

UNIVERSITY OF MUMBAI



Syllabus for S.Y.B.Sc. (SEM-III & SEM-IV)

**Program: B.Sc.
Course: Aviation**

(Credit Based Semester and Grading System with
effect from the academic year 2014–2015)

Course Code	Title	Credits
USAV 301	Air Navigation III	5 Credits (60 lectures)
<p><u>UNIT 1</u></p> <p>1) <u>Directional Gyro Indicator (DGI)</u> SHIFTED FROM SEM 2 IN OLD SYLLABUS Principle and construction of DGI, The control system – suction gyros, the caging device, DGI limitations, DGI errors, gimbaling errors, random wander, apparent wander, latitude nut correction, errors due to unstable rotor RPM, transport wander- change of latitude, drift rate calculations</p> <p>2) <u>The artificial Horizon</u> Construction, limitations, control systems, air driven artificial horizon, acceleration error in their air driven artificial horizon electric artificial horizon control system, acceleration errors in electric horizon, fast erection system,</p> <p>3) <u>Turn and Slip Indicator</u> Rate of turn indicator, rate gyros, operation, turn and slip displays, rate one turn & Turn co-ordinator</p> <p>4) <u>Polar Stereographic projection</u> Polar stereographic graticule, properties and uses</p> <p>5) <u>Transverse and Oblique Mercator Charts</u> Meridian of tangency, uses and properties of transverse Mercator, great circle of tangency, uses and properties of oblique Mercator chart</p>		<p>Lectures</p> <p>8</p> <p>6</p> <p>2</p> <p>2</p> <p>2</p> <hr/> <p>20</p>
<p><u>UNIT II</u></p> <p>6) <u>Aircraft Magnetism</u> Permanent magnetism, soft iron magnetism, analysis of components P+c, Q+f and R, calculation of coefficients A, B, C and total deviation. Effect of change of latitude on compass deviation, calculation of maximum and zero deviation headings.</p> <p>7) <u>Compass Swing</u> Requirement, correcting swing, check swing and calculation of residual deviation</p> <p>8) <u>Remote indicating compass</u> Principle of operation, flux valve, detector unit, signal selsyn operation of gyro compass, Manual synchronizing variation setting precession mechanism, erection mechanism, annunciator, control panel, adjustment of coefficients A, B and C. Advantages & Disadvantages of remote indicating compasses.</p> <p>NOTE- THIS UNIT IS SHIFTED FROM SEM 4 IN OLD SYLLABUS.</p>		<p>Lectures</p> <p>8</p> <p>4</p> <p>8</p> <hr/> <p>20</p>

<u>UNIT III</u>	Lectures
<p>9) <u>Solar System</u> SHIFTED FROM SEM 4 IN OLD SYLLABUS Planetary orbits, Kepler’s laws, seasons, Plane of ecliptic and plane of equator, declination, measurement of days and years, Hour angle, Measurement of time, mean solar time, local mean time, UTC, standard time, international date line, sunrise sunset, twilight moonrise & moonset</p>	10
<p>10) <u>Radio Altimeter</u> SHIFTED FROM SEM 4 IN OLD SYLLABUS (UNIT 2) Principle of FM altimeters, decision height indicator, accuracy, uses, principle of pulse modulation altimeters and its limitations</p>	5
<p>11) <u>Terrain Avoidance System</u> SHIFTED FROM SEM 4 (UNIT 3) IN OLD SYLLABUS Purpose & working principle, alert & warning elements of GPWS, modes of operation, winds shear detection</p>	5
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REFERENCE BOOKS

TITLE	PUBLISHER
1. Air Pilot’s Manual Vol 3 & 5	Peter D Godwin
2. Flight Performance & Planning	Nordian AS
3. General Navigation: ATPL JAR	Nordian AS
4. GSP : Plotting & Flight Planning	Underdown
5. GSP : Radio Aids	Underdown
6. GSP : Flight Instr. & Auto Flt.	Underdown
7. GSP : Navigation	Underdown
8. Radio Navigation ATPL JAR	Nordian AS
9. Oxford Aviation Gen Navigation	Jeppesen

Course Code	Title	Credits
USAV302	Air Regulation III	3 Credits (45 lectures)
Unit I: <u>Indian A/C Act 1937</u> 1. Part II – General conditions of flying (4 – 20) 2. Part III – General Safety Conditions (21 – 29C) 3. Part IV – Registration & Marking of A/c (30 – 37) 4. Part V – Personnel of Aircraft (38 – 48) 5. Part VI – Airworthiness (49 – 60) 6. Part VII – Radio Telegraph Apparatus (63) NO CHANGE IN TOPICS. SUBDIVIDED IN MORE DETAILS		Lectures 3 3 2 3 3 1 <hr/> 15
Unit II: 1. Altimeter Setting Procedure 2. Air Defense Identification Zone & Procedure for ADC 3. Aerodrome Operating Minima 4. Clearance I. Definitions II. Scope & Purpose III. Content & Description 5. Position Report, Voice Report & Air Report		Lectures 3 3 3 3 3 <hr/> 15

Unit III:	Lectures
SHIFTED FROM SEM 4 IN OLD SYLLABUS	
<u>Aerodrome</u>	
1. Aerodrome Data	2
2. Physical characteristics	2
3. TODA, ASDA, TORA & LDA	2
4. Markings	2
5. Lightings	4
6. Aerodrome Beacon & Identification Beacon	1
7. Intensity Control of runway	1
8. PAPA – AGNIS	1
9.	
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REFERENCE BOOKS

TITLE	PUBLISHER
1. Indian Aircraft Manual	Ministry of Civil Aviation
2. Air Regulation 2 Vol	Wg. Cdr R.K.Bali
3. ATPL Training Manual Air Law	Oxford
4. JAA – ATPL Aviation Law	Jeppesen

Course Code	Title	Credits
USA V 303	Meteorology III	3 Credits (45 lectures)
Unit I – Icing a) Formation of ice in the atmosphere b) Freezing level and index of icing c) Hazards of icing for aviation d) Types of icing e) Ice accretion in flight / preflight f) Super – cooled water droplets g) Carburetor icing		Lectures 2 2 2 1 2 2 2 2 <hr/> 15
Unit II – Winds a) Definition & estimation of winds b) Terms used for winds c) Units used d) Geostrophic, Gradient winds and coriolis force e) Thermal winds f) Jet streams g) Mountain and lee wave h) Anabatic & Katabatic winds i) Local winds and their names in different parts of the world		Lectures 2 1 1 3 1 2 2 2 1 <hr/> 15
Unit III – Thunderstorms, cyclones & extra-tropical depressions a) Definitions b) Conditions for formation c) Areas of formations on the world map d) Measuring instruments for met parameters at Observatories and airports e) Decoding of Met data, Metar, Specif, Tafs for aviation f) Sigmet		Lectures 2 3 3 4 2 1 <hr/> 15

REFERENCE BOOKS

TITLE

1. Climatology
2. Aviation Meteorology
3. Oxford Aviation Academy
4. Elementary Note on Indian Climatology
5. Meteorology for Pilots

PUBLISHER

Prof. Savindra Singh
R.B Underdown & Standen
E-Book from Oxford University
Indian MET Dept.
Mcgraw Hill

Course Code	Title	Credits
USAV304	Aircraft and Engines III	5 Credits (60 lectures)
Unit I:		Lectures
1. Low Speed Buffet, High Speed Buffet, Mach Crit, Coffin Corner, THS & Mach Trim System		8
2. MAC, Dependencies of stall speed, Stall Root of wing, Stall tip of sweep back, T type Tail A/c Deep Stall, Stick Shaker, Stick Pusher & Stall Working System, Auto Ignition System, Fuel Dipper System		12
		20
Unit II:		Lectures
SHIFTED FROM UNIT III OF SEM III		
1. Flap Selection for Takeoff landing, Flapless T/o & landing, Flap Jam, Flap Mechanism, Flaps Aerodynamic Load & Auto flaps roll to neutral		6
2. Spoilers various functions speed brake, roll spoilers, ground spoilers, flutter of controls, flutter dampening		7
3. Helicopter flight control, control components operation, cyclic pitch, collective pitch, hovering & helicopter stabilities		7
		20
Unit III:		Lectures
1. Concept of normal checklist, Abnormal & Emergencies Procedure & Checklist, MEL, MMEL		7
2. Take off techniques, Power setting procedures, T/O call & speed calls & RTO procedure , over weight		7
3. A/C Emergency equipment & Contents- ADDITION		6
		20

REFERENCE BOOKS

TITLE	PUBLISHER
Principle of flight	Beitz Ashield
Pilot Handbook of Aeronautical Knowledge	FAP
Manual of Flying AP 129	Air Ministry U.K
JAA – ATPL Principle of flight	Oxford/ Jeppesen

Course Code	Title	Credits
USA V 401	Air Navigation IV	5 Credits (60 lectures)
<p>UNIT I</p> <p style="text-align: center;">SHIFTED FROM SEM 3 UNIT 3</p> <p>1) <u>Basic Radar Theory</u> Radar Frequencies, Pulse Technique, Echo Principle, Factors affecting range of Radar, Primary & Secondary Radars, Advantages of Secondary Radar, Continuous Wave Radar & its Advantages Components of CRT & their Functions.</p> <p>2) <u>Ground Radars</u> Types of Ground Radars, Precision Approach Radar & Surveillance Radar Approaches</p> <p>3) <u>Doppler Radar</u> Doppler Shift and its Calculation, Principle of Ground Speed measurement, Doppler Aerials, Two beam, Three beam, Four beam systems & Janus Aerials, Doppler Spectrum, Airborne Doppler, Doppler Limitations.</p> <p>4) <u>Secondary Surveillance Radar (SSR)</u> Principle of Operation, Frequency, Modes A, B, C & D, Pre-allotted codes, Automatic Altitude Reporting, unwanted echoes, Mode 'S' data link, Advantages & Disadvantages of SSR</p>		<p>Lectures</p> <p style="text-align: right;">6</p> <p style="text-align: right;">3</p> <p style="text-align: right;">5</p> <p style="text-align: right;">6</p> <hr style="width: 10%; margin-left: auto; margin-right: 0;"/> <p style="text-align: right;">20</p>
<p>UNIT II</p> <p>5) <u>Distance Measuring Equipment</u> Principle of Operation, Random PRF Technique, Frequency & Channel Spacing, Beacon Saturation, Range, Accuracy & Uses of DME</p> <p>6) <u>Airborne Weather Radar</u> Components, Functions, Principle of Operation, Weather Depiction, Mapping Operation, Plotting a Navigation Fix, Weather Operation, Colour AWR Controls, Calculation of cloud height</p> <p>7) <u>Airborne Collision and Avoidance System (ACAS)</u> Introduction, TCAS I, TCAS II, Principle, Aircraft Equipment, Operation, System Interconnections, Synthetic Voice Prioritisation, Traffic Advisories (TAs) Resolution Advisories, Proximate Traffic/Other Traffic, TCAS Displays, Action to be taken on receiving TA's and RA's</p> <p style="text-align: center;">RE-ARRANGED TOPICS FROM OLD SYLABBUS IN SEM IV</p>		<p>Lectures</p> <p style="text-align: right;">4</p> <p style="text-align: right;">8</p> <p style="text-align: right;">8</p> <hr style="width: 10%; margin-left: auto; margin-right: 0;"/> <p style="text-align: right;">20</p>

<u>UNIT III</u>	Lectures
8) <u>Grid Navigation</u> Necessity for Using Gridded chart, Grid North, Grid Convergence, Grivation, Example of use of Polar Stereographic and Lamberts Chart	4
9) <u>Point of Safe Return</u> Definition, Practical Significance, Formula for Calculation, PSR on Two or more legs, Engine Failure PSR, Factors affecting PSR, Radius of Action, Practice Exercises.	8
10) <u>Point of Equal Time (PET) or Critical Point</u> Definition, Practical Significance, Formula for Calculation, Several Track PET, Factors affecting PET, Relationship of PET and PSR, Practice Exercises.	8
SHIFTED FROM SEM III (UNIT II)	20

REFERENCE BOOKS

TITLE	PUBLISHER
1. Air Pilot's Manual Vol 3 & 5	Peter D Godwin
2. Flight Performance & Planning	Nordian AS
P3. General Navigation: ATPL JAR	Nordian AS
4. GSP : Plotting & Flight Planning	Underdown
5. GSP : Radio Aids	Underdown
6. GSP : Flight Instr. & Auto Flt.	Underdown
7. GSP : Navigation	Underdown
8. Radio Navigation ATPL JAR	Nordian AS
9. Oxford Aviation Gen Navigation	Jeppesen

Unit III	Lectures
1. Identification & Interception Procedures	2
2. Air miss Reporting procedure	1
3. Air – Traffic Incident	5
4. Anti-hijacking Act 1982	4
5. The suppression of unlawful act against the safety of Civil Aviation Act 1982	3
	15

REFERENCE BOOKS

TITLE

PUBLISHER

Indian Aircraft Manual Vol I & II
 Air Regulation 2 Volume
 JAA – ATPL Communication
 Aviation Act 1934

Ministry of Civil Aviaiton
 Wing Cdr. R.K Bali
 Jeppesen
 Ministry of Civil Aviation

Course Code	Title	Credits
USAV403	Meteorology IV	3 Credits (45 lectures)
Unit I :		Lectures
a) Weather charts- types of charts, times of issue, plotting of data & reading the plotted data		2
b) Prognostic weather charts and interpreting the data		3
c) Various symbols used		2
d) Jet streams plotting and upper winds		3
e) Significant weather charts		3
f) Documentations given to pilots		2
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Unit II:		Lectures
a) Tropical climatology / Indian Climatology		2
b) ITCZ and its movement in different seasons		2
c) Weather in different seasons		3
d) Tropical cyclones- cause and development		3
e) Tropical cyclones- cause and development		2
f) Tornadoes, microburst water spouts		2
g) Trade winds and doldrums		1
h) Sand storms		1
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Unit III:		Lectures
a) Air masses – names origin and properties		2
b) Movement of air masses		2
c) Fronts, front zone and front surface		2
d) Warm and cold fronts – their movements		2
e) Formation of clouds in fonts		2
f) Occluded fronts warm or cold		2
g) Changes in weather parameters on front movements		1
h) Extra tropical depressions- their formations and associated weather		2
NO CHANGES		<hr/> 15

REFERENCE BOOKS

TITLE	PUBLISHER
1. Climatology	Prof. Savindra Singh
2. Aviation Meteorology	R.B Underdown & Standen
3. Oxford Aviation Academy	E-Book from Oxford University
4. Elementary Note on Indian Climatology	Indian MET Dept.
5. Meteorology for Pilots	Mcgraw Hill

Course Code	Title	Credits
USAV404	Aircraft and Engines IV	5 Credits (60 lectures)
Unit I:		Lectures
1. A/C Basic, Requirements for Air Conditioning Various Methods used for Air Conditioning		3
2. Ram Air, Bootstrap Bleed system, Displacement Blower System, Evaporation System		3
3. Aircraft Pressurization System		3
4. Zone temp control & unpressurized flight		5
5. Cockpit pressure controller ditching valve switch manual & auto		6
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Unit II:		Lectures
1. Crew Oxygen, Pax Oxygen System & Portable Oxy system		3
2. Deicing System, Anti Icing system & other heating in A/C REARRANGED		4
3. Hydraulic system & Primary Secondary system		4
4. Operated by Hydraulics – Hydraulics Fuses – Powered Flight controls., Landing gear system		6
5. A/c Wheel, Tyres, brake, Auto brakes Antiskid System - ADDITION		3
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Unit III:		Lectures
1. 1. A/C Fuel System- Tank, vents, boost pumps + various types of fuel		5
2. Refueling – Defueling auto refueling system- Fuel gauges, Quantity Measuring System		4
3. Fuel Jetesioning system – fuel quantity systems		4
4. Fire & crash protection system		2
5. Types of cruise, MRC, LRC, Max speed cruise		2
		3
		<hr/> 20

REFERENCE BOOKS

TITLE
Commercial Pilot Study Manual
JAA – ATPL Systems
Hand book of Aeronauticals
Pilots Handbook for Aeronautical Knowledge

PUBLISHER
Mike Burton
Oxford / Jeppesen
Royal Air Force
Aeronautical Society FAA

