SCHEME OF COURSE WORK

Course Title	: **AIRCRAFT STRUCTURES**		
Course Code	: **13ME2212**	L T P C	: 4 0 0 3
Program:	: M.Tech.		
Specialization:	: CAAD		
Semester	: II		

Course Outcomes (COs):

At the end of the course, the student will be able to

1	Explain the aircraft design process and structure of the aircraft
2	Discuss aircraft materials, manufacturing processes and structuralanalysis of aircraft structures
3	Apply the theory of beams for the design of aircraft structure
4	Apply the theory of torsion for the design of aircraft structure
5	Explain air worthiness, aircraft certification and aircraft structuralrepair

Program Outcomes (POs)

At the end of the program, the students in CAAD will be able to

PO 1	acquire knowledge in latest computer-aided design and analysis tools
PO 2	create 3D models of real-time components using latest CAD software
PO 3	acquire technical skills to formulate and solve engineering and industrial problems
PO 4	carry out analysis for the design of new products
PO 5	have proficiency to solve problems using modern engineering design tools
PO 6	have capability to work in multidisciplinary streams
PO 7	apply project and finance management skills to organise engineering projects
PO 8	prepare technical reports and present them effectively
PO 9	engage in lifelong learning
PO 10	realize professional and ethical responsibilities
PO 11	conduct surveys, analyse data, plan, design and implement new ideas into action

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1			M		M	M			M			
CO-2			S	M					M			
CO-3			M				M					
CO-4			M				M					
CO-5									M	M		

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

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Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Aircraft design process:introduction, phases of aircraft design, aircraftconceptual design process, conceptual stage, preliminary design,detailed design, design methodologies	CO1	(i)What are the different phases of aircraft design? (ii) What are the different types of structuralmembers offuselage? (iii)Explain the different types of loads on structural joints aircraft loads.	Lectures , PPT, Seminar	
2	Introduction to aircraft structures: types of structural members of fuselage and wing section ribs, spars, frames, stringers, longeron, splices, sectional properties of structural members and their loads	CO1			Seminar-I (week 2-8)
3	Typesof structural joints, type of loads on structural joints aircraft loads,duration: aerodynamic loads, inertial loads, loads due to engine, actuator loads, manoeuvre loads, gust loads, ground loads, ground conditions, miscellaneous loads	CO1			
4	Aircraft materials andmanufacturing processes: material selectioncriteria, aluminum alloys, titanium alloys, steel alloys, magnesiumalloys, copper alloys, nimonic alloys, nonmetallic materials	CO2	(i)Explain the selection criteria of materials for aircraft. (ii)What are the advantages of smart materials? (iii) Discuss the different types of manufacturing processesfor composites.	Lectures , PPT, Seminar	
5	compositematerials, use of advanced materials, smartmaterials, manufacturing ofa/c structural members, overview of types of manufacturing processesfor composites.	CO2			
6	Structural analysis of aircraft structures: theory of plates- analysis ofplates for bending, stresses due to bending, plate deflection under different end conditions, strain energy due to bending of circular, rectangular plates, plate buckling, compression buckling	CO2			
7	Shearbuckling, buckling due to in plane bending moments, analysis of stiffened panels in buckling, rectangular plate buckling, analysis ofstiffened panels in post buckling, post buckling under shear.	CO2			
8	Theory of beams-symmetric beams in pure bending, deflection of beams, unsymmetrical beams in bending	CO3	(i)Explain the theory of beams in bending.	Lectures , PPT	

9	Mid-Test 1	CO-1, CO-2, CO3			Mid-Test 1 (Week 9)
10	plastic bending of beams,shear stresses due to bending in thin walled beams, bending of open section beams, bending of closed section beams, shear stresses due to torsion in thin walled beams	CO3	(i)Explain the shear stresses due to bending in thin walled beams. (ii)Discuss the shear stresses due totorsion in thin walled beams.	Lectures , PPT, Seminar	
11	Theory of torsion- shafts of non-circular sections, torsion in closed section beams, torsion in open section beams,	CO4	(i)Discuss shells-analysis of shell panels for buckling. (ii)Explain the theory of torsion in closedsection beams.		
12	multi cell sections, theory of shells-analysis of shell panels for buckling, compression loading	CO4		Lectures , PPT, Seminar	
13	shear loading / shell shear factor, circumferential buckling stress	CO4			
14	Airworthiness and aircraftcertification: definition,airworthinessregulations,regulatory bodies, type certification, general requirements	CO5	(i)What are the requirements for landing? (ii)What are the different types of certification? (iii)What are the requirements related to aircraft design covers?		Seminar-II (week 11-17)
15	requirements related to aircraft design covers, performance and flightrequirements, airframe requirements, landing requirements, fatigue andfailsafe requirements	CO5		Lectures , PPT, Seminar	
16	Emergency provisions, emergency landing requirements, Aircraft structural repair: types of structural damage, non-conformance, rework, repair, allowable damage limit, repairable damage limit	CO5			
17	overview of adl analysis, types of repair, repair considerations and bestpractices.	CO5			
18	Mid-Test 2	CO-3, CO-4, CO-5			Mid-Test 2 (Week 18)
19/20	END EXAM	All Cos			