A.C. 10/2/12
Item No. 4.7

UNIVERSITY OF MUMBAI

Syllabus for S.Y.B.Sc.
Program: B.Sc.
Course: Aviation

(Credit Based Semester and Grading System with effect from the academic year 2012–2013)

B.SC (Aviation Course Structure) – SEMESTER III

CLASS	Class room instruction Face to Face									Notional			Total			Credits
S.Y.B.Sc (AVIATION)	per week			per sem			per sem hours									
	L	P	T	L	P	T	L	P	T	L	P	T	L	P	T	L
USAV 301 Air Navigation III	4	-	-	60	-	-	48	-	-	102	-	-	150	-	-	5
USAV 302 Air Regulation III	3	-	-	45	-	-	36	-	-	54	-	-	90	-	-	3
USAV 303 Meteorology III	3	-	-	45	-	-	36	-	-	54	-	-	90	-	-	3
USAV 304 Aircraft & Engine III	3	-	-	45	-	-	36	-	-	114	-	-	150	-	-	5
USAV 305 Flying	-	3	Briefing and Debriefing 3	-	45	45	-	36	36	-	36	12	120	-	-	4
Total	13	3	3	195	45	45	156	36	36	324	36	12	600	-	-	20

L – One Lecture / period of 48 minutes, P – Practical, T – Tutorial
Notional includes time spent in library / home / other institutions for preparation and writing of assignment, quizzes, Open book test, journal, case studies

B.SC (Aviation Course Structure) – SEMESTER IV

CLASS	Class room instruction Face to Face									Notional			Total			Credits
S.Y.B.Sc (AVIATION)	per week			per sem			per sem hours									
	L	P	T	L	P	T	L	P	T	L	P	T	L	P	T	L
USAV 401 Air Navigation IV	4	-	-	60	-	-	48	-	-	102	-	-	150	-	-	5
USAV 402 Air Regulation IV	3	-	-	45	-	-	36	-	-	54	-	-	90	-	-	3
USAV 403 Meteorology IV	3	-	-	45	-	-	36	-	-	54	-	-	90	-	-	3
USAV 404 Aircraft & Engine IV	3	-	-	45	-	-	36	-	-	114	-	-	150	-	-	5
USAV 405 Flying	-	3	Briefing and Debriefing 3	-	45	45	-	36	36	-	36	12	120	-	-	4
Total	13	3	3	195	45	45	156	36	36	324	36	12	600	-	-	20

L – One Lecture / period of 48 minutes, P – Practical, T – Tutorial
Notional includes time spent in library / home / other institutions for preparation and writing of assignment, quizzes, Open book test, journal, case studies

S.Y.B.Sc. Aviation Syllabus
Credit Based and Grading System
To be implemented from the Academic year 2012-2013

SEMESTER III

Course Code	UNIT	TOPICS	Credits	L / Week
USAV301	**I**	Machmeter, Inertial Navigation and Inertial Reference System, Polar Stereographic Projection, Transverse and Oblique Mercator Chart,	**5**	**4**
	II	Grid Navigation, Point of Safe Return (PSR), Point of Equal Time (PET) or Critical Point,		**4**
	III	ILS (Instrument Landing System) and MLS (Microwave Landing System), Basic Radar Theory, Ground Radars, Doppler Radar		**4**
USAV302	**I**	Indian Aircraft Act 1934, Indian Aircraft Rules 1937,	**3**	**3**
	II	Part VI – Airworthiness , Part VIII – Aeronautical beacon and Aeronautical ground lights, Schedule II – Aircraft Personnel, Schedule IV – Visual Flight Rules and special VFR Flights		**3**
	III	Indian Aircraft Rules, Carriage by Air Act 1972, Tokyo Convention Act 1975		**3**
USAV303	**I**	Air masses and Fronts	**3**	**3**
	II	Warm Front, Associated Clouds and Weather, Cold Front, Associated Clouds and Weather, Warm Sector, Associated Clouds and Weather, Weather behind the cold front, Occlusions, Associated Clouds and Weather, Stationary Front, Associated Clouds and Weather, Movement of Fronts and Pressure Systems, Life Cycle		**3**
	III	Pressure Systems		**3**
USAV304	**I**	High speed stall, Coffins corner, High speed stall , Low speed buffet, High speed buffet, Critical Mach Number, Mach trim System, Incidence trim, MAC, Dependencies of stall speed, stick shaker, stick pusher, stall warning for light aircraft Turbo charger for piston engine, waste gate control, Types of: Turbofan, turbo jet, turbo prop, turbo shaft, ram jet, scram jet, Starting of jet engine, hot start, hung start, windmill start, Flameout, Reverse thrust.	**5**	**3**
	II	Roll spoiler, Ground spoiler, Speed brake, Flutter, flutter damping, Brushless Alternator Electrical system faults, Helicopter flight control, terminology, control components, Operation, cyclic pitch, collective pitch, hovering, Pack temperature control for a heavy jet engine.		**3**
	III	Concept on Normal Check list, Emergency/Abnormal check list, Flap selection for T/O and Landing, Vx, Vy, Vmcg, Vmca.		**3**
	FLYING EXPERIENCE / FLYING CHECK		**4**	

SEMESTER IV

Course Code	UNIT	TOPICS	Credits	L / Week
USAV401	**I**	Aircraft Magnetism, Compass Swing, Remote Indicating Compass	**5**	**4**
	II	Air Temperature Measurement in Flight, Solar System, Radio Altimeter		**4**
	III	Secondary Surveillance Radar (SSR), Distance Measuring Equipment (DME), Terrain Avoidance Systems		**4**
USAV402	**I**	Aerodromes, Markings	**3**	**3**
	II	Approach Control Service		**3**
	III	Miscellaneous		**3**
USAV403	**I**	Climatology - Climatic Zones, Tropical Climatology	**3**	**3**
	II	Typical Weather situations in Mid-Latitudes, Local Seasonal Weather and Wind		**3**
	III	Indian Climatology		**3**
USAV404	**I**	Cabin Zone Temperature control , Unpressurised flight, Ram air inlet, Dump valve, Cockpit/ Cabin Smoke removal, Auto Flight: Basic Block diagram and operation	**5**	**3**
	II	Electrical: AC/DC bus, Essential Bus, Hot battery bus, Flight instrument bus, Low voltage AC bus, TR bus, APU/GPU/EXT PWR/Eng Generator power control, L.G: Sequence valve operation, indication and warnings, APU fire warning system, Pneumatic system for a heavy jet aircraft, Leak detection		**3**
	III	Basics of Obstacle Clearance Performance, Multi engine T/O profiles, MRC,LRC, Constant mach, Max speed Cruise Schedules, V1, Vr,V2, Vref, Vapp speed concepts		**3**
	FLYING EXPERIENCE / FLYING CHECK		**4**	

Course Code	Title	Credits
USAV301	**Air Navigation III**	**5 Credits (60 lectures)**
Unit 1: Machmeter: - Mach Number, Principle of Operation, Calculation of LSS, Machmeter Errors, Mach / TAS calculations Inertial Navigation and Inertial Reference System: - Basic Principle, Acclerometers and Integrators, Gyro Stabilized Platform, Calculation of Velocity and Position, Alignment of the System, Errors, Advantages and Disadvantages, Laser Gyro and IRS. Polar Stereographic Projection: - Polar Stereographic Graticule, Properties and Uses. Transverse and Oblique Mercator Chart: - Meridian of Tangency, Uses and Properties of Transverse Mercator, Great Circle of Tangency, Uses and Properties of Oblique Mercator Chart.		**20 Lectures**
Unit 2: Grid Navigation: - Necessity for using Gridded Chart, Grid North, Grid Convergence, Grivation, Example of Use of Polar Stereographic and Lamberts Chart. Point of Safe Return (PSR): - Definition, Practical Significance, Formula for Calculation, PSR on Two or more legs, Engine Failure PSR, Factors affecting PSR, Practice Exercises. Point of Equal Time (PET) or Critical Point: - Definition, Practical Significance, Formula for Calculation, Several Track PET, Factors affecting PET, Relationship of PET and PSR, Practice Exercises.		**20 Lectures**
Unit 3: ILS (Instrument Landing System) and MLS (Microwave Landing System): - Components, Frequencies, DME paired with ILS channels, ILS Identification, Marker Beacons, Ground Monitoring of ILS Transmissions, Coverage, Principle of Operation, Presentation and Interpretation, Categories, Errors and Accuracy, Factors Affecting, Range and Accuracy, Calculations, ILS Disadvantages, MLS – Principle of Operation, Airborne Equipment. Basic Radar Theory:- 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. Ground Radars:- Types of Ground Radars, Precision Approach Radar & Surveillance Radar Approaches. Doppler Radar:- 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		**20 Lectures**

Course Code	Title	Credits
USAV302	**Air Regulation III**	**3 Credits (45 lectures)**
Unit 1: **<u>Indian Aircraft Act 1934</u>** Extent & Definitions Rules 11, 11A, 11B, 12 & 18 **<u>Indian Aircraft Rules 1937</u>** Part I – Rules1, 2, 3 Part III – General Safety Conditions Rules – 25 to 29B Part IV – Registration and marking of Aircraft Rules – 30 (1), 37 & 37A Part V – Personnel of Aircraft Rules – 39, 40, 41, 42, 43, 44, 45, 46 & 48		**14 Lectures**
Unit 2: Part VI – Airworthiness Rules – 50, 56 & 60 Part VIII – Aeronautical beacon and Aeronautical ground lights Schedule II – Aircraft Personnel Commercial Pilots Licence, Validity, Renewal & Privileges, General Requirements Schedule IV – Visual Flight Rules and special VFR Flights		**16 Lectures**
Unit 3: Indian Aircraft Rules – 57, 58 & 64 Carriage by Air Act 1972 Liabilities of the carrier Rule – 17, 18, 19, 20, 21 & 22 Tokyo Convention Act 1975		**15 Lectures**

Course Code	Title	Credits
USAV303	**Meteorology III**	**3 Credits (45 lectures)**
Unit 1: **AIRMASSES AND FRONTS** Types of the Airmasses Description, Factors affecting the properties of Airmasses Classification of Airmasses, Modifications of Airmasses, Areas of Origin Fronts Boundaries between Airmasses (Fronts), General Situation, Geographic Differentiation		**12 Lectures**
Unit 2: Warm Front, Associated Clouds and Weather Cold Front, Associated Clouds and Weather Warm Sector, Associated Clouds and Weather Weather behind the cold front Occlusions, Associated Clouds and Weather Stationary Front, Associated Clouds and Weather Movement of Fronts and Pressure Systems, Life Cycle		**17 Lectures**
Unit 3: **Pressure Systems** Location of the Principal pressure areas Anticyclone: - Anticyclone, Types, General Properties, Cold and Warm Anticyclones, Ridges and Wedges, Subsidence Non Frontal Depressions: - Thermal, Orographic and Secondary Depressions, Troughs Tropical Revolving Storms: - Development of Tropical Revolving Storms Origin and Local Names, Location and Period of Occurrence		**16 Lectures**

Course Code	Title	Credits
USAV304	**Aircraft and Engines III**	**5 Credits (45 lectures)**
Unit 1: High speed stall, Coffins corner , High speed stall , Low speed buffet, High speed buffet, Critical Mach Number, Mach trim System, Incidence trim MAC, Dependencies of stall speed, stick shaker, stick pusher, stall warning for light aircraft Turbo charger for piston engine, waste gate control. Types of: Turbofan, turbo jet, turbo prop, turbo shaft, ram jet, scram jet, Starting of jet engine, hot start, hung start, windmill start, Flameout, Reverse thrust		**17 Lectures**
Unit 2: Roll spoiler, Ground spoiler, Speed brake, Flutter, flutter damping Brushless Alternator Electrical system faults Helicopter flight control, terminology, control components, Operation, cyclic pitch, collective pitch, hovering Pack temperature control for a heavy jet engine		**16 Lectures**
Unit 3: Concept on Normal Check list, Emergency/Abnormal check list. Flap selection for T/O and Landing Vx, Vy, Vmcg, Vmca		**12 Lectures**

Course Code	Title	Credits
USAV401	**Air Navigation IV**	**5 Credits (60 lectures)**
Unit 1: Aircraft Magnetism:- 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. Compass Swing:- Requirement, Correcting swing, Check swing and calculation of Residual Deviation. Remote Indicating Compass:- 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		**22 Lectures**
Unit 2: Air Temperature Measurement in Flight:- Temperature Measurement probes, COAT, Conversion of TAT into SAT. Solar System:- Measurement of time, Mean Solar Time, Local Mean Time, UTC, Standard Time, International Date Line, Sunrise Sunset, Twilight Moonrise & Moonset. Radio Altimeter:- Principle of FM altimeters, Decision Height Indicator, Accuracy, Uses, Principle of Pulse Modulation Altimeters & its Limitations		**20 Lectures**
Unit 3: Secondary Surveillance Radar (SSR):- 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. Distance Measuring Equipment (DME):- Principle of Operation, Random PRF Technique, Frequency & Channel Spacing, Beacon Saturation, Range, Accuracy & Uses of DME. Terrain Avoidance Systems:- Purpose & Working Principle, Alert & Warning Elements of GPWS, Modes of Operation, Winds Shear Detection.		**18 Lectures**

Course Code	Title	Credits
USAV402	**Air Regulation IV**	**3 Credits (45 lectures)**
Unit 1: **<u>Aerodromes</u>** Physical Characteristics Runway, Stop way, Clearway TORA, TODA, LDA, ASDA. **<u>Markings</u>** Runway Markings Runway edge and threshold markings Fixed Distance Markings Touch down zone markings Taxiway markings Runway holding position markings		**14 Lectures**
Unit 2: **<u>Approach Control Service</u>** Departing Aircraft – General Provisions Separation between departing Aircraft Information to departing Aircraft Information to arriving Aircraft Visual Approach, Instrument Approach, Holding, Expected approach time, Approach Sequence Mac Techniques & its uses in the provision of Air Traffic Services		**11 Lectures**
Unit 3: **<u>Miscellaneous</u>** Altimeter Notification of Flight Carriage of Radio Equipment Regulation for use of AAI Aerodromes & Airfields Use of Emergency Locator Transmitter Use of Transponder (S.S.R) Notification of Accidents Notification of Incidents Distress and Urgency communication procedures Responsibility of monitoring emergency signals, Interception of Signals.		**18 Lectures**

Course Code	Title	Credits
USAV403	**Meteorology IV**	**3 Credits (45 lectures)**
Unit 1: **Climatology** Climatic Zones General Seasonal circulation in the Troposphere and Lower Stratosphere. Tropical Rain Climate, Dry Climate, Mid-Latitude Climate. Subarctical Climate with cold winter, Snow Climate. Tropical Climatology Cause and Development of Tropical Showers, Humidity, Temperature, Tropopause. Seasonal Variation of Weather and Wind, Typical Synoptic situations. Intertropical Convergence Zone (ITCZ), Weather in the ITCZ, General seasonal Movement. Climatic elements relative to the area (Monsoon, Tradewinds, Sandstorms, Cold Air Outbreaks) Easterly Waves.		**17 Lectures**
Unit 2: Typical Weather situations in Mid-Latitudes: - Westerly Waves, High Pressure Area Local Seasonal Weather and Wind: - Foehn, Mistral, Bora, Sirocco, Khamsin, Harmattan, Ghibbli and Pampero		**18 Lectures**
Unit 3: Indian Climatology		**10 Lectures**

Course Code	Title	Credits
USAV404	**Aircraft and Engines IV**	**5 Credits (45 lectures)**
Unit 1: Cabin Zone Temperature control , Un-pressurised flight, Ram air inlet, Dump valve Cockpit/ Cabin Smoke removal Auto Flight: Basic Block diagram and operation		**12 Lectures**
Unit 2: Electrical: AC/DC bus, Essential Bus, Hot battery bus, Flight instrument bus, Low voltage AC bus, TR bus, APU/GPU/EXT PWR/Eng Generator power control L.G: Sequence valve operation, indication and warnings, APU fire warning system Pneumatic system for a heavy jet aircraft, Leak detection		**17 Lectures**
Unit 3: Basics of Obstacle Clearance Performance Multi engine T/O profiles MRC,LRC, Constant mach, Max speed Cruise Schedules V1, Vr,V2, Vref, Vapp speed concepts		**16 Lectures**

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