DEPARTMENT OF AERONAUTICAL ENGINEERING

COURSE COVERAGE SUMMARY

FOR IV B.TECH – I SEMESTER (2024-2025)







MALLAREDDYCOLLEGEOFENGINEERING&TECHNOLOGY

(SponsoredbyCMREducationalSociety) (AffiliatedtoJNTU,Hyderabad,ApprovedbyAICTE-AccreditedbyNBA&NAAC-'A'Grade-ISO9001:2008Certified) Maisammaguda,Dhulapally(PostViaHakimpet),Secunderabad-500100



AVIONICS COURSECOVERAGESUMMARY

UnitNo	TitleoftheUnit	TopicsoftheUnit	NameofTheText Book	ChapterNo	PageNo
UNIT-I	IntroductionTo Avionics	ImportanceandroleofAvionicsin modern aircraft systems which interfacedirectly with pilotAircraft state sensor systems, outside world sensor systems, task automationsystems. The avionics equipment and system requirement, environmental, weight, reliability. Standardization and specification of avionics equipment and systems, ARINC and MIL specification. Electricalandopticaldatabus systems. Integrated modular avionics architectures.	Avionics–RPG Collins	1	1-3 3-5 11-16 459- 486

	I		1		
		Introduction to displays			
		headupdisplays(HUD),basic			
		principles,Helmetmounted			19-36
		displays,Head			15 00
		trackingsystems.	Avionics-RPG	2	
		Head down displays Civil	Collins	2	36-42
UNIT-II	Display & Man Machine	cockpit, Military cockpit, Solid			
	InteractionAnd	statestandby display systems,			
	communicationsystem	DatafusionindisplaysIntelligent			79
		displaysystems.			
		Introductiontovoiceanddata			
		communication systems			
		HF,VHF,UHFand Satellite			
		communications,			
		Flightdatarecorders.			
		Basicprinciplesofgyroscopeand			
		accelerometers. Introduction to			
		opticalgyroscope, ring laser			
		gyros, principles.Stable platform		5	255-282
		system, strap down systems,	Avionics-RPG		
		error in inertial systems and	Collins		
	Derivation And Air Data	corrections.			
	Systems	Air data Information and its use,			
		derivation of Air Data Laws and		7	377-399
		relationship, altitude, static			
		pressurerelationship, variation of			
		ground pressure,			
		Speedofsound, Mach Number, CAS,			
		TAS, Pressureerror. Airdata			
		sensors and computing			

UNIT–IV	Navigation (Ins And Gps) AndLandingSystem	Principles of Navigation, Types of Navigation systems, Inertial NavigationSystem, Initialalignment and Gyro compassing, Strap down INS computing.Landing System, localizer and glide slope, marker systems. Categories of ILS.Global navigation satellite systems, GPS, description and basic principles.IntegrationofGPSand INS, Differential GPS.	Avionics–RPG Collins	6	303-365
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UNIT-V	SurveillanceAndAuto FlightSystems	Traffic alert and collision avoidance systems(TCAS),Enhanced groundproximitywarning system. Weather radar. Autopilots, Basicprinciple,heightcontrol, headingcontrol, ILS coupled	Avionics–RPG Collins	8	415-457
		system, speed control and auto throttle. Flight management systems,principles,flightplanning, navigation and Guidance, performance prediction and flight path optimization.			



COMPUTATIONALAERODYNAMICS (R18A2116) COURSECOVERAGESUMMARY

Unit	Titleofthe unit	Topicsofthe unit	Nameof	Chapt	Page No.
			book	No.	
Unit-1	Jnit-1 Introductionto computational fluiddynamics CFDandits importance asresearchand design tool, GeneralProcedure ofCFD.		1	3-13	
		Application of CFD tovariousEngineeri ngproblems.	Fluid Dynamics, McGrawHill	1	14-30
		Modelsoffluid flow-Finite ControlVolume, InfinitesimalFluid Element,Substant ial derivatives, divergence ofVelocity.		2	40-48
Unit-2	Governing equationsof fluid dynamics	Thecontinuity equation, momentum equation, energyequation, physical boundary conditions. Formof	John.D. Anderson, Computatio nal Fluid Dynamics, McGrawHill	2	49-90

		Governing equationsuited forCFD- Conservationform -shockfittingand shock capturing.			
		Impactofpartial differential equations on CFD. Classification ofQuasi-Linear Partial differential		3	95-120
		equation, TheEigenvalue			
		method, General behaviorof different classes of Partial differential equation— elliptic, parabolic and hyperbolic with examples.			
Unit-3	Discretization techniques	Introduction, Finite differences and formulas for first and second derivatives,	John .D. Anderson, Computation al Fluid Dynamics,	4	128-153

	difference equations,	McGrawHill		
	Explicitandimplicit			
	approaches.			

		Basisoffinite volume method-conditions onthefinite volume selections- approaches-Cell- centeredandcell- vertex.Definitionof finitevolume discretization general formulation of a numerical scheme. Needforgrid generation.	Charles Hirsch "Numerical computation of internal andexternal flows" Second Edition Butterworth -Heinemann is animprint of Elsevier Charles Hirsch	5	209- 215
Unit-4	Grid generatio n	Cartesian grids, body fitted structured grids, Multi-blockgrids - oversetgridswith applications. Unstructured grids-triangular/ tetrahedralcells, hybrid grids, quadrilateral/hexa hedra cells. Grid Generation techniques-	computation of internal andexternal flows" Second Edition Butterworth -Heinemann is animprint of Elsevier	6	249-276

		Delaunay triangulation, Advance fontmethod.Grid			
		qualityparameters	John D		
		technique,	Anderson,		
Unit-5	Cfd technique			6	217-224
	5	MacCormack's	Computation		
		technique,	Fluid Dynamics, McGrawHill		
		Alternating-Directi on-		6	243-247
		Implicit(ADI) Technique,Crank Nicholson technique, Relaxation technique,			
		Pressurecorrection technique Numerical		6	254-264

	procedures- SIMPLE algorithm. Boundary conditionsforthe pressurecorrection method.			
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(R18A2118)FLIGHTVEHICLEDESIGN COURSE COVERAGESUMMARY

Unit	TitleoftheUnit	TopicsoftheUnit	NameofThe Toxt Book	Chapter No.	PageNo
I	Design Process Overview, Airfoil And Geometry Selection, Thrust ToWeightRatio, WingLoading	Overviewofaircraftdesign,Phasesofaircraftdesign.Aircraftconceptualdesign process, Sizing from conceptualsketch,Emptyweight&fuelfractionestimation,Missionprofiles, Missionsegmentweight fractions.L/Destimation.Take-offweightestimation.Airfoilandgeometry selection, Airfoil design, Designliftcoefficient,Stall,Airfoilthicknessratio,Airfoilconsiderations.Wing geometry (aspect ratio, wingsweep, tapperratioandwingverticallocation,wingtipshapes.Tailgeometry and arrangements. Thrusttoweightratio&Wingloading-statisticalestimation,thrustmatching.Wing loading(fortake-off,instantaneous/sustainedturnrate,loitererendurance,cruise range).	AircraftDesign: A Conceptual Approach by DanielP.Raymer	1,2,3,4, 5	1-100
п	Initial sizing &configurationlayou t	Sizing with fixed engine and with rubber engine. Refined sizing equations/ methods. Geometry sizing of fuselage, Wing, Tail, Control surfaces. Development of configuration lay out from conceptual sketch. The inboard profile drawing, Wetted area, Volume distribution and fuel volume plots, Lofting- definition, significanceand methods, flat wrap lofting. Special consideration in configuration layout.IsobartailoringSears-Haackvolumedistribution,structuralloadpaths. Radar,IR, visualdetectability,auralsignatureconsiderations.	AircraftDesign: A Conceptual Approach by DanielP.Raymer	6,7,	101-152
ш	Crew station,passengers &payload, landing gear&subsystems, Structures,weight& balance	Fuselagedesign- crewstation, passenger compartment, cargoprovisions, weapons carriage, gun installation, Landing gear arrangements, guidelines forlayout. Shock absorbers – types, sizing, stroke determination, gear load factors. Gear retraction geometry. Aircraft subsystems, significance to configuration lay out. Airworthiness requirements - loads, safety margins, material properties, methods of estimation-construction, operation, maintenance, training- procedures, Aircraft materialsmechanical properties- design data- allowable, allowable bases. Failure theory.Flightloadsatmospheric, maneuver-constructionofflightenvelope.Wing loads, Empennageloads, Fuselageloads.	AircraftDesign: A Conceptual Approach by Daniel P. Raymer;	9,11	181-191, 229-252,

IV	Performanceand constraint analysis refined sizing & trade studies	The aircraft operating envelope. Take off analysis, Balanced field length Landing analysis. Fighter performance measures of merit. Effects of wind on aircraft performance. Initial technical report of baseline design analysis and evaluation. Refined baseline design and report of specifications. Elements of life cycle cost, cost estimating method, RDT&E and production costs, operation and maintenance costs, fuel and oil costs, crew salaries Refined conceptual sizing methods. Sizing matrixplotandcarpetplot.Tradestudies-designtrades,requirementtrades, growth sensitivities. Measures of merit Determination of final baseline design configuration, preparation of type specification report	AircraftDesign: A Conceptual Approachby DanielP. Raymer	17	455-491
v	Stability,control & handling qualities	Longitudinal static stability and control,aerodynamic center estimation,wing and tail lift and elevator, Estimation of wing, fuselage -and nacelle pitching moment, thrus effect, trim analysis, take-off rotation,velocity stability, Lateral & directional stability and control, lateral-directional derivatives, aircraft dynamic characteristics, steady roll, pull up, inertia coupling, Introduction to handling qualities(Cooper harper rating scale), Spin recovery.	AircraftDesign: A Conceptual Approach by DanielP.Raymer	16	411-449