Lesson Plan

Name of the Faculty: (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 6th

Subject: Aircraft Engineering Practices (ARE-302E)

Lesson Plan Duration: 15 Weeks (From January 2018 to April 2018)

Work Load (Lecture/Practical) per week (in hours): Lectures-04, Practicals-00

Week	Theory		Practical	
	Lecture day	Topic (including assignment/test)	Practical day	Topic
1st	1st	Mooring, jacking, levelling and towing operations		
	2nd	Mooring, jacking, levelling and towing operations		
	3rd	Mooring, jacking, levelling and towing operations		
	4th	Mooring, jacking, levelling and towing operations		
2nd	5th	Preparation		
	6th	Preparation		
	7th	Equipment and precautions		
	8th	Equipment and precautions		
3rd	9th	Engine starting procedures		
	10th	Engine starting procedures		
	11th	Piston engine, turboprops and turbojets		
	12th	Piston engine, turboprops and turbojets		
4th	13th	Piston engine, turboprops and turbojets		
	14th	Engine fire extinguishing		
	15th	Engine fire extinguishing		
	16th	Ground power units		
5th	17th	Ground power units; **Assignment 1**		
	18th	Air conditioning and pressurisation		
	19th	Oxygen and oil systems		
	20th	Oxygen and oil systems		
6th	21st	Ground units and their maintenance		
	22nd	Ground units and their maintenance		
	23rd	Shop safety		
	24th	Shop safety		
7th	25th	Environmental cleanliness		
	26th	Precautions		
	27th	Precautions		

	28th	Process; Purpose; Types		
8th	**29th**	Inspection intervals		
	30th	Techniques		
	31st	Techniques		
	32nd	Checklist		
9th	**33rd**	Special inspection		
	34th	Publications, Bulletins, various manuals		
	35th	Publications, Bulletins, various manuals		
	36th	FAR Air worthiness directives		
10th	**37th**	Type certificate Data Sheets		
	38th	Type certificate Data Sheets		
	39th	ATA specifications; **Assignment 2**		
	40th	Hand tools		
11th	**41st**	Precision instruments		
	42nd	Special tools and equipment in an airplane maintenance shop		
	43rd	Special tools and equipment in an airplane maintenance shop		
	44th	Identification terminology		
12th	**45th**	Specification and correct use of various aircraft hardware (i.e. nuts, bolts, rivets, screws, etc.)		
	46th	Specification and correct use of various aircraft hardware (i.e. nuts, bolts, rivets, screws, etc.)		
	47th	American and British systems of specifications		
	48th	American and British systems of specifications		
13th	**49th**	Threads, gears, bearings, etc.		
	50th	Drills, tapes & reamers		
	51st	Identification of all types of fluid line fittings		
	52nd	Identification of all types of fluid line fittings		
14th	**53rd**	Identification of all types of fluid line fittings		
	54th	Materials: metallic and non-metallic		
	55th	Materials: metallic and non-metallic; **Assignment 3**		
	56th	Cables		
15th	**57th**	Swaging procedures		
	58th	Swaging procedures		
	59th	Tests		
	60th	Advantages of swaging over splicing; **Assignment 4**		

Lesson Plan

Name of the Faculty: Mr. Nitesh Makkar (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 6th

Subject: Airplane Stability and Controls (ARE-306E)

Lesson Plan Duration: 15 Weeks (From January 2018 to April 2018)

Work Load (Lecture/Practical) per week (in hours): Lectures-04, Practicals-00

Week	Theory		Practical	
	Lecture day	Topic (including assignment/test)	Practical day	Topic
1st	1st	Introduction to stability of airplane		
	2nd	Stick fixed longitudinal stability		
	3rd	Stick fixed longitudinal stability		
	4th	Effect of power		
2nd	5th	Neutral point		
	6th	Centre of gravity limits		
	7th	In flight measurement of stick fixed neutral point		
	8th	In flight measurement of stick fixed neutral point		
3rd	9th	Control surface hinge moments		
	10th	Floating and restoring tendencies		
	11th	Floating and restoring tendencies		
	12th	Different types of tabs used on airplanes		
4th	13th	Different types of tabs used on airplanes		
	14th	Frise Aileron		
	15th	Spoiler Controls; **Assignment 1**		
	16th	**Revision**		
5th	17th	Effect of free elevator on airplane stability		
	18th	Elevator Control force		
	19th	Stick force gradients		
	20th	Stick force gradients		
6th	21st	Neutral point		
	22nd	Controls free centre of gravity limit		
	23rd	In flight measurement of stick free neutral point		
	24th	Effect of acceleration on airplane balancing		
7th	25th	Effect of acceleration on airplane balancing		

	26th	Elevator angle per g		
	27th	Stick force per g		
	28th	Manoeuver margins		
8th	**29th**	Manoeuver margins; **Assignment 2**		
	30th	**Revision**		
	31st	Asymmetric flight		
	32nd	Asymmetric flight		
9th	**33rd**	Weather cock stability		
	34th	Contribution of different parts of Airplane		
	35th	Contribution of different parts of Airplane		
	36th	Rudder Fixed directional stability		
10th	**37th**	Rudder free static directional stability		
	38th	Rudder lock		
	39th	Dihedral Effect		
	40th	Dihedral Effect		
11th	**41st**	Contribution of different parts of airplane controls in Roll		
	42nd	Contribution of different parts of airplane controls in Aileron		
	43rd	Contribution of different parts of airplane controls in control power		
	44th	Contribution of different parts of airplane controls in cross coupling of lateral and directional effects		
12th	**45th**	Contribution of different parts of airplane controls in cross coupling of lateral and directional effects; **Assignment 3**		
	46th	**Revision**		
	47th	Introduction to dynamics		
	48th	Spring-mass system		
13th	**49th**	Spring-mass system		
	50th	Equations of motion without derivation		
	51st	Equations of motion without derivation		
	52nd	Stability derivatives		
14th	**53rd**	Stability derivatives		
	54th	Longitudinal Dynamic Stability		
	55th	Lateral Dynamic Stability		
	56th	Directional Dynamic Stability		
15th	**57th**	Analysis of different stability modes		
	58th	Analysis of different stability modes; **Assignment 4**		
	59th	**Revision**		
	60th	**Revision**		

Lesson Plan

Name of the Faculty: Ms. Tusharika (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 8th

Subject: Air Transportation and Aircraft Maintenance Management (ARE-404E)

Lesson Plan Duration: 15 Weeks (From January 2018 to April 2018)

Work Load (Lecture/Practical) per week (in hours): Lectures-04, Practicals-00

Week	Theory		Practical	
	Lecture day	Topic (including assignment/test)	Practical day	Topic
1st	1st	Development of air transportation		
	2nd	Comparison with other modes of transport		
	3rd	Role of IATA, ICAO		
	4th	Role of IATA, ICAO		
2nd	5th	The general aviation industry airline		
	6th	Factors affecting general aviation, use of aircraft, airport		
	7th	Factors affecting general aviation, use of aircraft, airport		
	8th	Airline management and organisation		
3rd	9th	Levels of management; Functions of management		
	10th	Principles of organisation		
	11th	Planning the organisation - chart, staff departments & line departments		
	12th	Planning the organisation - chart, staff departments & line departments; **Assignment 1**		
4th	13th	Forecasting - Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc.		
	14th	Forecasting - Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc.		
	15th	Forecasting - Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc.		
	16th	Forecasting - Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity,		

		load factor etc.		
5th	**17th**	Passenger fare and tariffs		
	18th	Influence of geographical, economic & political factors on routes and route selection		
	19th	Influence of geographical, economic & political factors on routes and route selection		
	20th	Influence of geographical, economic & political factors on routes and route selection; **Assignment 2**		
6th	**21st**	FLEET PLANNING: The aircraft selection process		
	22nd	The aircraft selection process		
	23rd	Fleet commonality		
	24th	Factors affecting choice of fleet, route selection and Capitol acquisition		
7th	**25th**	Factors affecting choice of fleet, route selection and Capitol acquisition		
	26th	Valuation & Depreciation		
	27th	Valuation & Depreciation		
	28th	Budgeting, Cost planning		
8th	**29th**	Aircrew evaluation		
	30th	Route analysis		
	31st	Route analysis		
	32nd	Aircraft evaluation		
9th	**33rd**	Equipment maintenance		
	34th	Flight operations and crew scheduling		
	35th	Ground operations and facility limitations		
	36th	Equipment and types of schedule		
10th	**37th**	Hub & spoke scheduling, advantages / disadvantages & preparing flight plans		
	38th	Aircraft scheduling in line with aircraft maintenance practices		
	39th	Aircraft reliability - The maintenance schedule & its determinations		
	40th	Aircraft reliability - The maintenance schedule & its determinations		
11th	**41st**	Condition monitoring maintenance		
	42nd	Extended range operations (EROPS) & ETOPS		
	43rd	Extended range operations (EROPS) & ETOPS		
	44th	Ageing aircraft maintenance production; **Assignment 3**		
12th	**45th**	Airlines scheduling (with reference to engineering)		
	46th	Product support and spares		
	47th	Maintenance sharing		

	48th	Equipment and tools for aircraft maintenance		
13th	**49th**	Aircraft weight control		
	50th	Budgetary control		
	51st	On board maintenance systems		
	52nd	Engine monitoring		
14th	**53rd**	Turbine engine oil maintenance		
	54th	Turbine engine vibration monitoring in aircraft		
	55th	Turbine engine vibration monitoring in aircraft		
	56th	Life usage monitoring		
15th	**57th**	Current capabilities of NDT		
	58th	Current capabilities of NDT		
	59th	Helicopter maintenance		
	60th	Future of aircraft maintenance; **Assignment 4**		

Lesson Plan

Name of the Faculty: Mr. Nitesh Makkar (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 4th

Subject: Flight Dynamics (ARE-208E)

Lesson Plan Duration: 15 Weeks (From January 2018 to April 2018)

Work Load (Lecture/Practical) per week (in hours): Lectures-04, Practicals-00

Week	Theory		Practical	
	Lecture day	Topic (including assignment/test)	Practical day	Topic
1st	1st	Atmosphere: Properties		
	2nd	Standard atmosphere		
	3rd	Classification of aircraft		
	4th	Airplane (fixed wing aircraft) configuration and various parts		
2nd	5th	International Standard Atmosphere		
	6th	Forces and moments acting on a flight vehicle		
	7th	Equation of motion of a rigid flight vehicle		
	8th	Different types of drag		
3rd	9th	Drag polars of vehicles from low speed to high speeds		
	10th	Variation of thrust, power and SFC with velocity and altitudes for air breathing engines and rockets		
	11th	Variation of thrust, power and SFC with velocity and altitudes for air breathing engines and rockets		
	12th	Power available and power required curves; **Assignment 1**		
4th	13th	Performance of airplane in level flight		
	14th	Maximum speed in level flight		
	15th	Conditions for minimum drag and power required		
	16th	Conditions for minimum drag and power required		
5th	17th	Climbing and gliding flight		
	18th	Range and endurance		
	19th	Maximum rate of climb and steepest angle of climb		
	20th	Minimum rate of sink and shallowest angle of glide		

6th	**21st**	Turning performance (Turning rate turn radius)		
	22nd	Bank angle and load factor		
	23rd	Limitations of pull up and push over		
	24th	V-n diagram and load factor		
7th	**25th**	V-n diagram and load factor; **Assignment 2**		
	26th	Degree of freedom of rigid bodies in space		
	27th	Static and dynamic stability		
	28th	Static and dynamic stability		
8th	**29th**	Purpose of controls in airplanes		
	30th	Inherently stable and marginal stable airplanes		
	31st	Static, Longitudinal stability		
	32nd	Stick force gradients		
9th	**33rd**	Stick fixed stability		
	34th	Basic equilibrium equation		
	35th	Stick force per 'g'		
	36th	Stability criterion		
10th	**37th**	Effects of fuselage and nacelle; Influence of CG location		
	38th	Stick fixed neutral point; Stick free neutral points		
	39th	Stick free stability		
	40th	Power effects		
11th	**41st**	Symmetric manoeuvers		
	42nd	Aerodynamic balancing		
	43rd	Hinge moment coefficient		
	44th	Determination of neutral points and manoeuver points from flight test; **Assignment 3**		
12th	**45th**	Dihedral effect; Lateral control		
	46th	Coupling between rolling and yawing moments		
	47th	Adverse yaw effects; Aileron reversal		
	48th	Static directional stability; Weather cocking effect		
13th	**49th**	Rudder requirements		
	50th	One engine inoperative condition		
	51st	Rudder lock		
	52nd	Dynamic longitudinal stability: Equations of motion		
14th	**53rd**	Stability derivatives		
	54th	Characteristic equation of stick fixed case		
	55th	Effect of freeing-the stick		
	56th	Modes and stability criterion		
15th	**57th**	Brief description of lateral and directional		

	58th	Dynamic stability		
	59th	Spiral, divergence, Dutch roll, auto rotation and spin		
	60th	Spiral, divergence, Dutch roll, auto rotation and spin; **Assignment 4**		

Lesson Plan

Name of the Faculty: Ms. Tusharika (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 8th

Subject: Management Information System (ARE-422E)

Lesson Plan Duration: 15 Weeks (From January 2018 to April 2018)

Work Load (Lecture/Practical) per week (in hours): Lectures-04, Practicals-00

Week	Theory		Practical	
	Lecture day	Topic (including assignment/test)	Practical day	Topic
1st	1st	What is MIS?		
	2nd	Decision support systems		
	3rd	Systems approach		
	4th	The systems view of business		
2nd	5th	MIS organisation within the company management		
	6th	Organisational theory and the systems approach		
	7th	Development of organisational theory		
	8th	Management and organisational behaviour		
3rd	9th	Management information and the system approach		
	10th	Evolution of an information system		
	11th	Evolution of an information system		
	12th	Basic information systems		
4th	13th	Decision making and MIS		
	14th	MIS as a technique for making programmed decision assisting information systems		
	15th	Strategic and project planning for MIS: General business planning		
	16th	Strategic and project planning for MIS: General business planning		
5th	17th	Appropriate MIS Planning-general		
	18th	Appropriate MIS Planning-general		
	19th	MIS planning -details; **Assignment 1**		
	20th	Define the problems		
6th	21st	Set system objectives		
	22nd	Establish system constraints		
	23rd	Determine information needs		
	24th	Determine information sources		
7th	25th	Develop alternative conceptual designs and select one document		

	26th	Develop alternative conceptual designs and select one document		
	27th	The system concept		
	28th	Prepare the conceptual design report; **Assignment 2**		
8th	**29th**	Inform and involve the organisation		
	30th	Aim of detailed design		
	31st	Project management of MIS detailed design		
	32nd	Project management of MIS detailed design		
9th	**33rd**	Identify dominant and trade off criteria		
	34th	Define the subsystems		
	35th	Sketch the detailed operating subsystems and information flow		
	36th	Sketch the detailed operating subsystems and information flow		
10th	**37th**	Determine the degree of automation of each operation		
	38th	Inform and involve the organisation again		
	39th	Inform and involve the organisation again		
	40th	Inputs and processing		
11th	**41st**	Early system testing		
	42nd	Software, hardware and tools		
	43rd	Propose an organisation to operate the system		
	44th	Document the detailed design		
12th	**45th**	Revisit the manager –user; **Assignment 3**		
	46th	Plan the Implementation		
	47th	Acquire floor space and plan space layouts		
	48th	Organise for implementation		
13th	**49th**	Develop procedures for implementation		
	50th	Train the operating personnel		
	51st	Computer related acquisitions		
	52nd	Develop forms for data collection and information dissemination		
14th	**53rd**	Develop the files		
	54th	Test the system		
	55th	Cutover		
	56th	Document the system		
15th	**57th**	Evaluate the MIS control and maintain the system		

	58th	Pitfalls in MIS development: Fundamental weakness, soft spots in planning, design problems, implementation: The TARPIT		
	59th	Pitfalls in MIS development: Fundamental weakness, soft spots in planning, design problems, implementation: The TARPIT		
	60th	Pitfalls in MIS development: Fundamental weakness, soft spots in planning, design problems, implementation: The TARPIT; **Assignment 4**		

Lesson Plan

Name of the Faculty: (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 8th

Subject: Rockets and Missiles(ARE-406E)

Lesson Plan Duration: 15 Weeks (From January 2018 to April 2018)

Work Load (Lecture/Practical) per week (in hours): Lectures-04, Practicals-00

Week	Theory		Practical	
	Lecture day	Topic (including assignment/test)	Practical day	Topic
1st	1st	Classification of Rockets and Missiles		
	2nd	Differences		
	3rd	Uses		
	4th	Advantages and Disadvantages		
2nd	5th	Ignition system in Rockets		
	6th	Types of igniters		
	7th	Igniter design considerations		
	8th	Design consideration of liquid rocket combustion chamber, injector propellant feed lines, valves, Propellant tanks outlet and helium Pressurized and turbine feed systems		
3rd	9th	Design consideration of liquid rocket combustion chamber, injector propellant feed lines, valves, Propellant tanks outlet and helium Pressurized and turbine feed systems		
	10th	Design consideration of liquid rocket combustion chamber, injector propellant feed lines, valves, Propellant tanks outlet and helium Pressurized and turbine feed systems		
	11th	Design consideration of liquid rocket combustion chamber, injector propellant feed lines, valves, Propellant tanks outlet and helium Pressurized and turbine feed systems		
	12th	Propellant slosh and propellant hammer		
4th	13th	Elimination of geysering effect in missiles		
	14th	Airframe components of rockets and missiles		
	15th	Forces acting on a missile while passing		

		through atmosphere		
	16th	Method of describing aerodynamic forces and moments		
5th	**17th**	Method of describing aerodynamic forces and moments		
	18th	Lateral aerodynamic moment		
	19th	Lateral Damping moment and longitudinal moment of a rocket		
	20th	Lateral Damping moment and longitudinal moment of a rocket		
6th	**21st**	Lift and drag forces		
	22nd	Drag; **Assignment 1**		
	23rd	Body up wash and downwash in missiles		
	24th	Body up wash and downwash in missiles		
7th	**25th**	Rocket dispersion		
	26th	Numerical problems		
	27th	Numerical problems		
	28th	One dimensional and two dimensional rocket motions in free space and homogeneous gravitational fields		
8th	**29th**	One dimensional and two dimensional rocket motions in free space and homogeneous gravitational fields		
	30th	One dimensional and two dimensional rocket motions in free space and homogeneous gravitational fields		
	31st	Description of vertical, inclined and gravity turn trajectories		
	32nd	Description of vertical, inclined and gravity turn trajectories		
9th	**33rd**	Determination of range and altitude		
	34th	Determination of range and altitude		
	35th	Rocket vector control		
	36th	Methods		
10th	**37th**	Methods		
	38th	Thrust termination		
	39th	SITVC		
	40th	Multistage of rockets		
11th	**41st**	Vehicle optimisation		
	42nd	Stage separation dynamics		
	43rd	Separation techniques		
	44th	Separation techniques; **Assignment 2**		
12th	**45th**	Special requirements of materials to perform under adverse conditions		
	46th	Special requirements of materials to perform under adverse conditions		
	47th	Solid Rocket Motors: General description		

	48th	Interior ballistics component design Techniques		
13th	**49th**	Interior ballistics component design Techniques; **Assignment 3**		
	50th	Liquid Rocket Engines: General description		
	51st	Engine cycles		
	52nd	Power balance calculation		
14th	**53rd**	Component design fundamentals		
	54th	Component design fundamentals		
	55th	Classification of electric propulsion systems		
	56th	Classification of electric propulsion systems		
15th	**57th**	The rocket equation		
	58th	Vertical trajectories		
	59th	Multistage rockets		
	60th	Generalised 2D trajectory; **Assignment 4**		

Lesson Plan

Name of the Faculty: Mr. Nitesh Makkar (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 8th

Subject: Space Dynamics (ARE-414E)

Lesson Plan Duration: 15 Weeks (From January 2018 to April 2018)

Work Load (Lecture/Practical) per week (in hours): Lectures-04, Practicals-00

Week	Theory		Practical	
	Lecture day	Topic (including assignment/test)	Practical day	Topic
1st	1st	Initial works in Germany for space travel		
	2nd	Initial works in Germany for space travel		
	3rd	Russian and American campaigns		
	4th	Man in space		
2nd	5th	Profile of flight from earth to a destination in space and back		
	6th	The space shuttle		
	7th	Particle Dynamics:Introduction		
	8th	Newton's laws		
3rd	9th	Velocity and acceleration		
	10th	Coordinates and rotation		
	11th	The spherical pendulum		
	12th	Energy for one particle		
4th	13th	Angular momentum		
	14th	Energy for systems of particles		
	15th	The N-body problem; **Assignment 1**		
	16th	The Two-Body Problem: Introduction		
5th	17th	Energy and angular momentum		
	18th	Orbit equation		
	19th	Kepler's laws		
	20th	Orbit determination and satellite tracking		
6th	21st	Orbit determination and satellite tracking		
	22nd	The Hohmann transfer		
	23rd	Inclination-change manoeuver		
	24th	Launch to rendezvous		
7th	25th	Decay life time		
	26th	Earth oblations effect; **Assignment 2**		
	27th	Rigid Body Dynamics: Introduction		
	28th	Choice of origin		

8th	**29th**	Angular momentum and energy		
	30th	Principal-body-axis frame		
	31st	Particle axis theorem		
	32nd	Particle axis theorem		
9th	**33rd**	Euler's equations		
	34th	Orientation angle		
	35th	Torque –Free-axisymmetric Rigid body		
	36th	The general torque free rigid body		
10th	**37th**	The general torque free rigid body		
	38th	Semi-rigid space craft		
	39th	Attitude control: Spinning and Non spinning space craft		
	40th	Attitude control: Spinning and Non spinning space craft		
11th	**41st**	The Yo-Yo mechanism		
	42nd	Gravity gradient satellite		
	43rd	The dual spin spacecraft; **Assignment 3**		
	44th	Re-Entry: Introduction		
12th	**45th**	Ballistic re-entry		
	46th	Skip re-entry		
	47th	Double dip re-entry		
	48th	Aero braking, lifting re-entry		
13th	**49th**	Aero braking, lifting re-entry		
	50th	The Space Environment: Introduction		
	51st	The atmosphere		
	52nd	Light and space craft temperature		
14th	**53rd**	Charged particle motion		
	54th	Magnetic mirrors		
	55th	The van-atten Belts		
	56th	The van-atten Belts		
15th	**57th**	Radiation effects		
	58th	Meteors, Meteorites and impact		
	59th	Meteors, Meteorites and impact		
	60th	Our local neighbourhood; **Assignment 4**		

Specimen of Lesson Plan

Name of the Faculty: Mr. Sanjeev Kumar (Theory & Practical)

Discipline: Department of Aeronautical Engineering

Semester: 4th

Subject: Aerodynamics-I (ARE-204E), Aerodynamics Lab (ARE-210E)

Lesson Plan Duration: 15 Weeks (From January, 2018 to April, 2018)

Work Load (Lecture/ Practical) per week (in hours): Lectures -04, Practicals-06

WEEK	THEORY		PRACTICAL	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1st	1st	**UNIT-I** **Review of Basics Fluid Mechanics-** • Continuity Equation	1st	Use of Anemometer for measuring velocity.
	2nd	• Momentum equation		
	3rd	• Energy Equation		
	4th	**Two Dimensional Flows-** • Basic flows – Source		
2nd	1st	• Basic flows – Sink	2nd	Measurement of velocity profile in favorable and adverse pressure gradient.
	2nd	• Free vortex		
	3rd	• Forced vortex		
	4th	• uniform parallel flow		
3rd	1st	• Non Uniform Flow	3rd	Pressure distribution over a 2D cylinder and to find lift and drag.
	2nd	• Their combinations (uniform parallel flow)		
	3rd	• Pressure and velocity distributions on bodies with circulation in ideal and real fluid flows		
	4th	• Pressure and velocity distributions on bodies without circulation in ideal and real fluid flows		
4th	1st	• Kutta Joukowski's theorem	4th	Pressure distribution over an airfoil and to find lift

	2nd	• Kutta Joukowski's theorem (applications)		and drag.
	3rd	**Numerical/ Assignment-1**		
	4th	**Test-1**		
5th	**1st**	**<u>UNIT-II</u>** **Conformal Transformation-**	**5th**	Experiments on potential flow Analogy (Hele-Shaw flow).
	2nd	• Joukowski transformation		
	3rd	• Joukowski transformation (various shapes)		
	4th	• Application to fluid flow problems (Joukowski transformation)		
6th	**1st**	• Application to fluid flow problems (Joukowski transformation)	**6th**	To study shocks using a water table.
	2nd	• Kutta condition (aerofoils)		
	3rd	• Kutta condition (circular cylinder)		
	4th	Blasius theorem		
7th	**1st**	• Blasius theorem (applications)	**7th**	To find the displacement thickness for the given aerofoil at low Reynolds number.
	2nd	**Numerical/ Assignment-2**		
	3rd	**Test-2**		
	4th	**<u>UNIT –III</u>** **Aerofoil and Wing Theory-**		
8th	**1st**	• Joukowski (applications)	**8th**	To plot Cp vs angle of attack for a pitching aerofoil.
	2nd	• Joukowski (applications)		
	3rd	• Karman – Trefftz (Theorem)		
	4th	• Karman – Trefftz (applications)		
9th	**1st**	• Profiles - Thin aerofoil theory		
	2nd	• Profiles - Thin aerofoil theory		
	3rd	• Profiles - Thin aerofoil theory (applications)		
	4th	• Profiles - Thin aerofoil theory (applications)		
10th	**1st**	• Vortex line		
	2nd	• Horse shoe vortex		

	3rd	• Horse shoe vortex (Bound and Trailing edge vortex)		
	4th	• Biot and Savart law		
11th	**1st**	• Lifting line theory		
	2nd	• Lifting line theory and its limitations		
	3rd	**Numerical/ Assignment-3**		
	4th	**Test-3**		
12th	**1st**	**<u>UNIT -IV</u>** **Viscous Flow-**		
	2nd	• Newton's law of viscosity		
	3rd	• Boundary Layer (Laminar)		
	4th	• Boundary Layer (Turbulent)		
13th	**1st**	• Navier-Stokes equation		
	2nd	• Navier-Stokes equation (applications)		
	3rd	• Displacement Thickness		
	4th	• Momentum Thickness		
14th	**1st**	• Flow over a flat plate		
	2nd	• Blasius solution		
	3rd	**Numerical/ Assignment-4**		
	4th	**Test-4**		
15th	**1st**	• Revision (Unit-1)		
	2nd	• Revision (Unit-2)		
	3rd	• Revision (Unit-3)		
	4th	• Revision (Unit-4)		

Specimen of Lesson Plan

Name of the Faculty: Mr. Uma Shanker (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 6th

Subject: Aeroelasticity (*ARE-310E)*

Lesson Plan Duration: 15 Weeks (From January, 2018 to April, 2018)

Work Load (Lecture/ Practical) per week (in hours): Lectures -04

WEEK	THEORY		PRACTICAL	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1st	1st	**UNIT-I** ***Introduction-*** Definition and historical background		
	2nd	• Static and dynamic aeroelastic phenomenon (Static Phenomenon)		
	3rd	• Static and dynamic aeroelastic phenomenon (Dynamic Phenmenon)		
	4th	• Integretion of aerodynamic, elastic and inertia forces (aerodynamics forces)		
2nd	1st	• Integretion of aerodynamic, elastic and inertia forces (aerodynamics forces)		
	2nd	• Influence of aeroelstic phenomenon on air craft design (elastic and inertia forces)		
	3rd	• Numerical based on static and dynamic aeroelasticity phenomenon		
	4th	• Numerical based on static and dynamic aeroelasticity phenomenon		
3rd	1st	• Comparison of critical speeds		
	2nd	• Comparison of critical speeds		
	3rd	**Numerical/ Assignment-1**		
	4th	**Test-1**		
4th	1st	**UNIT-II** ***Divergence of Lifting Surface-*** The phenomenon of divergence		
	2nd	• Divergence of 2-D wing section		
	3rd	• Divergence of an idealized cantilever wing, solution based on semi-rigid assumptions		

	4th	• Divergence of an idealized cantilever wing, solution based on semi-rigid assumptions		
5th	**1st**	• Solution to generalized co-ordinates Method of successive approximation		
	2nd	• Solution to generalized co-ordinates Method of successive approximation		
	3rd	• Numerical based on divergence of lifting surface		
	4th	• Numerical based on divergence of lifting surface		
6th	**1st**	• Use of Numerical Methods		
	2nd	• Use of Numerical Methods		
	3rd	**Numerical/ Assignment-2**		
	4th	**Test-2**		
7th	**1st**	**<u>UNIT-III</u>** ***Steady State Aero-Elasticity Problems in General-*** Loss and reversal of aileron Control: 2D case		
	2nd	• Aileron reversal general case		
	3rd	• Lift distribution on a rigid and elastic wing		
	4th	• Lift distribution on a rigid and elastic wing		
8th	**1st**	• Effect on Static Longitudinal stability of airplane (fixed controls)		
	2nd	• Effect on Static Longitudinal stability of airplane (fixed controls)		
	3rd	• Effect on Static Longitudinal stability of airplane (free controls)		
	4th	• Effect on Static Longitudinal stability of airplane (free controls)		
9th	**1st**	• ***Introduction to Flutter and Buffeting-*** The phenomenon of flutter		
	2nd	• The phenomenon of flutter		
	3rd	• Flutter of a cantilever wing		
	4th	• Flutter of a cantilever wing		
10th	**1st**	• Approximate determination of critical speed by Galerkin's Method		
	2nd	• Approximate determination of critical speed by Galerkin's Method		

	3rd	• Buffeting and stall flutter--an introduction		
	4th	• Buffeting and stall flutter--an introduction		
11th	**1st**	**Numerical/ Assignment-3**		
	2nd	**Test-3**		
	3rd	**UNIT-IV** ***Non Aeronautical Problems-*** Some typical example in civil engineering		
	4th	• Some typical example in civil engineering		
12th	**1st**	• Flow around an oscillating circular cylinder applications to H-shaped sections		
	2nd	• Flow around an oscillating circular cylinder applications to H-shaped sections(aeroelastic effect on circular cylinder)		
	3rd	• Flow around an oscillating circular cylinder applications to H-shaped sections (aeroelastic effect on H-shaped sections)		
	4th	**Numerical/ Assignment-4**		
13th	**1st**	• Prevention of aero-elastic instabilities (stability and instability phenomenon)		
	2nd	• Prevention of aero-elastic instabilities (stability and instability phenomenon)		
	3rd	• Prevention of aero-elastic instabilities (various types of instabilities)		
	4th	• Prevention of aero-elastic instabilities (various types of instabilities)		
14th	**1st**	• Prevention of aero-elastic instabilities (methods to prevent the instabilities)		
	2nd	• Prevention of aero-elastic instabilities (methods to prevent the instabilities)		
	3rd	**Numerical/ Assignment-5**		
	4th	**Test-4**		
15th	**1st**	• Revision (Unit-1)		
	2nd	• Revision (Unit-2)		
	3rd	• Revision (Unit-3)		
	4th	• Revision (Unit-4)		

Specimen of Lesson Plan

Name of the Faculty: Mr. Uma Shanker (Theory & Practical)

Discipline: Department of Aeronautical Engineering

Semester: 4th

Subject: Aircraft Structures-I (ARE-202E), Aircraft Structures Lab (ARE-212E)

Lesson Plan Duration: 15 Weeks (From January, 2018 to April, 2018)

Work Load (Lecture/ Practical) per week (in hours): Lectures -04, Practicals-06

WEEK	THEORY		PRACTICAL	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1st	1st	**UNIT-I** **Aircraft Structures-** • Introduction	1st	Study the construction of fuselage and identify the primary load carrying members
	2nd	• Various Types of Structures used in Aircraft Construction.		
	3rd	• Various Types of Structures used in Aircraft Construction.		
	4th	• Numerical based on various types of aircraft structures**(Assignment-1)**		
2nd	1st	**Analysis of 2D Problems-** • Analysis of 2-D problems in rectangular and polar co-ordinates employing "Theory of Elasticity:	2nd	Study the construction of wings, ailerons, flaps, slits, slats and spoilers.
	2nd	• Analysis of 2-D problems in rectangular and polar co-ordinates employing "Theory of Elasticity (Compatibility Equations)		
	3rd	• Analysis of 2-D problems in rectangular and polar co-ordinates employing "Theory of Elasticity (Airy Stress Function)		
	4th	• Numerical based on Theory of Elasticity **(Assignment-2)**		
3rd	1st	• Plane Stress and Plane Strain Condition	3rd	Study the construction of empennage, stabilizers, rudders adjusting tabs etc with detail of honeycomb structure.
	2nd	• Plane Stress and Plane Strain Condition(Complimentary shear)		
	3rd	• Plane Stress and Plane Strain Condition (Principle planes)		
	4th	• Numerical Based on principle stress and strain **(Assignment-3)**		

4th	**1st**	**Test-1**	**4th**	Study the construction of landing gears and wheel turning mechanism
	2nd	**UNIT –II** **Statically Indeterminate Structures-** • Truss analysis with single and double redundancy		
	3rd	• Truss analysis with single and double redundancy (Numerical)		
	4th	• Frames and rings		
5th	**1st**	• Frames and rings (Various frames and rings used in aircraft constructions)	**5th**	Study of aileron control linkages including artificial feel mechanism, booster and manual controls and their adjustments
	2nd	• Numerical based on frames and rings **(Assignment-4)**		
	3rd	• Torsion and bending of multi shell box beams		
	4th	• Torsion and bending of multi shell box beams (Torsion and Bending)		
6th	**1st**	• Torsion and bending of multi shell box beams (Single shell problems)	**6th**	Study the measurement techniques with strain gauges
	2nd	• Torsion and bending of multi shell box beams (Multi shell problems)		
	3rd	• Numerical based on single and multi shell box beams **(Assignment-5)**		
	4th	**Test-2**		
7th	**1st**	**UNIT-III** **Torsion-** • Torsion of non-circular solid bars	**7th**	Dye penetrant testing for surface crack detection
	2nd	• Torsion of non-circular solid bars (Bredt- Batho Theory)		
	3rd	• Warping, axially constrained stresses		
	4th	• Warping, axially constrained stresses (Various section subjected to warping)		
8th	**1st**	• Numerical based on torsion of non circular solid bars and warping **(Assignment-6)**	**8th**	Measurement of deflection of simply supported beam
	2nd	• Torsional deflection of noncircular shell (Torsion and Deflection)		
	3rd	• Torsional deflection of noncircular shell (Circular and Non circular shell)		
	4th	• Torsional deflection of noncircular shell (Thin and Thick shell)		
9th	**1st**	• Analysis of thick walled tubes	**9th**	Study checks on airframe for life extension
	2nd	• Analysis of thick walled tubes (Bending and Torsion applications)		

	3rd	• Analysis of thick walled tubes (Bending and Torsion applications)		
	4th	• Numerical based on thick walled tubes **(Assignment-7)**		
10th	**1st**	**Joints in Structures-** • Riveted and Bolted Joints (Rivet)	**10th**	Determination of compressive strength of thin plates
	2nd	• Riveted and Bolted Joints (Bolts)		
	3rd	• Analysis and Design (Aircraft Structures)		
	4th	• Analysis and Design (Aircraft Structures)		
11th	**1st**	• Numerical based on rivets and bolts **(Assignment-8)**		
	2nd	**Test-3**		
	3rd	**<u>UNIT -IV</u>** **Structural components-** • Function of various components eg. aileron, flaps, rudder, landing gear etc (Aileron Structures)		
	4th	• Function of various components eg. aileron, flaps, rudder, landing gear etc (Flap and Rudder Structures)		
12th	**1st**	• Function of various components eg. aileron, flaps, rudder, landing gear etc (Landing Gear Structures)		
	2nd	• Design Criteria (Primary Controls)		
	3rd	• Design Criteria (Secondary Controls)		
	4th	• Numerical based on various aircraft structural components**(Assignment-9)**		
13th	**1st**	• Safe-Life and Fail Safe (Safe Life)		
	2nd	• Safe-Life and Fail Safe (Fail Safe)		
	3rd	• Damage Tolerance Approach (Spars, Stringers)		
	4th	• Damage Tolerance Approach (Webs)		
14th	**1st**	• Fatigue damage		
	2nd	• Fatigue damage (Various Types)		
	3rd	• Numerical **(Assignment-10)**		
	4th	**Test-4**		
15th	**1st**	• Revision (Unit-1)		
	2nd	• Revision (Unit-2)		
	3rd	• Revision (Unit-3)		

	4th	• Revision (Unit-4)	

Specimen of Lesson Plan

Name of the Faculty: Mr. Uma Shanker (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 8th

Subject: Computational Fluid Dynamics (ARE-402E)

Lesson Plan Duration: 15 Weeks (From January, 2018 to April, 2018)

Work Load (Lecture/ Practical) per week (in hours): Lectures -04

WEEK	THEORY		PRACTICAL	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1st	1st	**UNIT I-** • Methods of prediction: comparison of experimental investigation Vs theoretical calculation		
	2nd	• Mathematical description of physical phenomena; significance of governing differential equations		
	3rd	• The general form of governing differential equation		
	4th	• The general form of governing differential equation		
2nd	1st	• Classification of problems: Physical classification: Equilibrium problems and Marching problems		
	2nd	• Analysis of 2-D problems in rectangular and polar co-ordinates employing "Theory of Elasticity		
	3rd	• Mathematical classification: Elliptic, parabolic and hyperbolic partial differential equations		
	4th	• Mathematical classification: Elliptic, parabolic and hyperbolic partial differential equations		
3rd	1st	• Nature of co-ordinates		
	2nd	• One way and two-way co-ordinates		
	3rd	• Proper choice of co-ordinates		
	4th	**Numerical/ Assignment-1**		

4th	**1st**	**Test-I**		
	2nd	**UNIT II-** • The concept of discretisation, Finite differences; Taylor series formulation		
	3rd	• Finite difference discretisation of ordinary and partial derivatives		
	4th	• Finite difference discretisation of ordinary and partial derivatives		
5th	**1st**	• Truncation error, round-off error, discretisation error		
	2nd	• Truncation error, round-off error, discretisation error		
	3rd	• Consistency and stability of numerical schemes		
	4th	• Variation formulation; Method of weighted Residuals		
6th	**1st**	• Variation formulation; Method of weighted Residuals		
	2nd	• Control volume formulation		
	3rd	**Numerical/ Assignment-2**		
	4th	**Test-2**		
7th	**1st**	**UNIT III-** • Steady one- dimensional Conduction		
	2nd	• The inter-face conductivity, Non linearity, Source-Term Linearization		
	3rd	• The inter-face conductivity, Non linearity, Source-Term Linearization		
	4th	• Types of Boundary Conditions		
8th	**1st**	**Numerical/ Assignment-3**		
	2nd	• Unsteady one-dimensional Conduction: Explicit		
	3rd	• Unsteady one-dimensional Conduction: Explicit		
	4th	• Crank-Nicolson Method		
9th	**1st**	• Crank-Nicolson Method		
	2nd	• Fully Implicit scheme's		
	3rd	• Fully Implicit scheme's		
	4th	**Numerical/ Assignment-4**		

10th	**1st**	• Discretisation of two and three dimensional problems		
	2nd	• Discretisation of two and three dimensional problems		
	3rd	• Stability analysis		
	4th	• Stability analysis		
11th	**1st**	**Numerical/ Assignment-5**		
	2nd	**Test-3**		
	3rd	**<u>UNIT IV-</u>** • Steady one dimensional convection and diffusion		
	4th	• Steady one dimensional convection and diffusion		
12th	1st	• The up wind scheme, Generalized Formulation		
	2nd	• Discretisation equation for two and three dimensional problems		
	3rd	• Discretisation equation for two and three dimensional problems		
	4th	• The outflow Boundary condition, false Diffusion		
13th	**1st**	• Basic difficulty, Vorticity Based methods, Representation of the continuity equation		
	2nd	• Basic difficulty, Vorticity Based methods, Representation of the continuity equation		
	3rd	• Staggered grid: the momentum equations, the pressure velocity corrections		
	4th	• Staggered grid: the momentum equations, the pressure velocity corrections		
14th	**1st**	• SIMPLE algorithm		
	2nd	• SIMPLE algorithm		
	3rd	**Numerical/ Assignment-6**		
	4th	**Test-4**		
15th	**1st**	• Revision (Unit-1)		
	2nd	• Revision (Unit-2)		
	3rd	• Revision (Unit-3)		
	4th	• Revision (Unit-4)		

Specimen of Lesson Plan

Name of the Faculty: Mr. Sanjeev Kumar (Theory)

Discipline: Department of Aeronautical Engineering

Semester: 6th

Subject: Propulsion-II

Lesson Plan Duration: 15 Weeks (From January, 2018 to April, 2018)

Work Load (Lecture/ Practical) per week (in hours): Lectures -04

WEEK	THEORY		PRACTICAL	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1st	1st	UNIT-I **Aircraft Gas Turbines-** • Impulse and reaction blading of gas turbines		
	2nd	• Velocity triangles and power output		
	3rd	• Elementary theory		
	4th	• Vortex theory		
2nd	1st	• Choice of blade profile, pitch and chord		
	2nd	• Estimation of stage performance		
	3rd	• Limiting factors in gas turbine design		
	4th	• Overall turbine performance		
3rd	1st	• Methods of blade cooling		
	2nd	• Matching of turbine and compressor		
	3rd	**Numerical/ Assignment-1**		
	4th	**Test-1**		
4th	1st	**Ram Jet Propulsion-** • Operating principle		

	2nd	• Sub critical, critical and supercritical operation		
	3rd	• Combustion in ramjet engine		
	4th	• Ramjet performance – Sample ramjet design calculations		
5th	**1st**	• Introduction to scramjet		
	2nd	• Preliminary concepts in supersonic combustion		
	3rd	• Integral ram- rocket		
	4th	**Numerical/ Assignment-2**		
6th	**1st**	**Test-2**		
	2nd	**<u>UNIT- II</u>** **Fundamentals of Rocket Propulsion-** • Operating principle		
	3rd	• Specific impulse of a rocket		
	4th	• Internal ballistics		
7th	**1st**	• Rocket nozzle classification		
	2nd	• Rocket performance considerations		
	3rd	**Numerical/Assignment-3**		
	4th	**Test-3**		
8th	**1st**	**<u>UNIT-III</u>** **Chemical Rockets-** Solid propellant rockets		
	2nd	• Selection criteria of solid propellants		
	3rd	• Important hardware components of solid rockets		
	4th	• Important hardware components of solid rockets		
9th	**1st**	• Propellant grain design considerations		
	2nd	• Propellant grain design considerations		
	3rd	• Liquid propellant rockets		
	4th	• Selection of liquid propellants		
10th	**1st**	• Selection of liquid propellants		
	2nd	• Thrust control in liquid rockets		

	3rd	• Thrust control in liquid rockets		
	4th	• Cooling in liquid rockets		
11th	**1st**	• Cooling in liquid rockets		
	2nd	• Limitations of hybrid rockets		
	3rd	• Limitations of hybrid rockets		
	4th	• Relative advantages of liquid rockets over solid rockets		
12th	**1st**	• Relative advantages of liquid rockets over solid rockets		
	2nd	**Numerical/Assignment- 4**		
	3rd	**Test-4**		
	4th	**<u>UNIT-IV</u>** **Advantages of Propulsion Techniques-**		
13th	**1st**	• Electric rocket propulsion		
	2nd	• Ion propulsion techniques		
	3rd	• Nuclear rocket		
	4th	• Types – Solar sail		
14th	**1st**	• Preliminary Concepts in nozzleless propulsion		
	2nd	• Preliminary Concepts in nozzleless propulsion		
	3rd	**Numerical/ Assignment- 5**		
	4th	**Test-5**		
15th	**1st**	• Revision (Unit-1)		
	2nd	• Revision (Unit-2)		
	3rd	• Revision (Unit-3)		
	4th	• Revision (Unit-4)		

Specimen of Lesson Plan

Name of the Faculty: Mr. Sanjeev (Theory & Practical)

Discipline: Department of Aeronautical Engineering

Semester: 6th

Subject: Aircraft Systems (ARE-308E)

Lesson Plan Duration: 15 Weeks (From January, 2018 to April, 2018)

Work Load (Lecture/ Practical) per week (in hours): Lectures -04, Practicals-00

WEEK	THEORY		PRACTICAL	
	Lecture Day	Topic (Including assignment/ test)	Practical Day	Topic
1st	1st	**UNIT-I** • Air conditioning and Cabin pressurization		
	2nd	• Air Supply		
	3rd	• Sources including engine bleed, APU and ground Cart		
	4th	• Air-conditioning System component layout		
2nd	1st	• functioning of individual components & routine checks on the system		
	2nd	• Distribution System		
	3rd	• Flow temperature and humidity control		
	4th	**Test-1**		
3rd	1st	**UNIT-II** • Fire protection system		
	2nd	• Fire and smoke detection and warning system		
	3rd	• Fire Extinguishers system		
	4th	• Portable fire extinguisher type of Fire detectors.		
4th	1st	• standard operating procedures for fire on ground		

	2nd	**Test-2**		
	3rd	**UNIT-III** • Fuel System		
	4th	• System layout , fuel tanks		
5th	**1st**	• supply system, dumping, venting and draining		
	2nd	• Indications and warning		
	3rd	• functioning of various components		
	4th	• checks during routine servicing		
6th	**1st**	• Common problems in the system components		
	2nd	**Test-3**		
	3rd	**UNIT -IV** Hydraulic power		
	4th	• system layout		
7th	**1st**	• hydraulic reservoirs and accumulators		
	2nd	• pressure Generation, pressure control		
	3rd	• indication and warning system functioning of hydraulic pump		
	4th	• Checks on hydraulic oil		
8th	**1st**	• layout of hydraulic lab		
	2nd	**Test-4**		
	3rd	**UNIT -V** **Ice protection system**		
	4th	• Ice formation classification and detection		
9th	**1st**	• anti icing system		
	2nd	• deicing system		
	3rd	• working of system in general		
	4th	• Effect of ice formation on functioning on various system		
10th	**1st**	**Test-5**		
	2nd	**Unit-6.** **Oxygen system**		

	3rd	• system layout		
	4th	• supply regulation		
11th	**1st**	• sources, storage charging and distribution		
	2nd	• Indications and warning		
	3rd	• Engine oxygen system		
	4th	• Engine oxygen system		
12th	1st	• procedures for carrying out oxygen leak check		
	2nd	• procedures for carrying out oxygen leak check		
	3rd	• precaution while working on oxygen system		
	4th	**Test-6**		
13th	**1st**	• Revision (Unit-1)		
	2nd	• Revision (Unit-1)		
	3rd	• Revision (Unit-2)		
	4th	• Revision (Unit-2)		
14th	**1st**	• Revision (Unit-3)		
	2nd	• Revision (Unit-3)		
	3rd	• Revision (Unit-4)		
	4th	• Revision (Unit-4)		
15th	**1st**	• Revision (Unit-5)		
	2nd	• Revision (Unit-5)		
	3rd	• Revision (Unit-6)		
	4th	• Revision (Unit-6)		