	**K3**
5.1.6	Centrifugal and Thrust Forces	What is Centrifugal and Thrust Forces	**K3**
5.1.7	Torque	What is Torque	**K1**
5.1.8	Relative airflow on Blade angle of attack	Relative airflow on Blade angle of attack	**K2**
5.1.9	Blade phase, Blade shank, Blade back and Hub assembly	Define Blade phase, Blade shank, Blade back and Hub assembly	**K2**
5.1.10	fixed pitch, Control pitch	Explain fixed pitch, Control pitch	**K3**
5.1.11	Constant speeding Propeller,	What Constant speeding Propeller	**K2**
5.1.12	Propeller Pitch Control	What is Propeller Pitch Control	**K1**
5.1.13	Propeller ice Protection	Define Propeller ice Protection	**K1**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	L	M	M	M	-	-	-	-	-	-	-	-	M
CO2	L	M	-	M	-	-	-	-	-	-	-	-	M
CO3	-	M	-	M	-	-	-	-	-	-	L	-	M
CO4	-	M	-	M	-	-	-	-	-	-	-	-	L
CO5	-	M	-	M	-	-	-	-	-	-	-	-	L
CO6	L	M	-	M	-	-	-	-	-	-	-	-	L

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1 course – end survey feed back

SEMESTER: III **CODE: U21AV3E1**

TOTAL HOURS: 2 **CREDITS: 2**

COURSE OUTCOMES

On completion of this course, the students will be able to:

S.No	Course Outcomes	Level	Unit Covered
1	Explain the different areas in airport and its functions	K2	I
2	Interpret the meaning of markings and lightings in airport	K2	II
3	Categorize the different navigation and communication equipment used in Airport	K4	III
4	Compare the different Air Traffic Control Unit and its functions	K4	IV
5	Outline the different Important organization for safe and efficient conduct of flight	K2	V
6	Explain the basic about RADAR principle	K2	III

COURSE OBJECTIVE:

To acquire basic understanding of the layout at airport its building facilities installation and their functioning.

COURSE CONTENT:

UNIT 1: BUILDINGS & INSTALLATIONS

Basic definitions and understanding of Terminals, Security, Apron, Hangar, Taxiway, Runway, Fire Station, Airport Vehicles, Fuel depot. Regulations related to each of airport services. Purpose hanger, apron, aircraft stand, taxiway and runway.

UNIT 2: MARKINGS & LIGHTINGS

Difference between markings, Lightings and Signboards, Apron markings- aerobridge movement area markings, stand lead in line, Apron edge marking, Aircraft stand identification marking, Taxiway centerline and edge marking & lighting, Runway centerline and edge line marking & lighting, Threshold, aiming point, touch down zone marking & lighting Declared distances, PCN, Lighting system, Aerodrome Beacon, Obstacle Lighting & Marking. Location, Direction & Destination signboard.

UNIT 3: FACILITIES & EQUIPMENT'S

Basic understanding of Navigational facilities. Basic radio principle, frequency used and introduction about various navigational equipment's VOR, NDB/ADF, DME; Basic radar principle, Primary and secondary radar, Surveillance equipment's: Primary Radar, SSR, Surface Movement Radar, ADS; GPS, VHF antennae, ILS

UNIT 4: AIR TRAFFIC CONTROL

Different Air Traffic Control Units, Concept of Flight Information Region, Role of Flight Information Centre, five different Flight information region in India, Roles and responsibilities of Various air traffic control units- Ground control, Tower, Approach, Area control, Flight Plan briefing and filling, Flight Dispatch, ATC briefing

UNIT 5: IMPORTANT ORGANIZATIONS

Roles and Responsibility of International Air Transport Association (IATA), International Civil Aviation Organization (ICAO), Director General Civil Aviation (DGCA), Airport Authority of India (AAI) & its wings, Ministry of Civil Aviation, Bureau of Civil Aviation Security, Central Industrial Security Force. Important convention with these organization

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Airport Marking Aids and Signs	https://www.faa.gov/air_traffic/publications/atpubs/aim_html/chap2_section_3.html
2	Air traffic control position	https://mediawiki.ivao.aero/index.php?title=Air_traffic_control_position
3	Important Aviation organization	https://www.civilaviation.gov.in/en/aboutus/orgsetup

REFERENCE BOOKS

1. ICAO Annex 14 Volume 1 Aerodrome Design and Operations
2. Civil Aviation Requirements Section-4, Aerodrome Standards & Air Traffic Services.
3. R.K. Bali Air Regulations.
4. Airport council international (Second Edition

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Buildings & Installations**		
1.1	Basic definitions and understanding of Terminals, Apron, Hangar, Taxiway, Runway, Fire Station, Airport Vehicles, Fuel depot	Explain the definitions of Terminals, Security, Apron, Hangar, Taxiway, Runway, Fire Station, Airport Vehicles, Fuel depot	**K2**
1.2	Regulations related to each of airport services	Identify the relevant air regulations related to a particular airport service	**K3**
1.3	Purpose hanger, apron, aircraft stand, taxiway and runway	Analyse the work done in a particular area in an airport	**K4**
II	**Markings & Lightings**		
2.1	Difference between markings, Lightings and Signboards	Distinguish the purpose of marking, lighting and signage	**K4**
2.2	Apron markings- movement area markings, stand lead in line, Apron edge marking, Aircraft stand identification marking, Taxiway centreline and edge marking & lighting, Runway marking & lighting	Interpret apron, Taxiway, Runway marling and lightings	**K2**
2.3	Declared distances	Identify the different declared distances	**K3**
2.4	PCN	Solve PCN calculations	**K3**
2.5	Lighting system, Aerodrome Beacon, Obstacle Lighting & Marking.	Distinguish different lights used in and around airport	**K4**
2.6	Location, Direction & Destination signboard.	Interpret the meaning of different sign board	**K2**
2.7	Difference between markings, Lightings and Signboards	Distinguish the purpose of marking, lighting and signage	**K4**
2.8	Apron markings- movement area markings, stand lead in line, Apron edge marking, Aircraft stand identification marking, Taxiway centreline and edge marking &lighting, Runway marking & lighting	Interpret apron, Taxiway, Runway marling and lightings	**K2**
2.9	Declared distances	Identify the different declared distances	**K3**
2.10	PCN	Solve PCN calculations	**K3**

2.11	Lighting system, Aerodrome Beacon, Obstacle Lighting & Marking.	Distinguish different lights used in and around airport	**K4**
2.12	Location, Direction & Destination signboard.	Interpret the meaning of different sign board	**K2**
III	**Facilities & Equipment's**		
3.1.0	Basic understanding of Navigational facilities	Outline the purpose and uses of navigation facilities	**K2**
3.1.1	Basic radio principle	Explain the basic principle of radio aids	**K2**
3.1.2	Frequency used	Choose the appropriate Radio frequency	**K5**
3.1.3	introduction about various navigational equipment VOR, NDB/ADF, DME	Explain the functions of various Navigation Equipment's	**K2**
3.1.4	Basic radar principle	Summarize the basic Principle of RADAR	**K2**
3.1.5	Primary and secondary radar	List out the principle, advantages and disadvantages of primary and secondary RADAR	**K4**
3.1.6	SSR, Surface Movement Radar, ADS; GPS, VHF antennae, ILS	Make use of different Navigation Instrument for safe and efficient conduct of flight	**K3**
IV	**Air Traffic Control**		
4.1.0	Different Air Traffic Control Units	Compare the different air traffic control unit	**K4**
4.1.1	Concept of FIR	List out the boundaries and functions of FIR	**K4**
4.1.2	Role of FIC	Identify a particular FIC to obtain Information service	**K3**
4.1.3	Five different Flight information region in India	Identify a particular region comes under which FIR	**K3**
4.1.4	Roles and responsibilities of Various air traffic control units- Ground control, Tower, Approach, Area control	List out the roles and responsibilities of various ATC control unit	**K3**
4.1.5	Flight Plan briefing and filling	Built a fully filled flight plan	**K3**
4.1.6	Flight Dispatch	Explain the functions of flight Dispatch	**K2**
4.1.	ATC briefing	Interpret ATC briefing	**K2**
V	**Important Organizations**		

5.1.0	Roles and Responsibility of International Air Transport Association (IATA)	List out the Roles and Responsibilities of IATA	**K4**
5.1.1	International Civil Aviation Organization (ICAO)	Explain the various functions of ICAO	**K2**
5.1.2	DGCA	Categorize the roles and functions of DGCA	**K4**
5.1.3	AAI and its wings	Explain the functions of AAI and its Units	**K2**
5.1.4	Ministry of Civil Aviation	Outline the functions of civil Aviation ministry	**K2**
5.1.5	BCAS	Analyse how security is maintained in Aviation	**K4**
5.1.6	CISF	Summarize the function of CISF under the guidance of BCAS	**K2**
5.1.7	Important convention with these organization	List out the important convention made by the important organization	**K4**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	M	M	-	-	-	-	L	L	-	M	-	-	H
CO2	L	H	M	-	-	-	-	-	-	M	H		
CO3	M	H	H	M	-	L	M	H	H	H	L	M	-
CO4	H	M	H	M	L	M	H	H	H	L	-	L	M
CO5	L	-	H	L	H	H	H	M	H	-	-	L	H
CO6	-	H	M	L	-	-	M	M	M	M	-	L	L

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

SEMESTERIV

S. No	Course Title	Course Code
1.	Tamil IV	
2.	English Through Literature	
3.	Air Regulation-II	U21AV406
4.	Radio Aids	U21AV407
5.	Practical Hangar Workshop- I	U21AV2P2
6.	Aero Engines	U21AV4Y6
7.	Radio Telephony	U21AV4E2

CORE PAPER VI: AIR REGULATION-II

SEMESTER: IV **CODE: U21AV406**

TOTAL HOURS: 4 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Explain about the ruleset the air and navigation light intreaircraft	**K4**	I
2	What is the function of interception at civil aircraft	**K4**	II
3	Define details of margins and lighting	**K2**	III
4	Definition of airport document provide	**K3**	IV
5	Define Requirement for passenger and Customs	**K2**	V
6	Explain ICAO Annexure terminology	**K3**	V

COURSE OBJECTIVE:

- Get an insight into the various laws and rules applicable during flight, airspace restrictions and terminologies associated therewith.

UNIT 1: RULES OF THE AIR

Applicability of rules of the air, General Rules-Protection of persons & property, Surface movement of Aircraft, Lights to be displayed by aircraft, Flight plans, VFR, IFR, SVFR, Airspace classification, FIRs & Location indicator, Air Defense Identification Zones, Restricted Areas, Prohibited Area, Danger Area, Navigational lights to be displayed in the aircraft

UNIT 2: INTERCEPTIONS OF CIVIL AIRCRAFT

Interceptions of civil aircraft, procedure, signals for use in the event of interception, phrases for use by intercepting/intercepted aircraft, signals initiated by intercepted aircraft and response by intercepting aircraft, visual signals for aerodrome traffic, visual ground signals, marshalling signals, indicators & signaling devices wind direction indicators, landing direction indicator, signaling lamp, signal panel and signal area

UNIT 3: AERODROMES

Aeronautical Beacon- Location- Characteristics- Identification Beacon-Characteristics, right of way on the ground, Runway Markings-Threshold Markings-Holding position markings, Taxiway markings, Runway lightings-wing bar lights, Taxiway lightings-stop way lights, Isolated aircraft parking position, Aircraft stand markings, Apron safety lines, Road holding position marking, mandatory instruction marking, Declared Distances

UNIT 4: FACILITATION

Definitions, Entry & Departure of aircraft-Description, Purpose & use of aircraft documents, General Declaration-Entry & departure of persons and their baggage-Entry requirement & amp; procedures for crew & other operator's personnel, National Provisions-

Customs duty on aircraft, Customs requirement

UNIT 5: ICAO ANNEXURE TERMINOLOGY

Various definitions, terminologies used in aviation.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Rule Of Aircraft	https://www.civilaviation.gov.in/sites/default/files/moca_000947.pdf
2	Civil Aviation Requirement	http://164.100.60.133/rules/car-ind.htm
3	ICAO Annexure	https://www.icao.int/safety/airnavigation/nationalitymarks/annexes_booklet_en.pdf

REFERENCE BOOKS

1. Air Pilot's Manual, Vol 2, Aviation Laws by Peter. D. Godwin
2. Air Regulation Part 1 by R.K Bali.
3. Air Regulation Part 2 by R.K Bali.

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Rules of the Air**		
1.1	Applicability of rules of the air	Explain Applicability of rules of the air	**K3**
1.2	General Rules-Protection of persons &amp	General Rules-Protection of persons &amp	**K1**
1.3	Surface movement of Aircraft	Define Surface movement of Aircraft	**K3**
1.4	Lights to be displayed by aircraft	What are the Lights to be displayed by aircraft	**K1**
1.5	Flight plans	What is Flight Plans	**K1**
1.6	VFR, IFR, SVFR	Explain VFR, IFR, SVFR	**K2**
1.7	Airspace classification	Explain Airspace classification	**K3**
1.8	FIRs &amp	Define FIRs &amp	**K3**
1.9	Location indicator	What is Location indicator	**K1**
1.10	Air Defence Identification Zones	Explain Air Defence Identification Zones	**K2**
1.11	Restricted Areas, Prohibited Area, Danger Area	Explain Restricted Areas, Prohibited Area, Danger Area	**K2**
1.12	Navigational lights to be displayed in the aircraft	Explain Navigational lights to be displayed in the aircraft	**K3**
II	**Interceptions of Civil Aircraft**		
2.1	Interceptions of civil aircraft	Interceptions of civil aircraft	**K2**
2.2	signals for use in the event of interception	What are signals for use in the event of interception	**K3**
2.3	phrases for use by intercepting/intercepted aircraft	Define phrases for use by intercepting/intercepted aircraft	**K1**
2.4	signals initiated by intercepted aircraft and response by intercepting aircraft	Explain signals initiated by intercepted aircraft and response by intercepting aircraft	**K3**
2.5	Signals	visual signals for aerodrome traffic visual ground signals,	**K3**

		marshalling signals, indicators &amp	
2.6	signalling devices wind direction indicators	Explain signalling devices wind direction indicators	**K1**
2.7	landing direction indicator, signalling lamp, signal panel and signal area	Define landing direction indicator, signalling lamp, signal panel and signal area	**K3**
III	**Aerodromes**		
3.1.0	Aeronautical Beacon	Explain Beacon Aeronautical	**K3**
3.1.1	Beacon	Location- Characteristics- Identification Beacon	**K1**
3.1.2	Runway Markings- Threshold Markings Holding position markings, Taxiway markings	Define Runway Markings- Threshold Markings Holding position markings, Taxiway markings	**K2**
3.1.3	Runway lightings	Explain Runway lightings	**K3**
3.1.4	wing bar lights	What is wing bar lights	**K1**
3.1.5	Taxiway lightings- stop way lights	Define Taxiway lightings- stop way lights	**K3**
3.1.6	Isolated aircraft parking position	Explain Isolated aircraft parking position	**K3**
3.1.7	Aircraft stand markings	What Aircraft stand markings	**K1**
3.1.8	Apron safety lines	What is Apron safety lines	**K1**
3.1.9	Road holding position marking	What is Road holding position marking	**K1**
3.1.10	mandatory instruction marking	What is mandatory instruction marking	**K1**
IV	**Facilitation**		
4.1.0	Entry &amp	Definitions Entry &amp	**K2**
4.1.1	Departure of aircraft-Description	Departure of aircraft- Description	**K1**

4.1.2	use of aircraft documents	use of aircraft documents	**K2**
4.1.3	General Declaration-Entry &amp	General Declaration-Entry &amp	**K3**
4.1.4	departure of persons and their baggage-Entry requirement &amp	departure of persons and their baggage-Entry requirement &amp	**K1**
4.1.5	procedures for crew &amp	procedures for crew &amp	**K1**
4.1.6	National Provisions-Customs duty on aircraft, Customs requirement	National Provisions-Customs duty on aircraft, Customs requirement	**K2**
V	**ICAO Annexure Terminology**		
5.1.0	Various definitions	Various definitions ICAO	**K3**
5.1.1	Terminologies	Terminologies used in aviation.	**K3**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	-	L	-	M	-	-	-	-	M	M	-	L
CO2	L	-	-	-	M	-	-	L	-	L	-	-	L
CO3	L	L	-	L	L	-	-	-	-	M	H	-	-
CO4	-	-	L	-	L	-	-	-	-	-	M	-	-
CO5	L	-	-	-	M	-	-	L	-	-	-	-	L
CO6	L	-	-	-	M	-	-	-	-	L	L	-	-

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

CORE PAPER VII: RADIO AIDS

SEMESTER: IV **CODE: U21AV407**

TOTAL HOURS: 4 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Understand about the Direction-finding Aids	**K4**	I
2	What is Radar and Its types	**K2**	II
3	Classify the Advantage and Disadvantage of the Radar	**K2**	II
4	What is cockpit Display And its types	**K2**	III
5	Explain Secondary Radar Theory and DME	**K3**	IV
6	Explain Secondary Surveillance Radar	**K3**	V

COURSE OBJECTIVE:

- Understand the functioning of various Nav aids that are made available inflight, on ground, principle behind their operation.

UNIT 1: DIRECTION FINDING AIDS

Basic Radio Propagation Principles

VDF-Principles, Factors affecting range (D), Fac\tors affecting accuracy, VHF let-down service.

ADF/NDB-Types of NDB, principles of airborne D/F, frequency range, ADF, RBI, RMI, uses of RBI, Errors (ADF and NDB), and Accuracy.

VOR (VHF OMNIRANGE)-Principle of operation, Airborne equipment, frequency range, Factors affecting accuracy, factors affecting range.

RMI- Advantages and use of RMI, HSI.

UNIT 2: BASIC RADAR

Introduction to RADAR principles, Primary RADAR, Secondary RADAR, Terminology, Advantages and Disadvantages of primary and secondary RADAR, RADAR parameters, use of RADAR, Types of ground radar services, Use of Surveillance RADAR, Types of radar approaches.

UNIT 3: AIRBORNE WEATHER RADAR AND COCKPIT DISPLAYS

Introduction to CRT and LCD Head-up display, Principle of operation and functions of airborne weather Radar, Types of antennae and beam used, Selection of frequency, Intensity of weather displayed in color display, Iso echo circuit, Controls in panel, Mapping display, hazard detections.

UNIT 4: SECONDARY RADAR THEORY AND DME

Introduction to Secondary Radar principle, Transponder, airborne equipment, working principle of DME, Saturation of ground equipment, Distance calculation, slant range, Search mode, Track mode, co-located VOR and DME, ILS paired DME, Use of the equipment.

UNIT5: SECONDARY SURVEILLANCE RADAR

Working principle of SSR, Frequency used, Advantages and disadvantages of SSR, current modes and codes, Mode 'C' and 'S' interrogation, Advantage of Mode S, SQUAWK codes, Fruiting and Garbling.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Basic principle of Radio Propagation	https://www.eetimes.com/rf-basics-radio-propagation/#:~:text=Radio%20waves%20can%20propagate%20from,the%20surface%20of%20the%20earth.
2	Radar theory	https://www.infineon.com/cms/en/product/promopages/makeradar/makeradar-school/radar-theory/
3	Secondary Surveillance Radar	https://en.wikipedia.org/wiki/Secondary_surveillance_radar

Reference Books

1. 1 Oxford- Navigation 2(Radio Navigation)
2. Ground studies for Pilots-Radio Aids
3. General navigation by R.K. Bali
4. Guide to Radio telephony, Radio aids and avionics.

PECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Direction Finding Aids**		
1.1	**VDF**-Principles, Factors affecting range (D)	**Explain VDF**-Principles, Factors affecting range (D)	**K3**
1.2	Factors affecting accuracy, VHF let-down service.	Factors affecting accuracy, VHF let-down service.	**K2**
1.3	**ADF/NDB-**Types of NDB, principles of airborne D/F	Explain **ADF/NDB-**Types of NDB, principles of airborne D/F	**K3**
1.4	frequency range, ADF, RBI, RMI, uses of RBI, Errors (ADF and NDB), and Accuracy.	frequency range, ADF, RBI, RMI, uses of RBI, Errors (ADF and NDB), and Accuracy.	**K2**
1.5	**VOR (VHF OMNIRANGE)-** Principle of operation, Airborne equipment, frequency range	Explain **VOR (VHF OMNIRANGE)-**Principle of operation, Airborne equipment, frequency range	**K3**
1.6	Factors affecting accuracy, factors affecting range. **RMI-** Advantages and use of RMI, HSI.	Factors affecting accuracy, factors affecting range. **RMI-** Advantages and use of RMI, HSI.	**K2**
II	**Basic RADAR**		
2.1	Introduction to RADAR principles	Define Introduction to RADAR principles	**K1**
2.2	Primary RADAR, Secondary RADAR, Terminology	What Is Primary RADAR, Secondary RADAR, Terminology	**K2**
2.3	Advantages and Disadvantages of primary and secondary RADAR, RADAR parameters, use of RADAR,	Advantages and Disadvantages of primary and secondary RADAR, RADAR parameters, use of RADAR,	**K3**

2.4	Types of ground radar services	Types of ground radar services	**K2**
2.5	Use of Surveillance RADAR,	Use of Surveillance RADAR,	**K2**
2.6	Types of radar approaches.	Types of radar approaches.	**K2**
III	**Airborne Weather RADAR and Cockpit Displays**		
3.1.0	Introduction to CRT and LCD Head-up display	Introduction to CRT and LCD Head-up display	**K1**
3.1.1	Principle of operation and functions of airborne weather Radar	Explain Principle of operation and functions of airborne weather Radar	**K2**
3.1.2	Types of antennae and beam used	Types of antennae and beam used	**K2**
3.1.3	Selection of frequency, Intensity of weather displayed in colour display	Selection of frequency, Intensity of weather displayed in colour display	**K2**
3.1.4	Iso echo circuit, Controls in panel, Mapping display, hazard detections.	Iso echo circuit, Controls in panel, Mapping display, hazard detections.	**K1**
IV	**Secondary RADAR Theory and DME**		
4.1.0	Introduction to Secondary Radar principle	Introduction to Secondary Radar principle	**K1**
4.1.1	Transponder, airborne equipment, working principle of DME, Saturation of ground equipment, Distance calculation, slant range	**Explain** Transponder, airborne equipment, working principle of DME, Saturation of ground equipment, Distance calculation, slant range	**K3**
4.1.2	Search mode, Track mode, co-located	What is Search mode, Track mode, co-located VOR and	**K2**

	VOR and DME, ILS paired DME, Use of the equipment	DME, ILS paired DME, Use of the equipment	
V	**Secondary Surveillance RADAR**		
5.1.0	Working principle of SSR, Frequency used	Working principle of SSR, Frequency used	**K3**
5.1.1	Advantages and disadvantages of SSR, current modes and codes,	Advantages and disadvantages of SSR, current modes and codes,	**K2**
5.1.2	Mode 'C' and 'S' interrogation,	What is Mode 'C' and 'S' interrogation,	**K2**
5.1.3	Advantage of Mode S, SQUAWK codes, Fruiting and Garbling	Advantage of Mode S, SQUAWK codes, Fruiting and Garbling	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	M	L	M	-	L	L	L	L	M	-	L	L
CO2	L	M	L	M	-	-	-	-	-	L	L	L	L
CO3	L	M	-	M	-	-	-	-	-	M	-	L	-
CO4	L	M	-	M	-	-	L	-	-	M	-	L	L
CO5	M	M	-	M	-	-	L	--	-	M	-	-	-
CO6	M	M	L	M	-	-	-	-	-	M	-	-	L

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

CORE PRACTICAL II: PRACTICAL HANGAR WORKSHOP- I

SEMESTER: IV **CODE: U21AV2P2**

TOTAL HOURS: 4 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Experiment with Different Aviation tool	**K3**	I
2	Identify a particular tool for a particular Purpose	**K3**	I
3	Organize the used files	**K3**	I
4	Classify the Different classes of fire	**K4**	II
5	Inspect the Source of fire	**K4**	II
6	Choose the Correct fire extinguishers	K5	II

COURSE OBJECTIVE;

- To familiarize with the general tools used in aircraft maintenance

1. FAMILIARIZATION OF GENERAL HAND TOOLS

General Purpose Tools, Hummers and Mallets, Screwdrivers, Pilers and Plier-Type Cutting Tools. Punches Wrenches, Special Wrenches, Torque Wrench, Strap Wrenches. Impact Drivers, Metal Cutting Tools. Hand Snips, Hacksaws, Chisels, Vices, Files, Files—care and Use, Most Commonly Used Files, Care of files. Drills. Twist Drills, Reamers, Countersink, Taps and Dies, Layout and Measuring Tools, Rules. Combination Sets, Scribe, Dividers and Pencil Compasses, Calipers, Micrometer Calipers, Micrometer Parts. Reading a Micrometer, Vernier Scale, using a Micrometer, Vernier Scale, Using a Micrometer, calipers.

2. FIRE TRAINING.

a. Different Types & class of fire.
b. Different types of fire-extinguishers.
c. Procedure of use of fire extinguishers, fire-alarm bell.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	General Hand Tools	https://generaltools.com/hand-tools
2	Fire Training	https://emergency.yale.edu/sites/default/files/files/TMS-Fire-Extinguisher-Training.pdf

REFERENCE BOOKS

1. Shop Theory.
2. Airframe and Power plant Mechanics Airframe Handbook (Ac65- 9A) by Shroff Publishers.
3. Airframe and Power Plant mechanics Airframe handbook (Ac65- 15A) by Shroff Publishers

PECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Familiarization of general hand tools**		
1.1	Experiment with Different Aviation tool	Experiment with Different Aviation tool	**K3**
1.2	Identify a particular tool for a particular Purpose	Identify a particular tool for a particular Purpose	**K3**
1.3	Organize the used files	Organize the used files	**K3**
1.4	Categories the files Selection	Categories the files Selection	**K4**
1.5	Explain the procedure to read venire scale	Explain the procedure to read venire scale	**K2**
1.6			
II	**Fire Training**		
2.1	Classify the Different classes of fire	Classify the Different classes of fire	**K4**
2.2	Inspect the Source of fire	Inspect the Source of fire	**K4**
2.3	Choose the Correct fire	Choose the Correct fire	K5
2.4	Demonstrate the procedure to use fire extinguisher	Demonstrate the procedure to use fire extinguisher	**K2**
2.5	Explain Different fire warning Experiment	Explain Different fire warning Experiment	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	H	L	H	-	-	M	M	M	H	M	M	H
CO2	M	H	-	H	-	-	M	M	M	H	M	L	H
CO3	H	L	L	L	M	-	L	M	L	-	M	-	L
CO4	H	H	M	H	-	M	M	L	L	M	M	-	H
CO5	M	M	L	M	-	M	M	H	H	H	H	-	H
CO6	M	H	M	H	-	M	M	L	M	H	H	-	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

ALLIED VI: AERO ENGINES

SEMESTER: IV **CODE: U21AV4Y6**

TOTAL HOURS: 4 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Summaries the Basics of set Principle	**K2**	I
2	Illustrate the working of air Intake	**K2**	II
3	List out the various types of compressors and its benefits	**K4**	III
4	Dissect and explain the different part of a combustion chamber	**K4**	IV
5	Explain the working principle of Fuel Atomizer and Igniter	**K2**	IV
6	Discuss the faults of a compressor	**K6**	V

COURSE OBJECTIVE:

- Understand the principle behind Gas Turbine Engine operation, their working, types and components.

UNIT 1: GAS TURBINE THEORY

Introduction, Jet engine types, principle of jet thrust, engine efficiency, factors affecting thrust, internal engine parameter change, The gas turbine cycle, effects of Ram, density, and Temperature.

UNIT 2: AIR INTAKES

Intake design, Design requirement of an ideal air intake, Airflow through Ducts, Types of Air intake design (simple pitot, conical spike, wedge type),Subsonic Intake & Intake operation (critical, sub critical & super critical operations), Supersonic intake, shock waves, supersonic theory & supersonic inlet duct three speed zones operations (subsonic, Transonic & supersonic), Types of intakes for supersonic flight (pitot type & External compression, External compression types (Two shock, three shocks, Isentropic Amp; variable geometry intakes), Super intake critically (critical, sub critical & super critical operations).

UNIT 3: COMPRESSORS

Introduction, design basic requirement of a compressor, Centrifugal compressor, Main feature of single stage centrifugal compressor, Principles of operation & efficiency loss of CF Compressor, airflow through double entry impeller, , diffuser system, Axial flow compressor , construction & its principles of operation, Reverse flow compressor, The main features of axial flow compressors, compressor stall & surging, Stall conditions/occasions (At low & high RPM & acceleration stall) effects of compressor surge, Avoidance of compressor stall & surge (variable position guide vanes, air release valves (Bleed valves), multi spool engines, Variable area nozzle), compressor icing Axial & centrifugal type and causes of icing, comparison of axial flow and centrifugal flow compressor engines.

UNIT 4: COMBUSTION SYSTEMS

Introduction, combustion system requirements, Basic types of combustion chambers, multiple combustion chambers, The annular combustion chamber, Cannular combustion chamber, The direct flow type combustion chamber, Reverse flow combustion chamber, Advantage & disadvantages of Annular over other two types of CC, Fuel injection and vaporization, Atomization of fuel, Types of Burners (simplex, duplex, spill & Lubbock).

UNIT 5: TURBINES

Introduction, turbine principle of operation, constructions of Reaction and impulse turbine, Basic Material requirements of turbine, turbine faults (loss of tip clearance, buckling, cracking and distortion, FOD, Turbine blade containment),turbine blade creep, Types of installations (Single spool, multi-spool, Direct couple & free turbines), nozzle guide vanes (NGV), Exhaust system & its components (Exhaust unit, Jet pipe & Propelling Nozzle), Turbofan Engines: Turbofan engine layout, Bypass ratio, Turbofan engine performance, Turboprop Engines: principle of operation, types of turboprop engines, turboprop reduction gearing, propeller and engine control (constant speed control unit), turboprop performance, Introduction, Turbo Prop aircraft, principle of operation.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Gas Turbine Theory	https://en.wikipedia.org/wiki/Gas_turbine
2	Air Intakes	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/air-intakes
3	Combustion Systems	https://www.sciencedirect.com/topics/engineering/combustion-system

REFERENCE BOOKS

1. The Professional Pilot Study Guide Series, Mike Burton.
2. Aerodynamics, Engines and Airframe Systems for Air Transport Pilot,
A Trevor Thom Manual.

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Gas Turbine Theory**		
1.1	Introduction	Outline the basic about jet engine	**K2**
1.2	Jet engine types	List out the different type of Jet engine	**K4**
1.3	principle of jet thrust	Illustrate the working principle of jet thrust	**K2**
1.4	engine efficiency	Decide the factors which Influence the efficiency of engine	**K5**
1.5	factors affecting thrust	List out the factors which affect thrust	**K4**
1.6	internal engine parameter change	Inspect the factors which changes the engine parameter	**K4**
1.7	The gas turbine cycle	Explain\e the cycle of gas turbine engine	**K2**
1.8	Effects of Ram	Summarise the effects of Ram in jet engine	**K2**
1.9	Density and temperature	Summarised the effects of Ram in jet engine	**K2**
II	Air Intakes		

2.1	Intake design	Introduction of Intake design	**K2**
2.2	Design requirement of an ideal air intake	Design requirement of an ideal air intake	**K2**
2.3	Airflow through Ducts	Define Airflow through Ducts	**K3**
2.4	Types of Air intake design (simple pitot, conicalspike, wedge type)	Explain Types of Air intake design (simple pitot, conicalspike, wedge type)	**K2**
2.5	Subsonic Intake &amp	What is Subsonic Intake &amp	**K3**
2.6	Intake operation(critical, sub critical & super critical operations), Supersonic intake, shock waves, supersonic theory &amp	Explain Intake operation(critical, sub critical & super critical operations), Supersonic intake, shock waves, supersonic theory &amp	**K2**
2.7	supersonic inlet duct three speed zones operations (subsonic, Transonic& supersonic),	Discuss about supersonic inlet duct three speed zones operations (subsonic, Transonic& supersonic),	**K2**
2.8	Types of intakesfor supersonic flight (pitot type & External compression, External compression types (Two shock, three shocks, Isentropic &Amp; variable geometry intakes)	Types of intakes for supersonic flight (pitot type & External compression, External compression types (Two shock, three shocks, Isentropic &Amp; variable geometry intakes)	**K2**
2.9	Super intake critically (critical, sub critical & super critical operations).	Super intake critically (critical, sub critical & super critical operations).	**K2**
III	**Compressors**		
3.1.0	Introduction	Introduction of compressor	**K1**
3.1.1	design basic requirement of a compressor	design basic requirement of a compressor	**K2**

3.1.2	Centrifugal compressor	Explain Centrifugal compressor	**K3**
3.1.3	Main feature of single stage centrifugal compressor	Explain Main feature of single stage centrifugal compressor	**K2**
3.1.4	Centrifugal Compressor	efficiency loss of CF Compressor, airflow through double entry impeller, , diffuser system	**K2**
3.1.5	Axial flow compressor	Axial flow compressor , construction & its principles of operation, Reverse flow compressor	**K3**
3.1.6	The main features of axial flow compressors, compressor stall & surging, Stall conditions/occasions (At low & high RPM & acceleration stall) effects of compressor surge	The main features of axial flow compressors, compressor stall & surging, Stall conditions/occasions (At low & high RPM & acceleration stall) effects of compressor surge	**K2**
3.1.7	Avoidance of compressor stall & surge (variable position guide vanes, air release valves (Bleed valves), multi spool engines, Variable area nozzle),	Explain Avoidance of compressor stall & surge (variable position guide vanes, air release valves (Bleed valves), multi spool engines, Variable area nozzle),	**K3**
3.1.8	compressor icing Axial & centrifugal type and causes of icing, comparison of axial flow and centrifugal flow compressor engines.	Explain compressor icing Axial & centrifugal type and causes of icing, comparison of axial flow and centrifugal flow compressor engines.	**K3**
IV	**Combustion Systems**		

4.1.0	Introduction, combustion system requirements	Introduction, combustion system requirements	**K2**
4.1.1	Basic types of combustion chambers multiple combustion chambers, The annular combustion chamber, Cannular combustion chamber, The direct flow type combustion chamber, Reverse flow combustion chamber	Basic types of combustion chambers multiple combustion chambers, The annular combustion chamber, Cannular combustion chamber, The direct flow type combustion chamber, Reverse flow combustion chamber	**K2**
4.1.2	Advantage & disadvantages of Annular over other two types of CC,	Advantage & disadvantages of Annular over other two types of CC,	**K2**
4.1.3	Fuel injection and vaporization, Atomization of fuel	Explain Fuel injection and vaporization, Atomization of fuel	**K3**
4.1.4	Types of Burners (simplex, duplex, spill& Lubbock).	Types of Burners (simplex, duplex, spill& Lubbock).	**K2**
V	**Turbines**		
5.1.0	Introduction, turbine principle of operation	Introduction, turbine principle of operation	**K2**
5.1.1	constructions of Reaction and impulse turbine,	Explain constructions of Reaction and impulse turbine	**K3**
5.1.2	Basic Material requirements of turbine	Discuss about Basic Material requirements of turbine	**K2**
5.1.3	turbine faults (loss of tip clearance,buckling,cracking and distortion,FOD,Turbine blade containment),	Define turbine faults (loss of tip clearance,buckling,cracking and distortion,FOD,Turbine blade containment), turbine blade creep,	**K3**

	turbine blade creep,		
5.1.4	Types of installations (Single spool,multi-spool, Direct couple & free turbines), nozzle guide vanes (NGV),	Types of installations (Single spool,multi-spool, Direct couple & free turbines), nozzle guide vanes (NGV),	**K2**
5.1.5	Exhaust system & its components (Exhaust unit, Jet pipe & Propelling Nozzle),	Illustrate Exhaust system & its components (Exhaust unit, Jet pipe & Propelling Nozzle),	**K3**
5.1.6	Turbofan Engines	Turbofan engine layout, Bypass ratio,Turbofan engine performance	**K2**
5.1.7	Turboprop Engines	principle of operation, types of turboprop engines, turboprop reduction gearing, propeller and engine control (constant speed control unit), turboprop performance	**K3**
5.1.8	Turbo Prop aircraft	Introduction, Turbo Prop aircraft, principle of operation.	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	L	M	L	M	-	-	L	-	-	M	-	-	M
CO2	L	H	-	H	-	-	M	-	-	M	-	-	M
CO3	M	M	-	M	-	-	-	-	-	M	-	-	-
CO4	M	M	L	M	-	-	-	-	-	L	-	-	L
CO5	M	M	-	M	-	-	-	-	-	-	-	L	-
CO6	M	M	-	M	-	-	L	-	-	-	-	L	L

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

NMEC – II: RADIO TELEPHONY

SEMESTER: IV **CODE: U21AV4E2**

TOTAL HOURS: 2 **CREDITS: 2**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Explain the Duties of Different Bodies in Aviation and The Rule Made by them	**K2**	I
2	Interpret the Meaning of marking and lighting in airport	**K2**	II
3	Outline Of the Air traffic Service	**K3**	III
4	What is basic Radio Propagation	**K2**	IV
5	What is Frequency Bands	**K2**	IV
6	Analyze Basic Commercial Between Aircraft ATC and Aircraft	**K4**	V

COURSE OBJECTIVE:

To understand various aviation terminologies, Standard Universal Communication Procedures followed by different departments of Aviation.

COURSE CONTENT:

UNIT-1: REGULATIONS:

Duties of ITU, ICAO, AAI, WPC, ICAO Annexure, Aviation phonetic alphabet, and Transmission of numerical, Aircraft Identification, Location Indicators

UNIT2: MARKING AND LIGHTING:

Runway marking, threshold markings, taxiway markings, runway lights, t hreshold lights, taxiway lights

UNIT3: AIR TRAFFIC SERVICES (ATS):

Objective of ATS, Flight Information service, Alerting Service, Air Traffic Advisory Service, Air Traffic control Service, Air Traffic control Service Provided by various Air traffic control Units And its control Boundary

UNIT 4: BASIC RADIO PROPAGATION:

Properties of radio wave, Wave length, Frequency, Frequency bands, frequency modulation, Amplitude modulation, Types of propagation, Refraction, reflection, diffraction, Attenuation

UNIT 5: COMMUNICATION:

Introduction to radio call format, Radio strength check call, Startup clearance and pushback clearance call, Taxi clearance call, ATC clearance call

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Marking and lighting	https://www.icao.int/NACC/Documents/Meetings/2012/ICAOFAAAGACertification2012/ICAOFAACertification07.pdf
2	Air Traffic Services (ATS)	https://mediawiki.ivao.aero/index.php?title=Air_traffic_services
3	Radio Propagation Basic	https://en.wikipedia.org/wiki/Radio_propagation

REFERENCE BOOKS

Radio telephony, K.D. Tuli
Air Regulation by R.K Bali
Air navigation by R.K Bali

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Regulations**		
1.1	Duties of ITU	Analysis's duties of ITU	**K4**
1.2	ICAO	Develops and understanding of their rules & regulation	**K3**
1.3	AAI	Develops and understanding of their rules & regulation	**K3**
1.4	WPC	Develops and understanding of their rules & regulation	**K3**
1.5	ICAO annexure	Classifies contents of difference annexure	**K2**
1.6	Spelling of alphabets & transmission of numerical	Demonstrates the pronunciation of alphabet & numerical	**K2**
1.7	Aircraft ident	Interprets basic ident	**K2**
1.8	Location indicators	Interprets basic ident	**K2**
1.9	FIR	Analyses difference FIR & ground services	**K4**
1.10	Identification of ground services	Analyses difference FIR & ground services	**K4**
II			
2.1	Runway marking	Explain Runway marking	**K2**
2.2	threshold markings	Explain threshold markings	**K3**
2.3	taxiway markings	Detail about taxiway markings	**K2**
2.4	runway lights	Explain About runway lights	**K3**
2.5	threshold lights	Detail About threshold lights	**K2**
2.6	taxiway lights	Explain About taxiway lights	**K2**
III	**Air Traffic Services (ATS)**		
3.1.0	Objective of ATS	Explain Objective of ATS	**K2**
3.1.1	Flight Information service	Explain Flight Information service	**K2**

3.1.2	Alerting Service	Detail about Alerting Service	**K2**
3.1.3	Air Traffic Advisory Service	What is Air Traffic Advisory Service	**K2**
3.1.4	Air Traffic control Service	Air Traffic control Service Provided by various Air traffic control Units And its control Boundary	**K3**
IV	**Basic Radio Propagation**		
4.1.0	Properties of radio wave	Explain Properties of radio wave	**K2**
4.1.1	Wave length, Frequency, Frequency bands, frequency modulation, Amplitude modulation	**Types:** Wave length, Frequency, Frequency bands, frequency modulation, Amplitude modulation	**K3**
4.1.2	Types of propagation, Refraction, reflection, diffraction, Attenuation	Types of propagation, Refraction, reflection, diffraction, Attenuation	**K2**
V	**Communication**		
5.1.0	Introduction to radio call format	Introduction to radio call format	**K1**
5.1.1	Radio strength check call	What is Radio strength check call	**K2**
5.1.2	Start-up clearance and pushback clearance call	Explain Start-up clearance and pushback clearance call	**K2**
5.1.3	Taxi clearance call, ATC clearance call	What Taxi clearance call, ATC clearance call	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	H	-	M	-	H	L	-	L	L	M	M	L	M
CO2	H	M	M	M	L	L	M	M	M	H	H	M	M
CO3	M	-	H	-	M	M	L	-	-	M	M	L	M
CO4	M	M	H	M	-	L	L	-	-	L	L	M	M
CO5	M	L	H	L	-	-	L	-	-	L	-	-	L
CO6	H	H	H	H	-	M	M	M	M	M	M	L	M

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II 2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation 3.End Semester Examination
Indirect
1. course – end survey feed back

SEMESTER- V

S. No	Course Title	Course Code
1.	LanguageII	
2.	EnglishCommunicationSkills-II	
3.	Flight Performance and Planning	U21AV508
4.	Aircraft Instruments	U21AV509
5.	Meteorology - II	U21AV510
6	Aircraft Systems	U21AV5:2
7	Civil Aviation Requirements (Car) And Safety Management systems	U21AV5:3
8	Aviation Security	U21AV5S2
9	Introduction To Aviation	U21AV5S3
10	Practical Hangar Workshop - Ii	U21AV5P3

CORE PAPER VIII: FLIGHT PERFORMANCE AND PLANNING

SEMESTER: V **`CODE: U21AV508**

TOTAL HOURS: 5 **CREDITS: 4**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Apply the previous knowledge in different scenario take off Performance	K3	I
2	Performance based on the Landing	**K2**	II
3	Characteristics of the Runway Details	**K2**	III
4	Plan for diversion & rerouting	K3	IV
5	Plan for En rerouting	**K3**	IV
6	Explain About Weight and Balancing	**K2**	V

COURSE OBJECTIVE:

- To understand, infer and interpret performance charts, weight and balance restrictions and its effects.

COURSE CONTENT:

UNIT 1: TAKE-OFF PERFORMANCE

Using performance data, effects of weight and altitude, Take- Off performance, wind factors, Runway inclination, Condition of Runway, V1, V2, Var, Vlof, Vmbe, Vmcg, Vacca, Take- Off flap setting, factors affecting take-off performance.

UNIT 2: LANDING PERFORMANCE

Landing performance data, factors affecting landing performance, effects of weight and altitude, wind factors, runway surface, runway slope, Runway condition, flap setting, recommended safety factors for landing, approach speeds.

UNIT 3: RUNWAY CHARACTERISTICS

Take-off distance available (TODA), Take-Off run available (TORA), clearway, rejected Take-Offs, emergency distance, stop way, landing distance available (LDA). Accelerate Stop Distance Available (ASDA)

UNIT 4: EN ROUTE PERFORMANCE

Power required and power available curves, range and endurance, best -range speed, maximum- range speed, best endurance speed, cost index, influence of density, weight of aircraft, winds, ceiling, service ceiling, absolute celling.

UNIT 5: WEIGHT AND BALANCE

Definitions (basic empty weight, maximum zero fuel weight, maximum takeoff weight, maximum landing weight, payload, rap weight), weight of fuel, weight restrictions, effect of cg on the position of airplane, movement of CG position, mathematical approaches to weight and balance, dangerous goods, baggage and cargo restraint.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Landing And Take Off Performance	**https://www.flight-study.com/2021/04/aircraft-takeoff-and-landing-performance.html#:~:text=Takeoff%20and%20landing%20performance%20is,and%20decelerates%20to%20zero%20speed.**
2	En Route Performance	**https://ansperformance.eu/methodology/en-route-vertical-flight-efficiency-pi/**
3	Weight And Balance	**https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/faa-h-8083-1.pdf**

REFERENCE BOOKS

1. Oxford – Flight Performance and planning.
2. Ground studies for pilots, Flight planning.

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Take-Off Performance**		
1.1	Using performance data, effects of weight and altitude	Using performance data, effects of weight and altitude	**K2**
1.2	Take- Off performance	wind factors, Runway inclination, Condition of Runway	**K3**
1.3	V1, V2, Vr, Vlof, Vmbe, Vmcg,Vmca,	Explain V1, V2, Vr, Vlof, Vmbe,Vmcg,Vmca,	**K2**
1.4	Take- Off flap setting	Detail about Take- Off flap setting	**K2**
1.5	factors affecting take-off performance	factors affecting take-off performance	**K3**
II	**Landing Performance**		
2.1	Landing performance data	Explain Landing performance data	**K2**
2.2	factors affecting landing performance	factors affecting landing performance	**K2**
2.3	effects of weight and altitude	effects of weight and altitude	**K2**
2.4	wind factors, runway surface, runway slope, Runway condition, flap setting	Classifies the wind factors, runway surface, runway slope, Runway condition, flap setting	**K2**
2.5	Recommended safety factors for landing, approach speeds	Recommended safety factors for landing, approach speeds	**K3**
III	**Runway Characteristics**		
3.1.0	Take-off distance available (TODA),	Explain Take-off distance available (TODA),	**K2**
3.1.1	Take-Off run available (TORA)	Explain Take-Off run available (TORA)	**K2**
3.1.2	clearway rejected Take-Offs, emergency distance, stop way	What is clearway rejected Take-Offs, emergency distance, stop way	**K2**

3.1.3	landing distance available (LDA).	landing distance available (LDA).	**K3**
3.1.4	Accelerate Stop Distance Available (ASDA)	Accelerate Stop Distance Available (ASDA)	**K2**
IV	**En Route Performance**		
4.1.0	Power required and power available curves	Explain Power required and power available curves	**K2**
4.1.1	range and endurance, best -range speed, maximum- range speed, best endurance speed,	**What** range and endurance, best -range speed, maximum- range speed, best endurance speed,	**K2**
4.1.2	cost index, influence of density, weight of aircraft, winds, ceiling, service ceiling, absolute celling	Explain cost index, influence of density, weight of aircraft, winds, ceiling, service ceiling, absolute celling	**K2**
V	**Weight and Balance**		
5.1.0	Definitions (basic empty weight, maximum zero fuel weight, maximum takeoff weight, maximum landing weight, payload, rap weight)	Definitions (basic empty weight, maximum zero fuel weight, maximum takeoff weight, maximum landing weight, payload, rap weight)	**K3**
5.1.1	weight of fuel	What is weight of fuel	**K2**
5.1.2	weight restrictions,	What is weight restrictions	**K2**
5.1.3	effect of cg on the position of airplane	effect of cg on the position of airplane	**K3**
5.1.4	movement of CG position	Explain movement of CG position	**K2**
5.1.5	mathematical approaches to weight and balance	Explain mathematical approaches to weight and balance	**K4**

5.1.6	dangerous goods, baggage and cargo restraint.	Define dangerous goods, baggage and cargo restraint	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	M	M	M	L	L	H	H	M	M	L	H	H
CO2	H	M	M	M	-	-	M	M	M	L	L	H	H
CO3	L	M	L	L	-	-	L	-	-	L	M	M	H
CO4	M	M	M	M	L	-	M	M	M	L	M	M	L
CO5	M	M	M	M	-	-	M	M	-	M	L	H	H
CO6	H	M	H	H	-	-	H	M	-	L	L	H	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

CORE PAPER IX: AIRCRAFT INSTRUMENTS

SEMESTER: V **CODE: U21AV509**

TOTAL HOURS: 5 **CREDITS: 4**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Outline of the Pressure instrument and types of pressure	**K3**	I
2	Describe About working principle and construction of Air speed indicator	**K3**	II
3	Describe About working principle and construction of Vertical Speed Indicator	**K3**	III
4	Study of Earth Magnetism	**K2**	IV
5	Study of Magnetic Compass	**K2**	IV
6	Describe about Gyro Instrument	**K2**	V

COURSE OBJECTIVE:

- To understand the various principles and functions of pressure instruments and gyro instruments.

COURSE CONTENT:

UNIT 1: PRESSURE INSTRUMENTS

Revision on atmospheric pressure, static pressure, dynamic pressure, Pressure system, Pressure altimeter, simple altimeter, sensitive altimeter, servo-assisted altimeter- its working principle and construction, 10000 feet warning flag, altimeter errors, blockage and leakage associated with altimeter, purpose of servo assisted altimeter, Hysteresis.

UNIT 2: AIRSPEED INDICATORS

Working Principle and construction of ASI, speeds which are mentioned on the dial of ASI using colored ark, IAS, TAS, EAS, CAS, RAS, conversion, error, leakages and blockages associated with ASI. Mach meter, its principle, Mach/TAS calculations, Mach meter errors.

UNIT 3: VERTICAL SPEED INDICATOR

Working principle and construction of VSI, Delayed Static pressure, best rate of climb (Vy), Best angle of climb (Vx), Pressure error, Time lag, Position error and blockages, Instantaneous vertical speed indicator (IVSI), Purpose of IVSI, Dashpot, Problem with Dashpot during turn.

UNIT 4: MAGNETISM AND COMPASS.

Earth magnetism, Properties of magnet, Horizontality, sensitivity, aperiodicity, turning error, acceleration error, variation and deviation, Compass heading, magnetic heading, true heading.

UNIT 5: GYRO INSTRUMENTS

Properties and fundamentals of gyros, types of gyros-space gyro, earth gyro, tied gyro, rate gyro, drift, topple and wander, gyro rotor, spin axis Direction Indicator-Principle of operation, adjustment procedure, erection system, gimbal error, Drift calculation, Drift compensation Attitude Indicator- Principle and construction, erection mechanism, acceleration errors, turning errors, electrically driven attitude indicator and its errors Turn and slip Indicator- Principle and construction, bank indication, turn coordinator.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	**Pressure Instruments, Gyro Instruments**	**https://pilotinstitute.com/gyroscopic-instruments/#:~:text=The%203%20main%20gyroscopic%20instruments,aircraft's%20orientation%20can%20be%20measured.**
2	**speed Indicators**	**https://www.skybrary.aero/articles/air-speed-indicator#:~:text=An%20air%20speed%20indicator%20(ASI,and%20thus%20determine%20forward%20speed.**
3	**Magnetism and compass**	**https://www.exploratorium.edu/snacks/circles-of-magnetism#:~:text=A%20compass%20allows%20us%20to,parallel%20to%20magnetic%20field%20lines.**

REFERENCE BOOKS

1. GSP – Flight instruments
2. Oxford – general Knowledge 4 (Instrumentation)

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Pressure Instruments**		
1.1	Revision on atmospheric pressure, static pressure, dynamic pressure, Pressure system	Revision on atmospheric pressure, static pressure, dynamic pressure, Pressure system	**K2**
1.2	Pressure altimeter, simple altimeter, sensitive altimeter, servo-assisted altimeter- its working principle and construction	Pressure altimeter, simple altimeter, sensitive altimeter, servo-assisted altimeter- its working principle and construction	**K3**
1.3	10000 feet warning flag, altimeter errors,	Define 10000 feet warning flag, altimeter errors,	**K2**
1.4	blockage and leakageassociated with altimeter	Explain blockage and leakageassociated with altimeter	**K2**
1.5	purpose of servo assisted altimeter, Hysteresis.	purpose of servo assisted altimeter, Hysteresis.	**K2**
II	**Airspeed Indicators**		
2.1	Working Principle and construction of ASI	Working Principle and construction of ASI	**K3**
2.2	speeds which are mentioned on the dial of ASI using colored ark	Explain speeds which are mentioned on the dial of ASI using colored ark	**K3**
2.3	IAS, TAS, EAS, CAS, RAS, conversion, error,	Detail about IAS, TAS, EAS, CAS, RAS, conversion, error,	**K2**

	leakages and blockages associated with ASI	leakages and blockages associated with ASI	
2.4	Mach meter, its principle, Mach/TAS calculations,	What is Mach meter, its principle, Mach/TAS calculations	**K2**
2.5	Mach meter errors.	Explain Mach meter errors.	**K3**
III	**Vertical speed indicator**		
3.1.0	Working principle and construction of VSI	Explain Working principle and construction of VSI	**K3**
3.1.1	Delayed Static pressure	What is Delayed Static pressure	**K2**
3.1.2	best rate of climb (Vy), Best angle of climb (Vx),	Explain best rate of climb (Vy), Best angle of climb (Vx),	**K2**
3.1.3	Pressure error, ,	What is Pressure error	**K2**
3.1.4	Time lag, Position errorand blockages	What is Time lag, Position errorand blockages	**K3**
3.1.5	Instantaneous vertical speed indicator (IVSI)	Explain Instantaneous vertical speed indicator (IVSI)	**K2**
3.1.6	Purpose of IVSI, Dashpot, Problem with Dashpot during turn.	Purpose of IVSI, Dashpot, Problem with Dashpot during turn.	**K3**
IV	**Magnetism and compass**		
4.1.0	Earth magnetism	Explain Earth magnetism	**K2**
4.1.1	Properties of magnet	Horizontality, sensitivity, aperiodicity, turning error, acceleration error, variation and deviation	**K2**
4.1.2	Compass	Compass heading, magnetic heading, true heading.	
V	**Gyro Instruments**		
5.1.0	Properties and fundamentals of gyros	Properties and fundamentals of gyros	**K2**

5.1.1	types of gyros-space gyro, earth gyro, tied gyro, rate gyro, drift, topple and wander, gyro rotor, spin axis	types of gyros-space gyro, earth gyro, tied gyro, rate gyro, drift, topple and wander, gyro rotor, spin axis	**K3**
5.1.2	Direction Indicator-Principle of operation	What is Direction Indicator-Principle of operation	**K2**
5.1.3	adjustment procedure, erection system, gimbal error,	adjustment procedure, erection system, gimbal error	**K3**
5.1.4	Drift calculation, Drift compensation	Drift calculation, Drift compensation	**K4**
5.1.5	Attitude Indicator-Principle and construction, erection mechanism, acceleration errors, turning errors	Attitude Indicator- Principle and construction, erection mechanism, acceleration errors, turning errors	**K3**
5.1.6	electrically driven attitude indicator and its errors Turn and slip Indicator-	Explain electrically driven attitude indicator and its errors Turn and slip Indicator	**K4**
5.1.7	Principle and construction, bank indication, turn coordinator.	Principle and construction, bank indication, turn coordinator.	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	H	H	L	H	-	-	M	-	-	M	L	H	M
CO2	H	H	L	H	-	-	L	-	-	L	L	H	M
CO3	H	H	L	H	-	-	M	-	-	L	-	H	M
CO4	M	H	M	H	-	-	M	-	-	M	-	H	H
CO5	H	H	M	H	-	-	M	-	-	H	-	M	M
CO6	H	H	L	H	-	-	L	-	-	M	-	H	M

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II 2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation 3.End Semester Examination
Indirect
1. course – end survey feed back

CORE PAPER X: METEOROLOGY - II

SEMESTER: V **CODE: U21AV510**

TOTAL HOURS: 4 **CREDITS: 4**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Types of cloud and the study of Clouds	**K2**	I
2	Illustrate Knowledge On the thunderstorm	**K3**	II
3	Illustrate Knowledge on the Air masses	**K3**	II
4	Explain Dangers of Icing And how to rectify in the pilot static System	**K3**	III
5	Outline of the Weather forecast and its Report	**K2**	IV
6	Symbols And Abbreviation in Weather on MET Chart	**K2**	V

COURSE OBJECTIVE:

- To know the various aspects of weather

COURSE CONTENT:

UNIT 1: CLOUDS

Types of clouds according to their height and form, Precipitation, Humidity, Dew point temperature, Adiabatic process, the Fohn wind effect, Precipitation associated with cloud, cumin nimbus, Ice crystal theory, Coalescence theory, Giant nuclei theory, Types of cloud, Various Mountain Clouds, necessary condition for the formation of clouds, condensation trails.

UNIT 2: THUNDERSTORM AND AIR MASSES

Necessary conditions for thunderstorm, life cycle of a thunderstorm, the danger of thunderstorm Air masses, the origin of an air mass, its path, divergence and convergence, the warm front, observation from the ground, observation from the air, the cold front, observation from the ground, observation from the air, the occluded front, depressions, weather associated with it, trough of low pressure, the wave of frontal depression, the cyclone storm, anti-cyclone, weather associated with it, a ridge of high pressure.

UNIT 3: ICING

The dangers of icing, the formation of ice, super-cooled water drops, clear ice, Rime ice, cloudy ice, hoar frost, Deicing, anti-icing, structural icing and cloud type, carburetor icing, pitot static system icing.

UNIT 4: WEATHER FORECAST AND REPORTS

Dissemination of weather information, AIR MET service, types of weather information, meteorological forecast, special forecast, aerodrome forecast, Terminal Aerodrome forecast (TAF), METAR, TRENDS, Specie, Cloud base, VFR- in flight weather report, Automatic Terminal Information System (ATIS), Notam, Signet.

UNIT 5: SYMBOLS AND ABBREVIATIONS

Symbols for significant weather on MET charts, weather abbreviations (Cloud Type), Cloud amount, CB amount, common MET abbreviations, CAVOK, TEMPO, lasting change, Synoptic charts, wind symbols, visibility, METAR decoding.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Types of Clouds	**https://www.weather.gov/jetstream/corefour**
2	**Weather Forecast and report**	**https://en.wikipedia.org/wiki/Weather_forecasting**
3	**Icing and Deicing**	**https://en.wikipedia.org/wiki/Deicing**

REFERENCE BOOKS

1. Aviation meteorology by I.C. Joshi
2. Oxford- meteorology
3. Ground Studies for Pilots – Meteorology

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Clouds**		
1.1	Types of clouds	Types of clouds according to their height and form	**K2**
1.2	Precipitation, Humidity, Dew point temperature, Adiabatic process	Explain Precipitation, Humidity, Dew point temperature, Adiabatic process	**K2**
1.3	the Fohn wind effect, Precipitation associated with cloud	the Fohn wind effect, Precipitation associated with cloud	**K2**
1.4	cumin nimbus, Ice crystal theory, Coalescence theory, Giant nuclei theory,	Camino nimbus, Ice crystal theory, Coalescence theory, Giant nuclei theory,	**K3**
1.5	Types of cloud, Various Mountain Clouds	Types of cloud, Various Mountain Clouds	**K2**
1.6	necessary condition for the formation of clouds, condensation trails.	What is the necessary condition for the formation of clouds, condensation trails?	**K3**
2	**Thunderstorm and Air Masses**		
2.1.0	Necessary conditions for thunderstorm	Necessary conditions for thunderstorm	**K2**
2.1.1	life cycle of a thunderstorm, the danger of thunderstorm	life cycle of a thunderstorm, the danger of thunderstorm	**K3**
2.1.2	Air masses, the origin of an air mass its path, divergence and convergence	Explain Air masses, the origin of an air mass its path, divergence and convergence	**K2**
2.1.3	the warm front, observation from the ground	What is the warm front, observation from the ground	**K2**
2.1.4	observation from the air, the cold front, observation from the ground, observation from the air, the occluded front, depressions,	observation from the air, the cold front, observation from the ground, observation from	**K2**

		the air, the occluded front, depressions,	
2.1.5	weather associated with it, trough of low pressure, the wave of frontal depression, the cyclone storm, anti-cyclone	weather associated with it, trough of low pressure, the wave of frontal depression, the cyclone storm, anti-cyclone	**K3**
2.1.6	weather associated with it, a ridge of high pressure.	weather associated with it, a ridge of high pressure.	**K2**
3	**Icing**		
3.1.0	The dangers of icing	Explain The dangers of icing	**K3**
3.1.1	the formation of ice	Explain the formation of ice	**K3**
3.1.2	super-cooled water drops	What is super-cooled water drops	**K2**
3.1.3	clear ice, Rime ice, cloudy ice, hoar frost	Explain Rime ice, cloudy ice, hoar frost	**K2**
3.1.4	De-icing, anti-icing	Classify De-icing, anti-icing	**K3**
3.1.5	structural icing and cloud type	structural icing and cloud type	**K2**
3.1.6	carburettor icing, pitot static system icing	Explain carburettor icing, pitot static system icing	**K3**
4	**Weather Forecast and Reports**		
4.1.0	Dissemination of weather information	Dissemination of weather information	**K2**
4.1.1	AIR MET service	What is AIR MET service	**K2**
4.1.2	types of weather information	Classify the types of weather information	**K3**
4.1.3	meteorological forecast	Explain meteorological forecast	**K2**
4.1.4	special forecast	Explain special forecast	**K2**
4.1.5	aerodrome forecast	Explain aerodrome forecast	**K2**
4.1.6	Terminal Aerodrome forecast (TAF),	Define Terminal Aerodrome forecast (TAF),	**K2**
4.1.7	METAR, Transspecies	Classify METAR, Transspecies	**K1**
4.1.8	VFR- in flight weather report,	Define VFR- in flight weather report,	**K2**
4.1.9	Automatic Terminal Information System (ATIS)	Explain Automatic Terminal Information System (ATIS)	**K3**
4.1.10	Notam, Sigma.	Notam, Signet	**K1**

5	**Symbols and Abbreviations**		
5.1.0	Symbols for significant weather on MET charts	Short note on Symbols for significant weather on MET charts	**K4**
5.1.1	weather abbreviations (Cloud Type),	What weather abbreviations (Cloud Type),	
5.1.2	Cloud amount	Cloud amount	**K2**
5.1.3	CB amount, common MET abbreviations	CB amount, common MET abbreviations	**K2**
5.1.4	CAVOK, TEMPO, lasting change,	CAVOK, TEMPO, lasting change,	**K2**
5.1.5	Synoptic charts, wind symbols, visibility, METAR decoding	Synoptic charts, wind symbols, visibility, METAR decoding	**K3**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	**M**	**M**	**H**	**M**	**-**	**-**	**M**	**L**	**L**	**M**	**H**	**M**	**M**
CO2	**H**	**M**	**H**	**M**	**-**	**-**	**M**	**-**	**-**	**-**	**H**	**M**	**M**
CO3	**M**	**M**	**H**	**M**	**-**	**-**	**L**	**-**	**-**	**-**	**H**	**L**	**M**
CO4	**H**	**M**	**H**	**M**	**-**	**-**	**-**	**-**	**-**	**-**	**M**	**M**	**L**
CO5	**M**	**M**	**H**	**M**	**-**	**L**	**M**	**L**	**-**	**L**	**H**	**M**	**H**
CO6	**H**	**M**	**H**	**M**	**-**	**L**	**H**	**L**	**-**	**L**	**H**	**M**	**H**

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

ELECTIVE II: AIRCRAFT SYSTEMS

SEMESTER: V **CODE: U21AV5:2**

TOTAL HOURS: 4 **CREDITS: 4**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Outline of the Hydraulic and Pneumatic Power systems	**K2**	I
2	Illustrate the Air conditioning And Cabin Pressurization of the Aircraft	**K3**	II
3	Identify the Details of the Fuel System	**K2**	III
4	Classify the Landing Gear system	**K2**	IV
5	Explain the Landing Gear Systems	**K3**	IV
6	To know the Knowledge about the Engine Fuel System	**K4**	V

COURSE OBJECTIVE

- To understand the various principles and functions of Hydraulic and Pneumatic Power Systems, Fuel Systems

UNIT 1: HYDRAULIC AND PNEUMATIC POWER SYSTEMS.

Hydraulic System lay-out; Reservoir, pumps, actuator, valves. Pneumatic System lay-out; sources: engine/APU, compressors, air bottles, ground supply, pressure control; distribution.

UNIT 2: AIR CONDITIONING AND CABIN PRESSURIZATION

Air Supply-sources of air supply including engine bleed, APU and ground cart; Air conditioning systems; Air cycle and vapor cycle machines distribution systems; Flow, temperature and humidity control system. Pressurization- Pressurization systems; control and indication including control and safety valves; cabin pressure controllers, safety and warning devices; protection and warning devices

UNIT3: FUEL SYSTEMS

System lay-out, fuel tanks, supply systems, dumping, venting and draining, cross-feed and transfer, indications and warnings, refueling and defueling, longitudinal balance fuel systems.

UNIT4: LANDING GEAR

Construction, shock absorbing, extension and retraction systems, normal and emergency, Indications and warning, wheels, brakes, antiskid and auto braking, tyres, steering, air-ground sensing, skids, floats.

UNIT5: ENGINE FUEL SYSTEMS

Carburetor types, construction and principles of operation, icing and heating, Types of fuel system, construction and principle of operation, Starting systems, pre-heat systems, Magneto types, construction and principles of operation, ignition harness, spark plugs-, low- and high-tension systems.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Hydraulic and Pneumatic power systems	https://www.nexflow.com/blog/difference-between-pneumatics-and-hydraulics/
2	Engine Fuel Systems	https://www.skybrary.aero/articles/aircraft-fuel-systems
3	Landing Gear	https://simpleflying.com/how-does-landing-gear-work/

Reference Books

1. Professional Pilot Study Guide (Mike Burton)
2.Oxford ATPL ground training series-Airframe system.

PECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Hydraulic and Pneumatic power systems**		
1.1	Hydraulic System lay-out	Explain Hydraulic System lay-out	**K3**
1.2	Reservoir, pumps, actuator, valves. Pneumatic System lay-out	Explain Reservoir, pumps, actuator, valves. Pneumatic System lay-out	**K3**
1.3	engine/APU	Define engine/APU	**K3**
1.4	compressors, air bottles, ground supply	Explain compressors, air bottles, ground supply	**K2**
1.5	pressure control; distribution	Define pressure control; distribution	**K2**
II	**Air Conditioning and Cabin Pressurization**		
2.1	Air Supply-sources of air supply including engine bleed	Explain Air Supply-sources of air supply including engine bleed	**K2**
2.2	APU and ground cart	Illustrates APU and ground cart	**K2**
2.3	Air conditioning systems; Air cycle and vapor cycle machines distribution systems	Explain Air conditioning systems; Air cycle and vapor cycle machines distribution systems	**K3**
2.4	Flow, temperature and humidity control system	Explain Flow, temperature and humidity control system	**K1**
2.5	Pressurization systems	Define Pressurization systems	**K2**
2.6	control and indication including control and safety valves	control and indication including control and safety valves	**K3**
2.7	cabin pressure controllers	Illustrate cabin pressure controllers	**K2**
2.8	safety and warning devices	What safety and warning devices	**K1**
2.9	protection and warning devices	Explain protection and warning devices	**K3**

III	**Fuel Systems**		
3.1.0	System lay-out	What is System lay-out	**K1**
3.1.1	fuel tanks	Explain fuel tanks and its use	**K2**
3.1.2	supply systems	Explain supply systems	**K2**
3.1.3	dumping	What is dumping	**K2**
3.1.4	venting and draining	What is venting and draining	**K3**
3.1.5	cross-feed and transfer	Explain cross-feed and transfer	**K2**
3.1.6	indications and warnings	What is indications and warnings	**K3**
3.1.7	refuelling and defueling	refuelling and defueling	**K2**
3.1.8	longitudinal balance fuel systems	Explain longitudinal balance fuel systems	**K2**
IV	**Landing Gear**		
4.1.0	Construction, shock absorbing,	Construction, shock absorbing,	**K2**
4.1.1	extension and retraction systems	**Explain** extension and retraction systems	**K2**
4.1.2	normal and emergency **Landing Gear**	Explain normal and emergency **Landing Gear**	**K2**
4.1.3	Indications and warning **Landing Gear**	Indications and warning **Landing Gear**	**K3**
4.1.4	wheels, brakes, antiskid and auto braking	Define wheels, brakes, antiskid and auto braking	**K1**
4.1.5	tyres, steering, air-ground sensing, skids, floats	Explain tyres, steering, air-ground sensing, skids, floats	**K2**
V	**Engine Fuel Systems**		
5.1.0	Carburettor types	Carburettor types construction and principles of operation	**K3**

5.1.1	icing and heating,	Illustrate icing and heating,	**K 2**
5.1.2	Types of fuel system,	Types of fuel system, construction and principle of operation	**K2**
5.1.3	Starting systems, pre-heat systems	What is Starting systems, pre-heat systems	**K2**
5.1.4	Magneto types, construction and principles of operation	Magneto types, construction and principles of operation	**K3**
5.1.5	ignition harness, spark plugs-, low- and high-tension systems	ignition harness, spark plugs-, low- and high-tension systems	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	M	L	M	-	-	M	M	M	M	-	M	H
CO2	H	H	L	H	-	-	H	M	M	-	-	H	H
CO3	H	H	M	H	-	-	M	M	L	L	-	M	M
CO4	H	H	M	H	-	-	H	L	L	L	L	M	H
CO5	H	H	M	H	-	-	H	L	L	L	L	L	H
CO6	H	H	M	H	-	-	H	M	M	-	-	M	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

ELECTIVE III: CIVIL AVIATION REQUIREMENTS (CAR) AND SAFETY MANAGEMENTSYSTEMS

SEMESTER: V **CODE: U21AV5:3**

TOTAL HOURS: 4 **CREDITS: 4**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Purpose of the civil Aviation and Introduction of Civil Aviation Requirement	**K4**	I
2	Monitoring the Aircraft and the airport Regulation and noise management in Civil Aviation	**K3**	II
3	Study in Terms of General terms of Civil Aviation Requirement.	**K2**	III
4	Study of Airworthiness and air space and air navigation service standard	**K3**	III
5	Safety management System and Indian safety policy	**K2**	IV
6	Describe the Error and case study for the Accidents	**K3**	V

COURSE OBJECTIVE:

- Understanding the various laws and regulations pertaining to aviation safety and standards.

COURSE CONTENT:

UNIT 1: INTRODUCTION

Purpose of Civil Aviation requirement (CAR), purpose of safety management systems, applications, circulars, sections pertaining to various operations.

UNIT 2: AVIATION ENVIRONMENTAL PROTECTION

Noise management of aircraft, Noise Abatement operational Procedure, aircraft operations at airport, climate change initiatives and local air quality monitoring in civil aviation.

UNIT 3: CIVIL AVIATION REQUIREMENTS (CAR)

Section 1 to Section 11

- General
- Airworthiness
- Air transport
- Aerodrome standards
- Air safety
- Design standard and type certification
- Flight crew standard training & licensing
- Aircraft operations
- Airspace and air navigation service standards
- Aviation environment protection
- Safe transport of dangerous goods by air

UNIT 4: SAFETY MANAGEMENT SYSTEM (SMS)

Indian safety policy, Indian safety plan, SMS, SSP, ICAO ANNEX 19- Safety management, establishment of safety management system, applicability of SMS, safety policy and objective, coordination of emergency response planning, documentation, safety management system manual, safety risk management, safety assurance, safety promotions, quality policy.

UNIT 5: CASE STUDIES

Description, error, cause of accident and solution of following accidents.

- American Airlines Flight 587
- Aires Flight 8250
- American airlines flight 191
- Air France 447
- Flight Italia 870

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Safety Management System	https://www.faa.gov/about/initiatives/sms
2	**Case study accidents**	https://www.aopa.org/training-and-safety/online-learning/accident-case-studies
3	**CAR**	http://164.100.60.133/rules/car-ind.htm

REFERENCE BOOKS

1. DGCA website for latest CAR updates.
2. Aerodrome Information Publication (AIP)

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Introduction**		
1.1	Purpose of Civil Aviation requirement (CAR)	**Explain** Purpose of Civil Aviation requirement (CAR)	**K2**
1.2	purpose of safety management systems	Explain purpose of safety management systems	**K3**
1.3	applications, circulars, sections pertaining to various operations	applications, circulars, sections pertaining to various operations	**K2**
II	**Aviation Environmental Protection**		
2.1	Noise management of aircraft	Explain Noise management of aircraft	**K2**
2.2	Noise Abatement operational Procedure	Explain Noise Abatement operational Procedure	**K2**
2.3	aircraft operations at airport	aircraft operations at airport	**K3**
2.4	climate change initiatives and local air quality monitoring in civil aviation.	climate change initiatives and local air quality monitoring in civil aviation.	**K3**
III	**Civil Aviation Requirements (CAR)**		
3.1.0	Section 1 to Section 11	General	**K1**
3.1.1	Airworthiness	Explain Airworthiness	**K2**
3.1.2	Air transport	Explain Air transport	**K2**
3.1.3	Aerodrome standards	Explain Aerodrome standards	**K2**

3.1.4	Air safety	Explain Air safety	**K3**
3.1.5	Design standard and type certification	Define Design standard and type certification	**K2**
3.1.6	Flight crew standard training & licensing	Explain Flight crew standard training & licensing	**K3**
3.1.7	Aircraft operations	Describe the Aircraft operations	**K3**
3.1.8	Airspace and air navigation service standards	Illustrate Airspace and air navigation service standards	**K2**
3.1.9	Aviation environment protection	Explain Aviation environment protection	**K2**
3.1.10	Safe transport of dangerous goods by air	Safe transport of dangerous goods by air	**K3**
IV	**Safety Management System (SMS)**		
4.1.0	Indian safety policy	Explain Indian safety policy	**K3**
4.1.1	Indian safety plan, SMS, SSP, ICAO ANNEX 19- Safety management,	Indian safety plan, SMS, SSP, ICAO ANNEX 19- Safety management,	**K3**
4.1.2	establishment of safety management system	establishment of safety management system	**K2**
4.1.3	applicability of SMS	Explain the applicability of SMS	**K3**
4.1.4	safety policy and objective	safety policy and objective	**K4**
4.1.5	coordination of emergency response planning, documentation,	coordination of emergency response planning, documentation,	**K3**
4.1.6	safety management system manual	What is safety management system manual	**K2**
4.1.7	safety risk management, safety assurance, safety promotions, quality policy.	Explain safety risk management, safety assurance, safety promotions, quality policy.	**K3**

V	Case Studies		
5.1.0	American Airlines Flight 587	Description, error, cause of accident and solution of following accidents.	**K3**
5.1.1	Aires Flight 8250	Description, error, cause of accident and solution of following accidents.	**K3**
5.1.2	American airlines flight 191	Description, error, cause of accident and solution of following accidents.	**K3**
5.1.3	Air France 447	Description, error, cause of accident and solution of following accidents.	**K3**
5.1.4	Flight Italia 870	Description, error, cause of accident and solution of following accidents.	**K3**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	-	L	-	M	-	L	-	-	-	L	L	L
CO2	M	-	L	-	M	-	M	L	L	L	L	M	L
CO3	M	-	L	-	M	-	-	-	-	-	-	L	L
CO4	H	-	L	-	M	-	-	-	-	M	-	L	M
CO5	M	-	L	-	M	-	L	L	L	H	L	L	H
CO6	H	-	L	-	M	-	L	L	L	M	L	L	L

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3.End Semester Examination**
Indirect
1. course – end survey feed back

SBEC – II: AVIATION SECURITY

SEMESTER: V **CODE: U21AV5S2**

TOTAL HOURS: 2 **CREDITS: 2**

COURSE OUTCOMES

On completion of this course, the students will be able to:

No	Course Outcomes	Level	Unit Covered
1	Define the terms related toaviationsecurity	K1	I
2	Identify the process & equipment required or screening	K3	II
3	Identify the objects which are restricted in flight	K3	III
4	Determine the threat level for aviation and convention Related to safe guarding aviation	K5	IV
5	Summarize host age negotiation plan	K2	V
6	Outline the objective of aviation security	K2	I

COURSE OBJECTIVE:

The aim of the course is to

- Train various terminologies and threats in aviation.
- Learn to screen and search the passengers and staffs.
- Study about the restricted articles and substances regarding aircraft.
- Know about the aircraft hijacking and different international conventions.
- Have good knowledge in situation of hostage negotiation and their role.

COURSE CONTENT:

UNIT 1 – DEFENITIONS, OBJECTIVES AND THREATS

Aviation security and Airport security – Terminologies related to aviation security – Objectives of Aviation security – Nature of threats – Types / Characteristics of offenders.

UNIT 2– SCREENING AND SEARCHING OF PASSENGERS AND STAFF

Stages involved in inspection/screening process – Equipment's required for screening – X-ray examination of baggage – Physical inspection of baggage.

UNIT 3– RESTRICTED ARTICLES AND SUBSTANCES

Definition – Categories of restricted articles – Improvised explosive devices – Places of concealment of Explosives – Types of explosives detectors – Bomb threat – Threat to an airborne aircraft.

UNIT 4 – AIRCRAFT HIJACKING AND INTERNATIONAL CONVENTIONS

Unlawful seizure of Aircraft (Hijacking) – Why is Civil aviation considered as an attractive target? Where can the threats come from? – Historical review of the past incidents – Dealing with the hijacking situation onboard – Tokyo convention Hague convention – Montreal convention.

UNIT 5- HOSTAGE NEGOTIATION

Hostage situation – Hostage situation move through several distinct phases – Hostage takers – The negotiator arrives on the scene – Negotiator objectives and tactics – Making a deal with the hostage taker – Role of Cabin crew in hostage situation.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Emerging securityhreat in Aviation security	http://blog.safe-passage.com/emerging-threats-to-aviation-security
2	Improvised explosive devises	https://en.wikipedia.org/wiki/Improvised_explosive_devic e
3	Improvedpassengerscreening technology	https://www.futuretravelexperience.com/2016/08/new-technologies-strive-to-enhance-airport-security/

REFERENCE BOOKS

- R.K. Bali – Regulation
- Kathleen M. Sweet – Aviation and airport security
- ICAO Annex 17

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**DEFENITIONS, OBJECTIVESANDTHREATS**		
1.1	Aviation security and airport security	Exploitered of aviation security	K2
1.2	Terminology related to aviation security	Defeathers related to aviation security	K1
1.3	Objectives of aviation security	List outtheroles&responsibilities ofaviationsecurityunits	K4
1.4	Natureofthreats	Determinethethreats for aviation	K5
1.5	Characteristicsofoffenders	Identifytheoffenders	K3
II	**SCREENINGANDSEARCHINGOFPASSENGERSANDSTAFF**		
2.1	Stages involved in inspection/screening process	List out the stages in screening process	K4
2.2	Equipment required for screening	Choose the corrected pimento specific purpose of screening	K3
2.3	x-ray examination of baggage	Explain the process of screening baggageusingx-ray	K2
2.4	Physic a inspection of baggage	Explain the process of physical Inspection of baggage	K2
III	RESTRICTEDARTICLESANDSUBSTANCES		
3.1.0	Definition	Defeathers related with restricted article	K1
3.1.1	Categoriesofrestricted items	List out the it elsewhither restricted	K4
3.1.2	Improvised explosive devises	Explained	K2
3.1.3	Places ofc once lament	Identify the places of concealment	K3

	of explosive	of explosives	
3.1.4	Types of explosives detector	Compare different type of detector For a particular purpose	K4
3.1.5	Bomb threat	Decide what to do in bomb threat situation	K5
3.1.6	Threaten airborne aircraft	Plan counting unprocedural	K6
IV	AIRCRAFTHIJACKINGANDINTERNATIONALCONVENTIONS		
4.1.0	Unlawful seizure of aircraft	Explain the meaning of hijack	K2
4.1.1	Why civil aviation Consideredasanatrracti vetarget	List out there a son for hijack	K4
4.1.2	Where are the threats come from	Identify theareaofthreats	K3
4.1.3	His trailer view of past incidents	Recall past incidents for future protection	K1
4.1.4	Dealing with hijacking situation onboard	Explain The procedure of negotiation	K2
4.1.5	To kayo convention Hague convention, Montreal convention	List out the important contents of these convention	K4
V	HOSTAGENEGOTIATION		
5.1.0	Hostage situation	Assume the situation of hostages	K4
5.1.1	Hostage situation move through several district phases	Explain the situation of hostagesduringseveral phases	K2
5.1.2	Thenegotiatorsarrives on the scene	Outline the negotiation of the scene	K2
5.1.3	Negotiator's objectives& tactics	Formulate the objective of negotiator	K6
5.1.4	Making a deal with hijackers	Outline the procedure of negotiation	K2
5.1.5	Relocating crew in hijacking situation	Decide the responsibility of cabin Crew during negotiation process	K5

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	H	L	M	M	M	-	M	M	M	M	M	M	M
CO2	M	H	-	M	L	L	H	H	H	L	H	H	H
CO3	M	L	H	H	H	H	H	M	M	L	-	L	H
CO4	L	M	H	H	H	H	M	M	M	-	M	H	M
CO5	M	M	H	H	-	L	M	M	M	-	L	M	M
CO6	M	M	H	H	H	M	H	L	M	M	M	H	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

SBEC – III: INTRODUCTION TO AVIATION

SEMESTER: V **CODE: U21AV5S3**

TOTAL HOURS: 2 **CREDITS: 2**

COURSE OUTCOMES:

On Completion of this course, the student will be able to,

S. No	Course Outcomes	Level	Unit Covered
1	Outline the evaluation of aviation industry	K2	I
2	Categorize the organization responsible for safe operation of aircraft	K4	II
3	Compare the time zones & time difference between difference parts of globe	K2	III
4	Inspect the aircraft before departure	K4	IV
5	Explain the procedures of aborted t/o	K2	V
6	List the functions of different emergency equipment's	K4	III

COURSE OBJECTIVE:

The aim of the course is to

- Study about the history of aviation and know about the World wars.
- Have good knowledge about the basics of aviation and parts of an aircraft.
- Learn about the different time zones, names of airports and cities with 3 letter codes.
- Inculcate the pre-flight procedures to be followed and basic knowledge in different checking procedures in the aircraft.
- Understand the diverse concepts like airline meals, kitchens, aborted take-off and emergency landings etc.

COURSE CONTENT:

UNIT: I – HISTORYOFAVIATION

Introduction – The Basics of Aviation - Early scientific theories – Lighter-than-air flights – Gliders – Airships the internal combustion engine - Heavier-than-Air flight – The world's first Airmail service – The first World War – The inter-war years — Other long-distance flight – The decline of the Airships – The second world war – The Prop jets – The Jet liners – The wide-bodied Jets.

UNIT: II – THE BASICS OF AVIATION

The theory of Flight – Parts of an Aircraft – General Aviation terms – Terms relating to flights and schedules – Government departments and Civil Aviation Organizations.

UNIT: III –PLANE TALK

Time – Midnight – Time zones – Daylight saving time – Indian Standard Time – Names of Airports and cities with 3-letter code.

UNIT: IV –PRE-FLIGHT PROCEDURE

On reaching the departure terminal — For crew layover flights – Pre-flight emergency equipment checks – Passenger address system check – Cockpit checks –.

UNIT: V– MISCELLANEOUS

Aborted take-off and emergency landings – Cabin chimes and overhead bin panel lights – Cockpit Voice Recorder (CVR) -and Flight Data Recorder (FDR) – Evacuation slide – Window Exits – Over wing Exits.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	History of aviation	https://www.spartan.edu/news/history-of-aviation/#:~:text=The%20history%20of%20aviation%20dates,four%20pairs%20of%20glider%20wings.
2	The Basics of aviation	https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/airplane_handbook/media/05_afh_ch3.pdf
3	Pre-Flight Procedure	https://www.firstflight.com/private-pilot-course/preflighting-the-aircraft/

REFRENCES:

- R.K. Bali- Air Regulation
- Oxford – Navigation
- Oxford – Aircraft general knowledge

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
I	**Buildings & Installations**		
1.1	Introduction	Recall the previous related chapter	**K1**
1.2	The Basics of Aviation	Interpret the basics of Aviation	**K2**
1.3	Early scientific theories	Analyse the earl Aviation theories	**K4**
1.4	Lighter-than-air flights – Gliders – Airships	Outline the principles of lighter than air a/c Gliders & Airships	**K2**
1.5	internal combustion engine	Illustrate the Functions of Internal combustion Eng.	**K2**
1.6	world's first Airmail service	Make use of the concept laid by initial Aviators in Cargo handling	**K3**
1.7	The first World War	Summarize Aviation Innovations in Aviation during Ist world war	**K2**
1.8	Other long-distance flight	Solve the problems faced by long dust flights	**K3**
1.9	The decline of the Airships	Explain the reason for the decline of airship	**K2**
1.10	The second world war	Summarise the innovations in Aviation during IInd world war	**K2**
1.11	The Prop jets	Explain the developments of prop jet engines	**K2**
1.12	The Jet liners	Analyse the growth of jet liners	**K4**
1.13	The wide-bodied Jets.	List out the pros & comes of wide-bodied jet	**K4**
II	**The basics of Aviation**		
2.1	The theory of flight	Recall the theory of Flight chapter	**K1**
2.2	Parts of an a/c	Categorize the parts of an a/c	**K4**
2.3	General Aviation Terms	List out the specific of an a/c	**K4**
2.4	Terms related to flights and schedule	Recall the terms related to flights & schedule	**P1, K1**
2.5	Government Department and aviation organisation	Pr the Government bodies	**K5**

III	**Plane Talk**		
3.1	Time Midnight, Time zones	Compare the time Difference between different time zones	**K5**
3.2	Day light saving time	Choose the working hours for day light savings	**K5**
3.3	Indian standard time	Compare the IST with UTC	**K5**
3.4	Name of Airports and cities with 3 letter codes	Compare the IST with UTC	**K5**
IV	**Pre-flight procedures**		
4.1	On reaching the dep terminal	List out the procedures for pre-flight departure	**K4**
4.2	For crew lay over flights	Discuss with crew related to the layover flights	**K6**
4.3	Pre-flight emergency equipment check	Organize & check the emergency equipment	**K3**
4.4	Passenger address system check	Analyse the quality of P.A. S	**K4**
4.5	Cockpit check	List out the checks to be carried cockpit pre-flight	**K4**
V	**Miscellaneous**		
5.1	Aborted T/O & emergency leg	Explain the safes procedure for above T/O & energy leg	**K2**
5.2	Cabin chimes and overhead bin panel lights	Explain the meaning of diff. chimes & O/H lights in cabin	**K2**
5.3	Cockpit voice recorder & Flight Data Recorder	Inspect the functions of CVR & FDR	**K4**
5.4	Evacuation Slide	Summarize the working principle of Evacuation slide	**K2**
5.5	Window exits & over wing exits	Illustrate the energy evacuation through window exits & over wing exits	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	-	M	-	L	-	-	L	L	M	L	L	M
CO2	M	L	M	L	-	-	L	L	L	L	L	-	M
CO3	H	M		M	-	-	L	L	L	M	M	-	L
CO4	M	M	M	M	-	-	L	L	L	L	L	L	L
CO5	M	-	L	-	L	M	M	M	M	L	M	L	M
CO6	H	H	L	H	L	L	M	L	L	M	M	M	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

CORE PRACTICAL III: PRACTICAL HANGAR WORKSHOP - II

SEMESTER: V **CODE: U21AV5P3**

TOTAL HOURS: 4 **CREDITS: 3**

COURSE OUTCOMES

On completion of this course, the students will be able to:

S.No	Course Outcomes	Level	Unit Covered
1	Demonstrate the working of c152 aircraft systems	K2	I
2	Function as aircraft technician under suberized environment	K4	I
3	Take part in maintenance schedule of Cessna 152 aircraft	K4	I
4	Demonstrate the working of c 172 aircraft system	K2	II
5	Examine the function of auto pilot system in Cessna 172	K4	II
6	Take part in maintenance schedule of Cessna 172 aircraft	K4	II

COURSE OBJECTIVE

- To Familiarize with the Cessna 152 and Cessna 172 aircraft and their systems.

1. FAMILIARIZATION ON CESSNA 152

a. Airframe familiarization
b. Engine familiarization
c. Cessna 152 Electrical system
d. Cessna 152 Hydraulic system
e. Cessna 152 Landing gear system
f. Cessna 152 Aircraft Instrument system

2. FAMILIARIZATION ON CESSNA 172

a. Airframe familiarization
b. Engine familiarization
c. Cessna 172 Electrical system
d. Cessna 172 Hydraulic system
e. Cessna 172 Landing gear system
f. Cessna 172 Aircraft Instrument system

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Cessna 152	**https://en.wikipedia.org/wiki/Cessna_152**
2	Cessna 172	**https://en.wikipedia.org/wiki/Cessna_172**

REFERENCE BOOKS

1. Cessna 152 Aircraft Service manual by Cessna Aircraft Company
2. Cessna 172 Aircraft Maintenance manual by Cessna Aircraft Company

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
1	**Fire Training.**		
1.1	Aircraft fam	Explain the basics of Cessna 172 aircraft	**K2**
1.2	Engine fam	Interpret the basic parts of Cessna 172 aircraft	**K2**
1.3	Cessna 172 electrical	Demonstrable the working principle of electrical system in Cessna 172	**K2**
1.4	Cessna 172 by diaulic system	Apply the theoretical knowledge of hydraulics in practical session	**K3**
1.5	Cessna 172 lending gear system	Experiment with the working of long gear of Cessna 172	**K3**
1.6	Cessna 172 aircraft instrument system	Apply the theosophical knowledge of aircraft instruments in preached session	**K3**

SMAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	L	M	L	-	-	-	-	-	L	-	-	M
CO2	L	M	M	M	-	-	M	M	L	M	-	L	H
CO3	L	M	H	H	-	-	H	H	M	M	-	-	H
CO4	L	L	L	L	-	-	-	-	-	L	-	-	L
CO5	M	M	L	M	-	-	-	-	-	L	-	-	L
CO6	M	H	H	H	-	-	H	H	M	H	-	-	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

SEMESTER–VI

S.NO	Course Title	Course Code
1.	Flight Planning (Practical)	U21AV6P4
2.	Flight Operations (Practical)	U21AV6P5
3.	Maintenance Workshop (Practical)	U21AV6P6
4.	Flying Synthetic (Practical)	U21AV6P7

CORE PRACTICAL IV: FLIGHT PLANNING (PRACTICAL)

SEMESTER: VI **CODE: U21AV6P4**

TOTAL HOURS: 6 **CREDITS: 5**

COURSE OUTCOMES:

On Completion of this course, the student will be able to,

U. No	Course Outcomes	Level	Unit Covered
1	Outline the different agencies involved for flight planning	K2	I
2	Develop and submit a fresh flight plan	K3	II
3	Decide the mode of submission of flight plan according to their requirement	K5	III
4	Interpret the information's in NOTAM	K2	V
5	Interpret ATIS into	K2	VI
6	List out the procedure to obtain current Weather obtaining	K4	VII

COURSE CONTENT:

1. Understanding, Coordination with different agencies.
2. Filling of Flight Plan
3. Mode of submissions of flight plan
4. Obtaining FIC and ADC
5. Study of NOTAM
6. ATIS
7. Weather obtaining procedures.

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Flight Plan	https://en.wikipedia.org/wiki/Flight_plan
2	Weather obtaining procedures	https://gargicollege.in/wp-content/uploads/2020/03/weather_forecast.pdf
3	NOTAM	https://www.faa.gov/about/initiatives/notam/what_is_a_notam

REFERENCE BOOKS

1. Aeroplan Technical, Trevor Thom.
2. Oxford Mass and balance performance
3. Oxford Flight planning and monitoring.
4. Aircraft technical by Mike Burton.
5. Ground studies for pilots, Flight planning.

SPECIFIC LEARNING OUTCOMES(SLO)

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
1	**Filling of Flight Plan**		
1.1	Understanding, Coordination with different agencies	Understanding, Coordination with different agencies	**K3**
1.2	Filling of Flight Plan	Filling of Flight Plan	**K2**
1.3	Mode of submissions of flight plan	Mode of submissions of flight plan	**K2**
1.4	Obtaining FIC and ADC	Outline and the purpose of the obtaining FIC AND ADC	**K2**
1.5	Study of NOTAM	Study of NOTAM	**K2**
1.6	ATIS	ATIS	**K2**
1.7	Weather obtaining procedures.	Weather obtaining procedures.	**K2**

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	M	M	M	L	L	M	-	-	L	L	M	M
CO2	M	L	M	L	L	-	M	L	L	-	L	H	M
CO3	M	M	M	M	L	-	L	-	-	L	L	L	M
CO4	M	M	M	L	L	-	L	L	-	M	M	L	M
CO5	H	L	M	M	-	L	L	M	-	M	M	M	H
CO6	H	H	H	M	L	L	M	M	-	L	L	M	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

CORE PRACTICAL V: FLIGHT OPERATIONS (PRACTICAL)

SEMESTER: VI **CODE: U21AV6P5**

TOTAL HOURS: 6 **CREDITS: 5**

COURSE OUTCOMES:

On Completion of this course, the student will be able to,

S.No	Course Outcomes	Level	Unit Covered
1	Explement with differed types of aero engine	K3	I
2	Examine the functions of differed aircraft systems	K5	II
3	Identify the differed grades of fuel according to their color& properly	K3	III
4	Outline the electrical system in on aircraft	K2	IV
5	Experiment with the aircraft systems working with phenetic power	K3	V
6	Experiment with the aircraft hydraulic power	K3	VI
7	Examine the fenthion of aviation	k4	VII
8	Explain about the electrical circus with bathes	k5	VIII

COURSE CONTENT:

1. Types of engines
2. Systems
3. Type of fuels
4. Electrical system
5. Pneumatic systems
6. Hydraulics
7. Avionics
8. Battery

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Types of engines	**https://car-corral.com/blog/different-types-of-car-engines/**
2	Avionics	**https://en.wikipedia.org/wiki/Avionics#:~:text=Avionics%20(a%20blend%20of%20aviation,aircraft%20to%20perform%20individual%20functions.**
3	Type of fuels	**https://byjus.com/chemistry/fuel-types/**

Reference Books

1. Professional Pilot Study Guide (Mike Burton)
2. Oxford- Air Systems and Air conditioning.
3. Aircraft Systems by Ian Moir.
4. Oxford- fuel System

LEARNING OUTCOMES

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
1	FLIGHT OPERATIONS		
1.1	Types of engine	To Study the Practical of Types of Engines	K3
1.2	Systems	To Study the Practical of Systems	K3
1.3	Type of fuels	To Study the Practical of Type of Fuels	**K4**
1.4	Electrical system	To Study the Practical of Electrical System	**K3**

1.5	Electrical system	To Study the Practical of Electrical System	**K4**
1.6	Pneumatic systems	To Study the Practical of Pneumatic Systems	**K4**
1.7	Hydraulics	To Study the Practical of Hydraulics	**K3**
1.8	Avionics	To Study the Practical of Avionics	**K3**
1.9	Battery	To Study the Practical of Battery	**K3**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	H	L	M	-	L	M	L	L	L	-	L	M
CO2	H	H	L	H	-	L	M	-	-	L	-	-	H
CO3	H	H	M	H	-	L	M	-	-	M	L	L	M
CO4	H	H	M	H	-	H	L	L	L	M	L	-	M
CO5	M	M	L	M	-	M	M	L	L	H	L	-	H
CO6	H	H	M	H	-	L	M	L	L	H	-	L	M

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

CORE PRACTICAL VI: MAINTENANCE WORKSHOP (PRACTICAL)

SEMESTER: VI **CODE: U21AV6P6**

TOTAL HOURS: 6 **CREDITS: 5**

COURSE OUTCOMES:

On Completion of this course, the student will be able to,

S. No	Course Outcomes	Level	Unit Covered
1	Experiment with different Aviation tools	K3	I
2	Classify the different classes of fire training	K3	II
3	Learn about the Primary and Auxiliary control surfaces	K4	III
4	Illustrate the General Maintenance of the aircraft	K3	IV
5	Organized the refueling Procedure	K3	V
6	Identify the Marshalling Signals	K2	IV

COURSE CONTENT:

1. Familiarization of general hand tools
2. Fire Training
3. Primary and Auxiliary control surfaces
4. General Maintenance of the aircraft
5. Refueling Procedures
6. General handling of aircraft
7. Marshalling Signals

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	General Handling of an aircraft	https://www.qataraviation.com/page/ground-handling/aircraft-handling
2	Refueling Procedures	https://www.epd.gov.hk/eia/register/report/eiareport/eia_2232014/html/Appendix%206.2.pdf
3	Marshalling Signals	https://www.aviationhunt.com/aircraft-marshalling-signals/

Reference Books

1. Air Regulations by R.K. Bali
2. Air Pilot's Manual, Vol 2, Aviation Laws by Peter. D. Godwin.
3. Air Regulations by K.D. Tuli

LEARNING OUTCOMES

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
1	**MAINTENANCE WORKSHOP**		
1.1	Familiarization of general hand tools	Familiarization of general hand tools	**K2**
1.2	Fire Training	Fire Training	**K3**
1.3	Primary and Auxiliary control surfaces	Primary and Auxiliary control surfaces	**K3**
1.4	General Maintenance of the aircraft	General Maintenance of the aircraft	**K2**

1.5	Refuelling Procedures	Refuelling Procedures	**K3**
1.6	General handling of aircraft	General handling of aircraft	**K2**
1.7	Marshalling Signals	Marshalling Signals	**K3**

MAPPING:

	PROGRAMMEOUTCOMES									**PROGRAMMESPECIFICOUTCOMES**			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	M	H	L	H	-	L	M	L	L	H	M	L	M
CO2	H	H	M		L	M	H	M	H	H	H	L	H
CO3	H	M	L	M	-	L	M	L	L	L	L	L	M
CO4	H	M	M	M	-	L	M	M	L	M	M	L	M
CO5	H	H	M	H	-	H	H	H	H	H	M	L	H
CO6	H	L	M	L	H	H	H	H	H	H	H	L	H

COURSEASSESSMENTMETHODS

Direct
1.Continuous Assessment Test I, II **2.Open Book Test Assignment Seminar Journal Paper Review Group Presentation** **3. End Semester Examination**
Indirect
1. course – end survey feed back

CORE PRACTICAL VII: FLYING SYNTHETIC (PRACTIAL)

SEMESTER: VI **CODE: U21AV6P7**

TOTAL HOURS: 6 **CREDITS: 5**

COURSE OUTCOMES:

On Completion of this course, the student will be able to,

S. No	Course Outcomes	Level	Unit Covered
1	Learn how to make the Starting procedure for aircraft	K2	I
2	Learn the procedure how to make Taxing for aircraft	K3	II
3	Illustrate the Take Off synthetic procedure	K3	III
4	Learn about the Landing procedure from ATC	K3	IV
5	Outline of the Aircraft Instrument Identification	K2	V
6	Understanding the synthetic procedures of aircraft	K4	VI

COURSE CONTENT:

1. Starting procedure
2. Taxing
3. Take Off
4. Landing
5. Instrument Identification
6. Understanding the synthetic procedures

TOPICS FOR SELF STUDY

S. No	Topics	Web Links
1	Starting procedure	https://www.boldmethod.com/learn-to-fly/systems/how-does-a-plane-start/
2	Taxing takes off and landing	https://www.faa.gov/air_traffic/publications/atpubs/atc_html/chap3_section_7.html
3	Understanding the synthetic procedures	https://en.wikipedia.org/wiki/Flight_simulator

REFERENCE BOOKS

1. Cessna 152 Aircraft Service manual by Cessna Aircraft Company
2. Cessna 172 Aircraft Maintenance manual by Cessna Aircraft Company

LEARNING OUTCOMES

UNIT	COURSE CONTENTS	LEARNING OUTCOMES	TAXONOMY LEVEL
1	FLYING SYNTHETIC		
1.1	Starting procedure	Starting procedure	K3
1.2	Taxing	Taxing	K3
1.3	Take Off	Take Off	K3
1.4	Landing	Landing	K3
1.5	Instrument Identification	Instrument Identification	K2
1.6	Understanding the synthetic procedures	Understanding the synthetic procedures	K4

MAPPING:

	PROGRAMMEOUTCOMES									PROGRAMMESPECIFICOUTCOMES			
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	H	M	M	M	L	H	M	M	M	M	L	L	H
CO2	H	M	L	M	L	M	M	M	L	H	L	M	H
CO3	H	H	M	H	-	H	M	L	L	L	L	L	H
CO4	H	H	M	H	L	H	M	M	L	M	M	L	H
CO5	M	H	M	H	-	M	M	L	L	H	L	M	H
CO6	H	M	L	H	-	M	M	M	L	H	L	L	H

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