Second Year (Lateral Entry)

Curriculum

Admission year 2026-27

Bachelor of Technology (Lateral Entry)
Aeronautical Engineering

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Semester 3

a. **Course Name:** Fundamentals of Fluid Mechanics
b. **Course Code:** 03010103PC01
c. **Prerequisite:** Fundamentals Knowledge of various thermal, physical properties of fluid.
d. **Rationale:** The subject gives exposure to various fluids principles, the behavior of Fluid under different conditions, and types of flow generation, which is required in Engineering for analysis purposes.
e. **Course Learning Objective:**

CLOBJ 1	Define and classify fluids; study mechanics principles, properties, behaviors including capillarity.
CLOBJ 2	Understand Pascal's law, fluid forces, pressure, buoyancy, stability, submerged bodies.
CLOBJ 3	Learn flow types, continuity, velocity, acceleration, potential lines, Euler, Bernoulli.
CLOBJ 4	Explore viscosity, Navier-Stokes equations, energy equation, Plane and Hagen-Poiseuille flows.
CLOBJ 5	Apply boundary layer concepts, Von Karman momentum, laminar, turbulent separation control
CLOBJ 6	Use Buckingham's theorem, dimensionless groups, similarity laws, scaling experiments, model testing.

f. **Course Learning Outcomes:**

CLO 1	Understand the fundamentals of fluid Mechanics and respective properties of fluid
CLO 2	Understand the behavior of fluid under static and dynamic conditions.
CLO 3	Apply various governing equation to solve the fluid mechanics problems
CLO 4	Analysis the flow with various measurement techniques and instruments used in fluid mechanics

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**40**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P**- Practical; **C**- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

h. **Course Content**

Unit No.	**Topic**	**Teaching Hrs.**	**Weightage**
1.	**Introduction of Fluids** Definition and types of fluids, the science of fluid mechanics, fluid properties, capillarity, surface tension, compressibility, units and dimensions, Normal and shear stresses in fluid flows and measurement of fluid velocity.	04	7
2.	**Fluid Statistics** Pascal's law, types of forces on a fluid system, measurement of pressure, use of manometers and gauges, Buoyancy, forces on partially and fully submerged bodies, forces on curved surfaces, stability of floating bodies, center of gravity and meta centric heights.	06	15
3.	**Kinematics of Fluid Flow** Types of flow, Stream line, Path line, Streak line, Stream tube, Continuity equation, One- & Two-dimensional flow, Velocity & Acceleration at a point, Potential lines, Flow net, Source, Sink and doublet flow, Stream function, Velocity potential, Circulation and Vortex motion. Dynamics of Fluid Flow; One-dimensional method for flow analysis, Euler`s equation of motion, Derivation of Bernoulli`s equation for incompressible flow & its applications, Condition on velocity for incompressible flow, Laplace's equation.	10	25

Unit No.	Topic	Teaching Hrs.	Weightage
4.	**Viscous Flow** Qualitative aspects of viscous flows, viscosity, Navier stoke's equations in vector form, viscous flow energy equation, some exact solutions of Navier stoke's equations; Plane Poiseuille flow, Hagen - Poiseuille flow.	06	15
5.	**Boundary Layer Theory** Introduction, Boundary layer Definitions and Characteristics, Momentum Equation for Boundary Layer by Von Karman, Laminar Boundary Layer, Turbulent Boundary Layer, Boundary Layer Separation and its control	12	30
6.	**Dimensional Analysis and Similitude** Buckingham's theorem, non-dimensional groups, Geometric, Kinematic and Dynamic similarity, Applications.	07	08

i. Text Book and Reference Book:

1. Fluid Mechanics and Hydraulic Machines By Dr. R K. Bansal | Laxmi Publications
2. Fluid Mechanics and Hydraulic Machines By R.K. Rajput | S.Chand & Co
3. Fluid Mechanics By F. M. White | Tata McGraw - Hill Publishing Co. Ltd.
4. Engineering Fluid Mechanics By D. S. Kumar | S K KATARIA & SONS-NEW DELHI.
5. Engineering Fluid Mechanics By K. L. Kumar | S. Chand Limited

a. Course Name: Fundamentals of Fluid Mechanics Lab

b. Course Code: 03010103PC02

c. Prerequisite: Fundamentals Knowledge of various thermal properties of fluid.

d. Rationale: The subject gives exposure to various fluids principles, the behavior of Fluid under different conditions and types of flow generation, which is required in Engineering for analysis purposes.

e. Course Learning Objective:

CLOBJ 1	Understand the fundamentals of the Apparatus required in the laboratory.
CLOBJ 2	Understand the application of Bernoulli's Principle.
CLOBJ 3	Apply the equation and measurement techniques to calculate the fluid properties.
CLOBJ 4	Analyze experimental data and develop Empirical equations.

f. Course Learning Outcomes:

CLO 1	Understand the fundamentals of the Apparatus required in the laboratory.
CLO 2	Understand the application of Bernoulli's Principle.
CLO 3	Apply the equation and measurement techniques to calculate the fluid properties.
CLO 4	Analyze experimental data and develop Empirical equations.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
-	**-**	**2**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

List of Practical	
1.	Study the different apparatuses used for the experiment.
2.	Experimental verification of Bernoulli's Theorem.
3.	Determination of metacentric height of a Floating Body.
4.	Determination of the discharge coefficient of V-Notch.
5.	Determination of the discharge coefficient of Rectangular-Notch.
6.	Calibration of Venturi and Orifice Meters.
7.	Friction losses in Pipes.
8.	Verification of Froude's Model Law.
9.	To calibrate the wind tunnel by using a Pitot tube

i. Text Book and Reference Book:

1. Fluid Mechanics and Hydraulic Machines By Dr. R K. Bansal | Laxmi Publications
2. Fluid Mechanics and Hydraulic Machines By R.K. Rajput | S.Chand & Co
3. Fluid Mechanics By F. M. White | Tata McGraw - Hill Publishing Co. Ltd.
4. Engineering Fluid Mechanics By D. S. Kumar | S K KATARIA & SONS-NEW DELHI.
5. Engineering Fluid Mechanics By K. L. Kumar | S. Chand Limited

a. **Course Name:** Mechanics of Solid
b. **Course Code:** 03010103PC03
c. **Prerequisite:** System of units, Laws of motion, Basic idea of force, Concept of centroid Fundamentals of stress, strain and their relationships.
d. **Rationale:** Mechanics of Solids is conceptual applications of principles of mechanics in Engineering.
e. **Course Learning Objective:**

CLOBJ 1	To build a clear conceptual foundation of force systems, free body diagrams, moments, and equilibrium conditions used in engineering mechanics.
CLOBJ 2	To develop understanding of distributed forces and the geometric properties of sections, including centroid/Centre of gravity and moment of inertia, for engineering analysis
CLOBJ 3	To introduce the behavior of beams under different loading and support conditions through the study of reactions, shear force, and bending moment relationships
CLOBJ 4	To explain the fundamentals of dry friction and its relevance in practical engineering situations such as ladders, wedges/spheres, and belt drives.
CLOBJ 5	To establish the basics of simple stresses and strains and elastic material behavior, and to connect these ideas with standard laboratory tests on engineering materials

f. **Course Learning Outcomes:**

CLO 1	Apply fundamental principles of mechanics & principles of equilibrium to simple and practical problems of Engineering
CLO 2	Determine centroid and moment of inertia of a different geometrical shape and able to understand its importance.
CLO 3	Apply principles of statics to determine reactions & internal forces in statically determinate beams
CLO 4	Know basics of friction and its importance through simple applications
CLO 5	Understand behavior & properties of engineering materials

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course** Content:

Unit No.	**Topic**	**Teaching Hrs.**	**Weightage**
1	**INTRODUCTION** Forces/Equilibrium of Rigid body, Scalar and vectors, system of forces, resultant force, Statics of particles. Free- body diagrams. Equilibrium of particle in two dimensions, Resultants of three or more concurrent forces, Resolution of a force into components. Rectangular components of a force. Resultants by rectangular components, Concurrent force system in space: Resolution of a force into rectangular components in space, Coplanar Non-Concurrent Force Systems, Moments about Points and Axes, Equilibrium, Non-coplanar Non- concurrent Forces.	**5**	**15**
2	**CENTROID MOMENT OF INERTIA** Distributed forces: Centroid and centre of gravity. Determination of centroid of lines and areas using the integral technique, Determination of centroid of composite wires and areas, Centroid of volumes. Theorems of Pappus- Guldinus and its applications, Second moment of areas, Definition of the moment of inertia. Determination of moment of areas by integration, Parallel axis theorem for Moment of Inertia. MI of	**10**	**20**

Unit No.	Topic	Teaching Hrs.	Weightage
	composite areas, Concept of Mass moment of inertia of bodies.		
3	**BEAMS** Definitions, types of beams, types of loading, types of supports. Determination of reactions for simply, Supported and overhanging beams. Relation between distributed load, Shear force and Bending Moment, Shear force and Bending moment in beams with diagrams	**10**	**20**
4	**FRICTION** The Laws of Dry Friction. Coefficients of Friction, Angles of Friction, Analysis of systems involving dry frictions such as ladders spheres etc, Belt Friction, Analysis of flat and v-belt.	**10**	**20**
5	**SIMPLE STRESSES & STRAINS** Basics of stress and strain: 3-D state of stress (Concept only), Normal/axial stresses: Tensile & compressive Stresses: Shear and complementary shear Strains, Linear, shear, lateral, thermal and volumetric. Hooke's law, Elastic Constants: Modulus of elasticity, Poisson's ratio.	**10**	**25**

i. Text Book and Reference Book:

1. **Statics and Dynamics**
   By Beer, F.P. and Johnston, E.R. Vector mechanics for engineers | Tata McGraw-Hill
2. **Engineering Mechanics: Statics and Dynamics**
   By J.A Desai and B.B Mistry | Popular Prakashan
3. **Engineering Mechanics: Statics and Dynamics**
   By R.C Hibbeler | Prentice Hall of India
4. **Engineering Mechanics: Statics and Dynamics**
   By S Rajsekaran | Vikas Publication
5. **Applied Mechanics (TextBook)**
   By H. J. Shah and S. B. Junarkar | Charotar publication
6. **Engineering Mechanics**
   By S.S. Bhavikatti and K. G. Rajashekarappa | Wiley 'Eastern Ltd
7. **Theory of Structures**
   By S.Ramamrutham | Dhanpat Rai Publishing Company
8. **Engineering Mechanics**
   By J.L. Meriam, and L.G.Kraige | John Wiley and sons, New York.
9. **Theory of Structures**
   By R S KHURMI

j. List of Experiments

1. Equilibrium of Coplanar-Concurrent force system (Law of Parallelogram of forces) by analytical method
2. Equilibrium of Coplanar-Concurrent force system (Law of Parallelogram of forces) by graphical method
3. Equilibrium of Coplanar-Concurrent force system (Law of Polygon of forces) by analytical method
4. Equilibrium of Coplanar-Concurrent force system (Law of Polygon of forces) by graphical method
5. Equilibrium of Coplanar non-concurrent forces (theory)
6. Equilibrium of Coplanar non-concurrent forces (performance)
7. Theorem Equilibrium of parallel force system - Simply Supported Beam
8. Verification of principle of moment: Bell crank lever
9. Determination Coefficient of static friction (theory)
10. Determination Coefficient of static friction (performance)
11. Brinell Hardness test
12. Izod impact test
13. Compression test on timber
14. Transverse test on Timber
15. Tensile test on mild steel

a. **Course Name:** Avionics
b. **Course Code:** 03019603PC05
c. **Prerequisite:** Basics of Electrical and Electronics, Aircraft Science
d. **Rationale**: Avionics is one of the core areas in the field of aviation. The concepts of avionics are vitally important to the aeronautical engineer.
e. **Course Learning Objective:**

CLOBJ 1	Develop a comprehensive understanding of various concepts of avionics, cockpit systems. Studying the various control and display technologies
CLOBJ 2	Analyze various types of Radars used and the technology behind it
CLOBJ 3	Develop a comprehensive understanding of various Navigation system used in Aircrafts and the technology behind it
CLOBJ 4	Study about various components of Autopilot System and fundamental concept behind the control systems of each function
CLOBJ 5	Understand the characteristics of various types of Missiles and Missile systems

f. Course Learning Outcomes:

CLO 1	Gain knowledge of avionics architecture, subsystem design, and control/display
CLO 2	Understand the ground and airborne radar systems, GPWS, TCAS, and data processing
CLO 3	Familiarize with navigation methods and aids for precise aircraft positioning
CLO 4	Understand autopilot structures, integration with navigation systems, and automatic landing capabilities

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P**- Practical; **C**- Credit; **MSE**- Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE**- End Semester Examination

h. Course Content:

Unit No.	Topic	Teaching Hrs.	Weightage
1.	**Introduction to Avionics** Basics of Avionics, Basics of Cockpits, Need for Avionics in civil and military aircraft and space systems, Integrated Avionics Architecture, Military and Civil system, Typical avionics System and Subsystems − Design and Technologies. Control and display technologies, Touch screen − Direct voice input (DVI) − Civil and Military Cockpits: MFDS, HUD, MFK, HOTAS.	13	30
2.	**Radar Engineering** Primary ground radar Secondary surveillance radar (SSR) Radar display & data processing systems Radar altimeter, Radar Ground Proximity Warning System (GPWS) Doppler radar Airborne Weather Radar (AWR) Traffic Collision Avoidance System (TCAS).	10	20
3.	**Aircraft Navigation** Maps and Charts, classification of various navigation systems, celestial and radio navigation, Radio direction finding at medium, high and very high frequencies. The radio compass and Automatic Direction finders. Hyperbolic navigation systems.	12	30

Unit No.	Topic	Teaching Hrs.	Weightage
	TACAN. Aids to approach and landing, the standard ILS, various categories of ILS accuracy, MLS, Ground Control Approach Systems. Dead reckoning navigation systems, Doppler navigational and inertial navigation, Global Positioning System (GPS).		
4.	**Aircraft Autopilot System** Components of Autopilot, Autopilot Structure- Successive Loop Closure, Longitudinal Autopilot; Airspeed Hold, Attitude Hold, Altitude Hold. Lateral Autopilot; Bank Angle Hold, Heading Hold, Yaw Damper, Principle and applications, Integration with Flight Management and Flight Direction system, Automatic approach and landing, height and throttle control system, ILS/MLS coupled autopilot system.	10	20

i. Text Book and Reference Book:

1. Avionics Systems by D H Middleton
2. Principles of Avionics by Albert Helfrick
3. Avionics Handbook (Text Book) by CARYR.SPITZER; Avioni Con, Inc

a. Course Name: Aerospace Materials and Manufacturing Processes

b. Course Code: 03019603PC07

c. Prerequisite: Fundamental Knowledge of materials and workshop

d. Rationale: The course is designed to give a detailed understanding of various materials and machining processes. Also, the subject gives details about the production machines and different tools.

e. Course Learning Objective:

CLOBJ 1	Understand aircraft material properties, selection, and testing for optimal performance in structures and engines
CLOBJ 2	Gain insights into the principles and applications of heat treatments, wood, rubber, fabrics, dope, and paint in aircraft manufacturing
CLOBJ 3	Master composite material applications, fabrication techniques, and mechanical behaviors for lightweight and durable aerospace components.
CLOBJ 4	Acquire knowledge of casting processes, welding techniques, and their applications in aircraft manufacturing
CLOBJ 5	Develop proficiency in operating machines (lathe, milling, grinding), sheet metal operations, and riveting for aircraft construction

f. Course Learning Outcomes:

CLO 1	Study of different types of Engineering Materials
CLO 2	Understand different types of composite materials & methods of manufacturing the composite materials
CLO 3	Understand about different types of casting processes.
CLO 4	Study of the principle of different types of welding processes
CLO 5	Understand about classification and working of basic machines & machine tools

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	**0**	**0**	**3**	20	20	-	60	-	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Unit No.	**Topic**	**Teaching Hrs.**	**Weightage**
1.	**Introduction to Aircraft Materials** General properties of materials, Definition of terms, Requirements of aircraft materials, Testing of aircraft materials, Inspection methods, Application and trends in usage in aircraft structures and engines, Selection of materials for use in aircraft, heat treatments, wood, rubber, fabrics & dope and paint used in aircraft manufacturing.	10	20
2.	**Composite Materials** Introduction to Composite material, Advantages of Composite Materials and Structures, Applications of Composite Materials in the Present world, Fibers, Matrix, Prepegs, Filler and Other Additives, Lamina and Laminate, General Characteristics of FRPS, Micromechanics and Micromechanics, Properties of Typical Composite Materials, Mechanical Behaviour of Composite Materials. Contact moulding: Mould preparation, Spray-up, Hand lay-up, Compression moulding methods: Matched die moulding, Forming methods employing gas pressure, Centrifugal Casting, Pultrusion, and Filament Winding.	12	30

Unit No.	Topic	Teaching Hrs.	Weightage
3.	**Casting and Welding** General principles of various Casting Processes: Sand casting, diecasting, centrifugal casting, Investment casting. Welding Techniques: Arc welding, Gas welding, Friction welding, Laser welding, Electron Beam welding, TIG welding, MIG welding, Soldering and brazing techniques.	13	25
4.	**Machines, Sheet Metal, Grinding and Rivet Operation** General Principles (with schematic diagram only) of working of Lathe and types of Lathe, Shaper Machine, Milling Machine, Grinding Machine, Drilling Machine, Sheet metal operations: Shearing, Punching, Bending, Forming, Spinning, Drawing etc., Types of rivets & its operations.	10	25

i. Reference Books:

1. Aircraft Materials By C G K Nair | Interline
2. Mechanics of Composite Materials and Structures (TextBook) By Madhujit Mukhopadhyay | Universities press
3. Production Technology by P C Sharma

a. Course Name: Aerospace Materials and Manufacturing Processes Laboratory

b. Course Code: 03019603PC08

c. Prerequisite: Basic understanding of engineering workshop.

d. Rationale: The course is designed to provide practical exposure to Casting, Welding Sheet Metal Operation and Machining Processes

e. Course Learning Objective:

CLOBJ 1	To familiarize students with the classification, properties, and applications of aircraft materials used in aerospace structures and components
CLOBJ 2	To provide hands-on understanding of fundamental casting processes and their relevance in manufacturing aircraft parts
CLOBJ 3	To develop practical knowledge of welding processes, including arc welding, with emphasis on joint preparation, execution, and safety practices.
CLOBJ 4	To impart operational knowledge of basic machine tools such as lathe, shaper, drilling, milling, and grinding machines through demonstration and job preparation.
CLOBJ 5	To enable students to perform and analyze sheet metal and riveting operations commonly employed in aircraft manufacturing and assembly
CLOBJ 6	To cultivate safe workshop practices, proper tool handling skills, and adherence to industrial standards during manufacturing processes.

f. Course Learning Outcomes:

CLO 1	Study the various aircraft materials
CLO 2	Study the different types of casting processes.
CLO 3	Understand the principles of different types of welding processes.
CLO 4	Study the classification and working of basic machine tools.
CLO 5	Apply the concept of sheet metal operation.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**0**	**0**	**20**	**0**	**30**	**50**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

List of Practical	
1.	Introduction to Aerospace materials.
2.	Demonstrate and perform the casting process.
3.	Preparation of a job using arc welding processes.
4.	Preparation of a job using a lathe machine.
5.	Demonstration of shaper machine operations.
6.	Demonstration of drilling machine operations.
7.	Demonstration of milling machine operations.
8.	Demonstration of grinding machine operations.
9.	Demonstration of sheet metal operations.
10.	Demonstrate and perform the riveting operations.

i. Text Book and Reference Book:

1. Aircraft Materials By C G K Nair | Interline
2. Mechanics of Composite Materials and Structures (TextBook) By Madhujit Mukhopadhyay | Universities press
3. Production Technology by P C Sharma

a. Course Name: Functional Communication Skills

b. Course Code: 03010003HM01

c. Prerequisite: Knowledge of Advanced Communication and Interpersonal Skills

d. Rationale: This course develops workplace-oriented communication skills by bridging academic language competence with professional communication requirements.

e. Course Learning Objective:

CLOBJ 1	Develop grammatical accuracy and logical reasoning skills through sentence correction, para jumble, and statement–assumption analysis.
CLOBJ 2	Strengthen advanced reading and analytical skills to interpret complex texts, infer meaning, and evaluate authorial intent.
CLOBJ 3	Apply professional writing skills in creating resumes, cover letters, emails, and reports suitable for workplace communication.
CLOBJ 4	Enhance digital and verbal communication skills through LinkedIn profile building, JAM activities, and telephone/video call etiquette.
CLOBJ 5	Improve clarity, coherence, and professionalism in oral and written communication through structured practice and workplace-oriented tasks.

f. Course Learning Outcomes:

CLO 1	Identify grammatical, usage, and style errors; logically reorder sentences; and differentiate facts from assumptions in workplace problem scenarios.
CLO 2	Understand the usage of grammatical rules, cohesion markers, professional writing formats, and communication etiquette to produce accurate workplace communication.
CLO 3	Apply principles of professional communication to ensure clarity, coherence, time management, and etiquette in both written and spoken workplace contexts.
CLO 4	Analyse effective verbal, digital, and virtual communication skills through JAM participation, LinkedIn profile optimization, and telephone/video call interactions.
CLO 5	Create ATS-friendly resumes, customized cover letters, professional emails, structured reports, optimized LinkedIn profiles.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
1	**0**	**2**	**2**	40	-	20	60	30	**150**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Unit No.	Topic	Teaching Hrs.	Weightage
1.	**Sentence Correction** Error identification (grammar, usage, style), Common workplace errors and Contextual grammar usage.	10	02
2.	**Para Jumbles & Sentence Reordering** Logical sequencing, Cohesion markers and Theme identification.	08	01
3.	**Statement and Assumptions** Fact vs assumption, Logical reasoning basics and Workplace problem scenarios.	10	01
4.	**Reading Comprehension (Level of Difficulty – Advanced)** Inferential questions,	12	02

Unit No.	Topic	Teaching Hrs.	Weightage
	Author's tone & intent and Vocabulary in context.		
5	**Resume and Cover Letter Writing** Resume formats Achievement-based bullet points Customizing cover letters	14	02
6	**Building a Professional LinkedIn Profile** Professional headline Summary writing Digital networking ethics	08	01
7	**Just a Minute (JAM)** Idea organization Fluency techniques Time management in speech	08	01
8	**Telephone and Video Call Etiquette** Opening & closing calls Voice modulation Virtual meeting etiquette	08	01
9	**Email Writing** Format Professional tone Subject lines Email etiquette	10	02
10	**Report Writing Report Writing** Types of reports Structure & formatting Use of visuals & data	12	02

Lab Content

Sr.	Content	Weightage	Teaching Hrs.
1	Sentence Correction 1. Grammar & usage error identification 2. Context-based sentence correction worksheets 3. Common workplace error correction 4. Peer editing activities	10%	4
2	Para Jumbles and Reordering of Sentence **a.** Identifying topic sentences **b.** Logical sequencing exercises **c.** Use of cohesion markers **d.** Timed para-jumble practice	8%	2
3	Reading Comprehension (Level of Difficulty - Advanced) **a.** Inferential and analytical questions **b.** Identifying author's tone & intent **c.** Vocabulary-in-context activities **d.** Group discussion on passages	10%	2

4	Resume and Cover Letter Writing 1. Resume formats (chronological, functional) 2. Achievement-based bullet writing 3. ATS-friendly resume drafting 4. Customized cover letter writing	12%	4
5	Statement and Assumptions 1. Identification of implicit assumptions through guided exercises 2. Application of assumption-testing techniques (possibility test) 3. Analysis of case-based and real-life reasoning scenarios	14%	4
	1. Timed practice drills with discussion of common errors		
6	Building a Professional LinkedIn Profile 1. Writing professional headlines 2. Summary and About section drafting 3. Profile optimization task 4. Digital networking ethics	8%	2
7	Just a Minute (JAM) 1. Topic-based JAM speaking practice 2. Fluency and coherence drills 3. Time-management techniques 4. Individual feedback sessions	8%	2
8	Telephone and Video Call Etiquette 1. Professional call role-plays 2. Voice modulation exercises 3. Mock video meeting practice 4. Virtual etiquette evaluation	8%	2
9	Report Writing **1.** Types of reports (incident, progress, proposal) **2.** Structure and formatting practice **3.** Use of visuals and data **4.** Writing and reviewing short reports	10%	4

10	Email Writing 1. Professional email drafting 2. Subject-line writing activities 3. Tone and etiquette correction 4. Peer review and rewriting	12%	4

i. Reference Books:

1. Business Communication Today By Bovee, Courtland L., and John V. Thill | Pearson Education, Pub. Year 2019
2. Essentials of Business Communication By Guffey, Mary Ellen, and Dana Loewy. | Cengage Learning, Pub. Year 2018
3. Advanced Grammar in Use By Hewings, Martin. | Cambridge University Press, Pub. Year 2013
4. English Vocabulary in Use: Advanced By McCarthy, Michael, and Felicity O'Dell | Cambridge University Press, Pub. Year 2017
5. Personality Development and Soft Skills By Mitra, Barun K | Oxford University Press, Pub. Year 2011
6. Technical Communication: Principles and Practice By Raman, Meenakshi, and Sangeeta Sharma | Oxford University Press, Pub. Year 2018

a. **Course Name:** Probability and Statistics
b. **Course Code:** 03019103BS02
c. **Prerequisite:** Knowledge of Mathematics up to 12th science level
d. **Rationale**: The Mathematics I, Mathematics-II syllabus integrates fundamental calculus concepts, advanced mathematical techniques, and vector calculus, preparing students for engineering challenges with optimized problem-solving skills.

e. **Course Learning Objective:**

CLOBJ 1	Understand fundamental concepts of probability, probability spaces, conditional probability, and Bayes' Rule for making informed statistical decisions.
CLOBJ 2	Analyze discrete and continuous random variables, compute expectations and variances, and explore key distributions such as Binomial, Poisson, and Normal.
CLOBJ 3	Develop skills in hypothesis testing, including large sample tests for proportions, means, standard deviations, and chi-square tests for goodness of fit and independence.
CLOBJ 4	Demonstrate proficiency in numerical methods for solving linear equations, finding roots of algebraic and transcendental equations using techniques like Gauss-Jacobi, Gauss-Seidel, Bisection, Newton-Raphson, and Regula-Falsi.
CLOBJ 5	Master the concepts of finite differences, interpolation using Newton's Forward and Backward Difference Formula, Newton's Divided, and Lagrange's Formula for Unequal Intervals.
CLOBJ 6	Gain expertise in numerical integration techniques such as the Trapezoidal rule, Simpson's 1/3rd and 3/8th Rules, Gaussian Quadrature, and solve ordinary differential equations using methods like Taylor's series, Euler, Modified Euler, and Runge-Kutta of the fourth order for first and second-order equations.

f. **Course Learning Outcomes:**

CLO 1	Analyse correlation and regression between two variables.
CLO 2	Apply least-square method for different type of curve fitting.
CLO 3	Determine expectation and variance for different probability distributions.
CLO 4	Evaluate statistical hypotheses using appropriate significance tests for proportions, means, standard deviations, and variances.
CLO 5	Present mathematical arguments and solutions in a unified, logical, and organized manner, emphasizing clarity, coherence, and precision across all units.
CLO 6	Lay a solid foundation for more advanced courses in mathematics and related disciplines.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
4	**-**	**-**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr.	**Topics**	**W**	**T**
1	**Probability and Probability Distributions:** Probability Spaces, Conditional Probability, Bayes' Rule, Discrete and continuous random variables, Independent Random Variables, Expectation and Variance of Discrete and Continuous Random Variables, Distribution and Their Properties: Binomial Distribution, Poisson Distribution, Normal Distribution.	18	8

2	**Correlation, Regression and Curve fitting:** Correlation- Karl Person correlation, Spearman's Rank correlation, Regression –regression co-efficient and regression lines, Curve Fitting by The Method of Least Squares- Fitting of Straight Lines, Second Degree Parabolas and More General Curves.	23	10
3	**Testing of Hypothesis Large sample:** Z-test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Small sample: t-test for single mean, difference of means, Test for ratio of variances, Chi-square test for goodness of fit and independence of attributes.	25	15

i. Text Book and Reference Book:

1. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol.I& II, 8th Edition. The World Press, Kolkata.
2. A First Course in Probability (TextBook) by S. Ross, Pearson Education India, 6th Ed., Pub. Year 2010
3. Introduction to Probability (TextBook) by P. G. Hoel, S. C. Port and C. J. Stone, | UBS Publishers.
4. Fundamentals of Mathematical Statistics (TextBook) by S.C. Gupta and V. K. Kapoor | Sultan Chand & Sons.

a. **Course Name:** Surface and Solid Modelling Lab

b. **Course Code: 03010103ES01**

c. **Prerequisite:** Basic concept of Engineering Graphics.

d. **Rationale:** Solid modeling tools integrate 2D sketching with 3D parametric features. In addition to enhancing understanding of design concepts, the subject demonstrates the effective use of modeling tools to solve real-world engineering problems.

e. **Course Learning Objective:**

CLOBJ 1	To introduce students to the fundamentals of Computer-Aided Design (CAD) and familiarize them with the CATIA V5 environment and workbenches
CLOBJ 2	To develop proficiency in 2D sketching using geometric and dimensional constraints in the Sketcher Workbench
CLOBJ 3	To apply feature-based solid modeling techniques to create and draft mechanical components using the Part Design and Drafting Workbench
CLOBJ 4	To understand assembly modeling principles by designing and assembling mechanical systems using appropriate constraints
CLOBJ 5	To develop advanced surface modeling skills for creating complex multi-curvature and aerospace structural components such as wings and fuselages

f. **Course Learning Outcomes:**

CLO 1	Identify and use the CATIA V5R21 interface, workbenches, and basic CAD operations effectively.
CLO 2	Create accurate 2D sketches using geometric and dimensional constraints in the Sketcher Workbench
CLO 3	Develop 3D solid models and engineering drawings of mechanical components using feature-based modeling techniques
CLO 4	Design and assemble mechanical systems by applying appropriate assembly constraints and understanding component relationships
CLO 5	Construct complex surface and aerospace structural models, such as multi-curvature components, wings, and fuselages, using surface design tools

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**T**	**CE**	**P**	**T**	**P**	**Total**
0	**00**	**4**	**2**	**0**	**0**	**20**	**0**	**30**	**50**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

List of Practical	
1.	Introduction to CATIA.
2.	Drawing sketches on a sketcher workbench – 2D Sketch Exercise I
3.	Drawing sketches in sketcher workbench – 2D Sketch Exercise II
4.	Part Design Workbench- 3D Modeling and Drafting of a Stepped Flange Component
5.	Part Design Workbench- 3D Modeling and Drafting of the any mechanical component
6.	Assembly Workbench- Design and Assembly of a Universal Joint
7.	Surface Design Workbench- Surface Modelling of a Multi-Curvature Mechanical Component 1
8.	Surface Design Workbench - Surface Modelling of a Multi-Curvature Mechanical Component 2
9.	Surface Design Workbench- 3D structural model of an Aircraft wing.
10.	Surface Design Workbench- 3D structural model of an aircraft fuselage

i. **Text Book and Reference Book:**

5. CATIA V5-6R2021 for Designers (19th Edition) – *Prof. Sham Tickoo & CADCIM Technologies*

6. CATIA V5-6R2014 for Beginners – *Cadfolks*

SEMESTER-4

a. **Course Name:** Aerodynamics - I
b. **Course Code:** 03010104PC01
c. **Prerequisite:** Basic Knowledge of Fluid Mechanics.
d. **Rationale:** Aerodynamics is one of the core areas in the field of aviation. The concepts of aerodynamics are vitally important to the aeronautical engineer.
e. **Course Learning Objective:**

CLOBJ 1	Analyse low-speed aerodynamic forces and moments on airfoils and wings, including lift, drag, pitching moment, pressure distribution, stalling behavior, and downwash effects
CLOBJ 2	Apply incompressible and potential flow theory concepts such as velocity potential, stream function, circulation, vorticity, and superposition to analyse lifting and non-lifting flow fields.
CLOBJ 3	Use thin airfoil theory to estimate aerodynamic characteristics of symmetric and cambered airfoils, accounting for the Kutta condition, circulation, and viscous effects
CLOBJ 4	Evaluate finite wing aerodynamics using lifting line theory and vortex-based methods to determine lift distribution, induced drag, and the influence of aspect ratio.
CLOBJ 5	Apply numerical aerodynamic techniques such as vortex panel, lifting line, and vortex lattice methods to predict aerodynamic performance of wings and lifting surfaces, including delta wings

f. **Course Learning Outcomes:**

CLO 1	Understand the fundamentals of aerodynamics
CLO 2	Analyze the effect of the flow on different bodies
CLO 3	Formulate and apply appropriate aerodynamics models to predict the forces on and performance of 3-dimensional configuration.
CLO 4	Perform analytical and experimental aerodynamic analysis.
CLO 5	Apply the concepts of aerodynamics to design airfoil and wing

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	**-**	**0**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Low speed Aerodynamics:** Aerodynamic forces and moments, Incompressible Flow in a duct: The Venturi and Low-Speed Wind Tunnel, Pitot Tube: Measurement of Air Speed, Pressure coefficient, Centre of pressure and aerodynamic center, Effect of incidence on pressure distribution, The lift Curve, Airfoil stalling, Drag, Types of drag, Drag Polar, D'Alembert Paradox, Pitching moment, Spanwise Flow variation, Downwash.	**15%**	**8**
2	**Potential Flow:** Angular Velocity, Vorticity and Strain, Circulation, Kutta Joukowsky Theorem, Stream Function, Velocity Potential, Elementary flows: Uniform flow, Source Flow, Doublet Flow, Vortex	**25%**	**12**

	Flow, Principles of Superposition, Combination of uniform flow with a source and sink, Half body, Rankine oval body, Non-lifting flow over circular cylinder, lifting flow over a cylinder.		
3	**Thin Airfoil Theory:** Low speed flow over an Airfoil - Vortex Sheet, The Kutta Condition, Kelvin's Circulation Theorem, Classical Thin Airfoil Theory - The Symmetrical Airfoil, The Cambered Airfoil, Viscous Flow: Estimating Skin Friction Drag, Transition, Flow Separation, The Vortex Panel Numerical Method for Lifting flow over bodies.	**30%**	**12**
4	**Finite Wings:** Introduction: Downwash and Induced Drag, The vortex filament, The Biot-Savart Law and Helmhotz 's Theorem. Prandtl's classical lifting line theory. Elliptical lift distribution, General Lift distribution, Effect of Aspect Ratio. Numerical Lifting line method. Lifting surface and VLM, Applied aerodynamics over the delta wing	**30%**	**13**

i. Text Book and Reference Book:

1. "Fundamentals of Aerodynamics" by John D Anderson
2. "Aerodynamics for Engineering" Students by E L Houghton and P W Carpenter
3. "Aerodynamics" by L J Clancy | Sterling Book House Indian Edition
4. "Theoretical Aerodynamics" by Milne Thomson

a. **Course Name:** Aerodynamics Laboratory
b. **Course Code:** 03010104PC02
c. **Prerequisite**: Basic Knowledge of Fluid Mechanics
d. **Rationale:** Aerodynamics is one of the core areas in the field of aviation. The concepts of aerodynamics are vitally important to the aeronautical engineer.
e. **Course Learning Objective:**

CLOBJ 1	To understand the fundamental principles of aerodynamics and basic flow behavior through experimental study.
CLOBJ 2	To identify different types of wind tunnels, study their applications, and perform calibration of a subsonic wind tunnel
CLOBJ 3	To experimentally determine aerodynamic forces, moments, and lift and drag coefficients for airfoils and circular cylinders
CLOBJ 4	To analyze pressure distribution over airfoils and circular cylinders under varying flow conditions and angles of attack
CLOBJ 5	To visualize flow patterns over symmetrical and cambered airfoils and interpret key aerodynamic phenomena

f. **Course Learning Outcomes:**

CLO 1	Understanding and application of different experimental setups used in Aerodynamics laboratories.
CLO 2	Investigate the variation of surface pressure over the bluff and slender bodies
CLO 3	Predict and calculate the aerodynamic forces over an airfoil/wing
CLO 4	Perform analytical and experimental aerodynamic analysis

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
0	**-**	**2**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content**

List of Practical	
1.	To study fundamentals of aerodynamics.
2.	Introduction to different types of wind tunnel and their applications.
3.	To study basic elementary flow.
4.	Calibration of subsonic wind tunnel.
5.	Determination of aerodynamic forces and moments over the cambered airfoil.
6.	Determination of co-efficient of lift and co-efficient of drag over the cylinder.
7.	Determination of co-efficient of lift and co-efficient of drag over symmetrical airfoil.
8.	Pressure distribution over a circular cylinder at different free stream velocities.
9.	Pressure distribution over a symmetrical airfoil at different angle of attack.
10.	Flow visualization over symmetrical airfoil and cambered airfoil.

i. **Text Book and Reference Book:**

1. "Fundamentals of Aerodynamics" by John D Anderson
2. "Aerodynamics for Engineering" Students by E L Houghton and P W Carpenter
3. "Aerodynamics" by L J Clancy | Sterling Book House Indian Edition "Theoretical Aerodynamics" by Milne Thomson

e. Course Name: Aerospace Propulsion -I

f. Course Code: 03019604PC02

g. Prerequisite: Fundamentals Knowledge of various thermal, physical properties of fluid

h. Rationale: The subject gives exposure to various fluids principles, the behavior of Fluid under different conditions, and types of flow generation, which is required in Engineering for analysis purposes.

i. Course Learning Objective:

CLOBJ 1	Understand flow mechanisms through gas turbine engines for efficient propulsion system analysis
CLOBJ 2	Explain construction and working of gas turbine engine components with clarity.
CLOBJ 3	Analyze fundamental losses occurring in turbomachinery to improve performance efficiency
CLOBJ 4	Apply jet engine propulsion concepts effectively across various aerospace engineering applications.

j. Course Learning Outcomes:

CLO 1	Understand the mechanism of flow through the Gas Turbine engine
CLO 2	Explain the working and construction of the main components of the Gas Turbine engine
CLO 3	Analysis of the basic losses involved in turbo machines
CLO 4	Apply the application for the propulsion of jet engines

k. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	**1**	**0**	**4**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

l. Course Content:

Unit No.	Topic	Teaching Hrs.	Weightage
1.	**Introduction to Propulsion System** Introduction of Turbomachines and positive displacement machine, The internal combustion engine process, brief historical sketch, spark ignition and compression ignition, (SI and CI) engines, 4-stroke and 2-stroke engines.	08	18
2.	**Propellers Theory** Ideal Froude Momentum theory, blade element theory, numerical problems, use of propeller charts. Selection and choice of propellers. Fixed/variable pitch and constant speed propellers, Relative merits and applications, Ducted propellers, prop-fan, Helicopter Rotor in Hover and climbing. Materials for propellers.	10	20
3.	**Compressors Theory** **Axial Flow Compressors**: Introduction. Geometry and working principle, Stage velocity triangles, H-S diagram. Flow through blade row, Stage losses and efficiency, Work done factor, Low hub-tip ratio, Supersonic and transonic stages, and Performance characteristics. **Centrifugal Flow Compressors**: Introduction and different parts of a centrifugal compressor, Principles of operation. H-S diagram. Nature of impeller flow, Slip factor, Diffuser, Volute casing, Performance characteristics and losses in centrifugal compressor.	13	30
4.	**Turbine Theory** **Axial Turbine**:	14	32

Unit No.	Topic	Teaching Hrs.	Weightage
	Introduction, Stage velocity triangle, Single impulse stage, Multistage velocity compounded impulse and Multistage pressure compounded impulse, Reaction stages, Blade to gas speed ratio, Losses and efficiencies, Performance charts, Low hub-tip ration stage. **Radial Turbine**: Elements of a radial turbine stage, Stage velocity triangles, H-S diagram, Stage losses, Outward flow radial stage and Performance characteristics.		

m. Text Book and Reference Book:

1. Compressors Turbines and Fans By S M Yahya
2. Elements of Gas Turbine Propulsion By Mattingly.
3. Steam & Gas turbines By R Yadav.
4. Aircraft Propulsion, System Technology & Design By Gordon C Oates
5. Gas turbine Theory By Cohen & Rogers

- **Course Name:** Aircraft Systems and Instruments
- **Course Code:** 03010104PE01
- **Prerequisite:** Fundamental knowledge of Aircraft components..
- **Rationale:** The main objective of this course is to understand the workings of Aircraft Systems and Instruments. This subject addresses the understanding and functioning of the different aircraft systems, instruments and associated components.

- **Course Learning Objective:**

CLOBJ 1	Analyze aircraft systems for safe and efficient operation in diverse conditions
CLOBJ 2	Evaluate engine systems' components and functions to ensure optimal performance
CLOBJ 3	Examine auxiliary systems for aircraft safety and passenger comfort in various situations.
CLOBJ 4	Interpret aircraft instruments and their readings for effective flight navigation and control.
CLOBJ 5	Apply knowledge of aircraft systems to troubleshoot and resolve operational challenges

- **Course Learning Outcomes:**

CLO 1	Identify the key components and their roles in ensuring the proper functioning of various aircraft systems
CLO 2	Proficiently optimize diverse aircraft engine systems for safe, efficient operation
CLO 3	Demonstrate a fundamental understanding of the operation of auxiliary systems
CLO 4	Describe the working principles of various vital parameter displays and instruments to conduct effective flight

- **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	0	0	3	20	20	0	60	0	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination.

- **Course Content:**

Unit No.	**Topic**	**Teaching Hrs.**	**Weightage**
1.	**Aircraft Systems** Introduction, Classification, Hydraulic System, Pneumatic System, Brake System, Landing Gear System.	10	20
2.	**Engine Systems** Lubrication System, Fuel System, Engine Cooling Systems, Ignition and Starting System, Induction and Exhaust Systems, Typical Aircraft Bleed Air System, Turbocharger System, Propeller System.	12	30
3.	**Auxiliary Systems** Ice and Rain Protection Systems, Fire Protection System, Cabin Atmosphere Control System, Electrical System, Auxiliary Power Units	10	20
4.	**Aircraft Instruments** Introduction, Types of instrument panels, Electronic Flight Display, Flight Instruments, Engine Instruments, Navigation Instruments, Air Data Computer (ADC), Trim tab indicator, Flap position indicator, Angle of Attack Indicator, Magnetic Compass, Outside Air Temperature (OAT) Gauge, Mach meter	13	30

- **Text Book and Reference Book:**

1. Aircraft Systems: Mechanical, Electrical and Avionics-Subsystem Integration Ian Moir and Allan Seabridge Wiley India Pvt Ltd 3rd edition, 2012
2. General Hand Books of Airframe and Powerplant Mechanics, U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi1995.
3. Aircraft Maintenance & Repair, McKinley, J.L., and Bent, R.D., McGraw-Hill, 1993.
4. Aircraft Hydraulic Systems William A Neese Himalayan Books 2007
5. Aircraft Instruments and Integrated Systems Pallet, E.H.J Longman Scientific and Technical 1996

a. **Course Name:** Aircraft Systems and Instruments Laboratory
b. **Course Code: 03010104PE02**
c. **Prerequisite:** Fundamental knowledge of Aircraft components and aerodynamics
d. **Rationale:** Aircraft design is one of the core areas in the field of aviation. To enter the world of aircraft modeling, one has to start with conceptual design and all the fundamentals related to aircraft systems.
e. **Course Learning Objective:**

CLOBJ 1	Provide practical exposure to the construction, working principles, and operation of aircraft systems and flight instruments
CLOBJ 2	Enable students to gain hands-on experience in operating, testing, and observing aircraft instruments under controlled laboratory conditions
CLOBJ 3	Develop basic skills in calibration, inspection, and fault identification of aircraft instruments and systems
CLOBJ 4	Familiarize students with standard aviation safety practices, maintenance procedures, and laboratory discipline
CLOBJ 5	Enhance students' ability to analyse experimental observations and document results through clear and systematic laboratory reports

f. **Course Learning Outcomes:**

CLO 1	Identify and explain the operating principles of major aircraft systems and flight instruments
CLO 2	Conduct laboratory experiments to operate and test aircraft instruments and systems using standard procedures
CLO 3	Perform basic calibration, inspection, and fault identification of aircraft instruments.
CLO 4	Interpret instrument readings and system performance under normal and simulated fault conditions
CLO 5	Record, analyze, and present experimental results through structured laboratory reports while following aviation safety practices

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
-	**-**	**2**	**1**	**-**	**-**	**20**	**-**	**30**	**50**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content**

List of Practical	
1.	Aircraft "Jacking Up" procedure
2.	Aircraft "Levelling" procedure
3.	Control System "Rigging check" procedure
4.	Aircraft "Symmetry Check" procedure
5.	"Flow test" to assess of filter element clogging
6.	"Pressure Test" To assess hydraulic External/Internal Leakage
7.	"Functional Test" to adjust operating pressure
8.	Pressure Test" procedure on fuel system components
9.	"Brake Torque Load Test" on wheel brake units
10.	Maintenance and rectification of snags in hydraulic and fuel systems.

i. Text Book and Reference Book:

1. Aircraft Systems: Mechanical, Electrical and Avionics-Subsystem Integration Ian Moir and Allan Sea bridge Wiley India Pvt Ltd 3rd edition, 2012
2. General Hand Books of Airframe and Power plant Mechanics, U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi1995.
3. Aircraft Maintenance & Repair, McKinley, J.L., and Bent, R.D., McGraw-Hill, 1993.
4. Aircraft Hydraulic Systems William A Neese Himalayan Books 2007
5. Aircraft Instruments and Integrated Systems Pallet, E.H.J Longman Scientific and Technical 1996

a. **Course Name:** Control Theory and Systems
b. **Course Code:** 03010104PE03
c. **Prerequisite:** Fundamental knowledge of Mathematics
d. **Rationale:** In aircraft it is necessary to control three different types of axis i.e. yaw, pitch and roll. So in order to control such axis it is necessary to understand the basic concepts of control and its detailed theory
e. **Course Learning Objective:**

CLOBJ 1	To introduce the fundamental concepts of control systems, including open-loop and closed-loop systems, with examples from natural and man-made systems
CLOBJ 2	To develop mathematical models of mechanical and electrical systems using differential equations and transfer function representations
CLOBJ 3	To analyze control systems using block diagram reduction techniques and signal flow graphs for simplified system representation
CLOBJ 4	To evaluate system performance in the time domain and frequency domain, including transient response, steady-state error, and stability criteria
CLOBJ 5	To design and analyze controllers such as PI, PD, and PID controllers to improve system stability and performance

f. **Course Learning Outcomes:**

CLO 1	Explain the basic concepts and classifications of control systems and differentiate between open-loop and closed-loop systems
CLO 2	Develop mathematical models of mechanical and electrical systems and obtain their transfer functions
CLO 3	Analyze complex control systems using block diagrams, signal flow graphs, and Mason's Gain Formula.
CLO 4	Determine time-domain and frequency-domain performance parameters and assess system stability using Routh–Hurwitz, Nyquist, and Bode plot techniques
CLO 5	Design and analyze root locus plots and implement PI, PD, and PID controllers to meet desired performance and stability requirements

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		**Total**
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	
3	**-**	**0**	**3**	**20**	**20**	**0**	**60**	**0**	**100**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Unit No.	Topic	Teaching Hrs.	Weightage
1.	**Introduction** Concept, Natural & Man made control systems, Open Loop & Closed Loop systems	03	10
2.	**Mathematical models of systems** Modeling of mechanical systems, Modeling of electrical systems, Examples	04	10
3.	**Block Diagrams & Signal Flow** Properties of block diagrams, Block diagram reductions, Construction of SFG, Mason's Gain Formula	06	10
4.	**Time Domain Performance Analysis** Excitation functions, First Order, Second Order and Higher Order Systems, Transient response, Steady State Error, Error constants, s- plane root location and	08	20

Unit No.	Topic	Teaching Hrs.	Weightage
	transient response, Time response of second order system		
5.	**Stability Analysis of Control Systems** Introduction, Bode's Plot, Polar plots, Hurwits Criterion, Routh-Hurtwitz criterion, Nyquist Plot, Nyquist Stability Criterion, Stability analysis, Relative Stability, Closed Loop Frequency response of Unity feed Back System.	08	15
6.	**Root Locus Method** Introduction, Root Locus plots, Rules for construction of root loci, Feedback systems, Stability Conditions	06	15
7.	**Composite Controllers** Introduction, Proportional – Integral (PI) control, Proportional – Derivative (PD) control, Proportional – Integral – Derivative (PID) control, Special terminology, (proportional band, repeats per minute, rate gain, direct action, reverse, action), desired features of a feedback control algorithms, Proportional mode, integral mode, derivative mode.	10	20

i. Text Book and Reference Book:

1. Control Systems By A Anand Kumar
2. Control Theory By U A Bakshi & V U Bakshi
3. Control Systems By Rao V Dukkipati

a. Course Name: Control Theory and Systems Laboratory

b. Course Code: 03010104PE04

c. Prerequisite: Fundamental knowledge of Mathematics

d. Rationale: In aircraft it is necessary to control three different types of axis i.e. yaw, pitch and roll. So in order to control such axis it is necessary to understand the basic concepts of control and its detailed theory.

e. Course Learning Objective:

CLOBJ 1	To introduce the fundamental concepts of control systems, including open-loop and closed-loop systems, with examples from natural and man-made systems
CLOBJ 2	To develop mathematical models of mechanical and electrical systems using differential equations and transfer function representations
CLOBJ 3	To analyze control systems using block diagram reduction techniques and signal flow graphs for simplified system representation
CLOBJ 4	To evaluate system performance in the time domain and frequency domain, including transient response, steady-state error, and stability criteria
CLOBJ 5	To design and analyze controllers such as PI, PD, and PID controllers to improve system stability and performance.

f. Course Learning Outcomes:

CLO 1	Explain the basic concepts and classifications of control systems and differentiate between open-loop and closed-loop systems
CLO 2	Develop mathematical models of mechanical and electrical systems and obtain their transfer functions
CLO 3	Analyze complex control systems using block diagrams, signal flow graphs, and Mason's Gain Formula.
CLO 4	Determine time-domain and frequency-domain performance parameters and assess system stability using Routh–Hurwitz, Nyquist, and Bode plot techniques
CLO 5	Design and analyze root locus plots and implement PI, PD, and PID controllers to meet desired performance and stability requirements

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
0	**-**	**2**	**1**	**0**	**0**	**20**	**0**	**30**	**50**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

List of Practical	
1.	Introduction of MATLAB software and its application for Control System Analysis.
2.	Relate various MATLAB commands to the Control System.
3.	To study about building and analyzing multi block models.
4.	Solve the algorithm with time response to Unit Step, Unit Impulse, Unit Ramp, Unit Parabolic input signal.
5.	Evaluate steady state error of type-zero, type-one and type-two control systems on standard test input signals.
6.	Construct about Bode plot and Nyquist plot for stability analysis using MATLAB.
7.	Find the root locus for stability analysis using MATLAB.
8.	Build Bode's Plot for Frequency Response Analysis.
9.	Summarize Liquid Level Controller using Magnetic Float Type Liquid Level Sensor.
10.	Write a programme to implement Design and simulation using MATLAB.

i. Text Book and Reference Book:

1. Control Systems By A Anand Kumar

2. Control Theory By U A Bakshi & V U Bakshi

3. Control Systems By Rao V Dukkipati

a. Course Name Airport Operations and Management

b. Course Code: 03010104PE05

c. Prerequisite: Fundamental knowledge of Airport operations and Air Traffic Control

d. Rationale: The main objective of this course is to understand the of Airport operations and Air Traffic Control. This subject addresses the understanding along with functioning of the various task involved in managing Airport operations and Air Traffic Control

e. Course Learning Objective:

CLOBJ 1	Attain proficiency in executing the various airport operations
CLOBJ 2	Develop skills in safety management in terms of aircraft timely operations
CLOBJ 3	Acquire knowledge and practical experience in Air traffic control
CLOBJ 4	Identify and utilize specialized practices during emergency period
CLOBJ 5	Comprehend and apply safety protocols and procedures related to Air traffic control

f. Course Learning Outcomes:

CLO 1	Explain the aviation challenges and its environment
CLO 2	Explain the airport planning and organizational structure design
CLO 3	Examine the economics in aviation
CLO 4	Analyze the maintenance management in Airport hangar

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
3	**0**	**0**	**3**	20	20	-	60	-	**100**

L- Lectures; **T-** Tutorial; **P-** Practical; **C-** Credit; **MSE-** Mid-Semester Evaluation, **CE-** Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Unit No.	Topic	Teaching Hrs.	Weightage
1.	**Airport Operation - Introduction** Evolution of Management of Aviation-Organization, Global, Social, and Ethical Environment-History of Indian Airline Industry - Major Players in the Airline Industry -SWOT analysis of Airline Industry- Market potential on Indian Airline Industry-Current Challenges in Airline Industry- Completion in Airline Industry.	12	25
2.	**Airport Management** Airport Planning-Terminal Planning, design and operation-Airport Operation Airport Functions- Organization Structure of Airline sectors- Airport Authorities Global and Indian Scenario of Airport Management	12	25
3.	**Air Transport Services** International Trends-Emerging Indian Scenario-Private Participation: International Developments- Private Participation in Indian Airports-Environmental regulation Regulatory Issues-Meteorological Services in Aviation-Airport fees, rates charges	11	25
4.	**Air Traffic Management** Safety Regulation - Economic Regulation - Management of Bilateral - Aviation Security. Traffic Control-Airspace and Navigational aids-TCAS-Controlling Process- Coordination Response to emergencies and airport Securities-Case Studies in Airline Industry.	10	25

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Graham A ."Managing Airports: An International Perspective"-Butterworth-Heinemann, Oxford2001
2. Wells. A, ."Airport Planning and Management",4thEditionMcGraw-Hill,London 2000
3. Richard de Neufille, "Airport Systems: Planning, Design and Management", McGraw-Hill London 2007.
4. P S Senguttavan "Fundementals of Air Transport Management",ExcelBooks2007

a. **Course Name:** Airport Operations and Management Laboratory
b. **Course Code:** 03010104PE06
c. **Prerequisite:** Fundamental knowledge of aircraft and airports.
d. **Rationale:** This laboratory course provides practical exposure to airport planning, operations, safety, and management practices. It equips students with industry-relevant skills required for efficient and safe airport operations.
e. **Course Learning Objective**

CLOBJ 1	To introduce fundamental concepts of airport operations, planning, and management
CLOBJ 2	To provide practical knowledge of runway, terminal, apron, and ground handling operations
CLOBJ 3	To familiarize students with airport safety, security, and regulatory requirements
CLOBJ 4	To develop analytical skills related to airport capacity, efficiency, and operational decision-making

f. Course Learning Outcomes:

CLO 1	Analyze airport layout, runway systems, and terminal facilities based on operational requirements.
CLO 2	Apply standard methods to evaluate runway length, airport capacity, and passenger flow
CLO 3	Understand and interpret airport safety, security, and emergency management procedures
CLO 4	Demonstrate awareness of airport operational management, economics, and regulatory practices

g. Teaching & Examination Scheme:

Teaching Scheme (Hrs/Week)			Credit	Examination Scheme					
				External		Internal			
L	T	P		T	P	T	P	CE	TOTAL
0	0	2	1	0	30	0	20	0	50

h. Course Content:

List of Practical	
1.	Study of Airport Layout and Components
2.	Runway Orientation and Wind Rose Analysis
3.	Airport Capacity Analysis
4.	Passenger Terminal Planning and Flow Analysis
5.	Apron and Gate Management Study
6.	Air Traffic Control Operations Simulation
7.	Runway Length Calculation
8.	Airport Safety, Security, and Emergency Planning
9.	Ground Handling Operations Study

i. Text Books and reference book:

1. Graham A ."Managing Airports: An International Perspective"-Butterworth-Heinemann, Oxford2001
2. Wells. A, ."Airport Planning and Management",4thEditionMcGraw-Hill,London 2000
3. Richard de Neufille, "Airport Systems: Planning, Design and Management", McGraw-Hill London 2007.
4. P S Senguttavan "Fundementals of Air Transport Management",ExcelBooks2007

a. Course Name : Aircraft General Engineering & Maintenance Practices

b. Course Code : 03010104PE07

c. Prerequisite: Safety Training Workshop Safety, Fire Safety, and the use of Personal Protective Equipment (PPE). Basic knowledge of hand tools (wrenches, pliers, screwdrivers) and measurement instruments (micrometers, vernier calipers).

d. Rationale : Learning tasks like safety wiring, riveting, and torque application. Familiarizing the student with the Aircraft Maintenance Manual (AMM) and ensuring every action is documented correctly. Safety Culture on Instilling a "Zero-Error" mentality.

e. Course Learning Objective:

CLOBJ 1	To make the students to understand the basic concepts of aircraft general engineering and maintenance practices
CLOBJ 2	To differentiate between various maintenance strategies, such as time-limited, on-condition, and condition-monitoring
CLOBJ 3	To internalize safety protocols for ground handling, jacking, and refueling operations

f. Course Learning Outcomes:

CLO 1	To explain ground handling techniques of aircraft
CLO 2	To illustrate maintenance procedure and service of various subsystems.
CLO 3	To Prepare safety measures and take precautions in workshop
CLO 4	To Manage inspection documents, data sheets and have knowledge in FAR, airworthiness
CLO 5	To Explain Hand Tools and specifications of aircraft hardware

g. Teaching & Examination Scheme:

Teaching Scheme (Hrs/Week)			**Credit**	**Examination Scheme**					
				External		**Internal**			
L	**T**	**P**		**T**	**P**	**T**	**P**	**CE**	**TOTAL**
3	0	0	3	60	0	20	0	20	100

h. Course Content:

Unit No.	**Topic**	**Teaching Hrs.**	**Weightage**
1.	**Aircraft Ground Handling and Support Equipment** Mooring, jacking, leveling and towing operations – Preparation – Equipment - precautions –Engine starting procedures – Piston engine and Jet engine – Engine fire extinguishing –Ground power units.	10	10
2.	**Servicing of Various Sub Systems** Air conditioning and pressurization System Maintenance –Servicing of Oxygen System and oil systems –Ground units and their maintenance.	08	20
3.	**Maintenance of Safety** Shop safety – Environmental cleanliness – Precautions.	05	20
4.	**Inspection** Process –Purpose –Types –Inspection intervals –Techniques –Checklist –Special inspection–Publications, bulletins, various manuals –FAR Air worthiness directives –Type certificate - Data Sheets –ATA specifications.	10	20
5.	**Aircraft Hardware, Materials, Systems Processes** Hand tools –Precision instruments –Special tools and equipment in an airplane maintenance shop –Identification terminology –Specification and correct use of various aircraft hardware (i.e. nuts, bolts, rivets, screws etc.) –American and British	12	30

Unit No.	Topic	Teaching Hrs.	Weightage
	systems of specifications –Threads, gears, bearings, etc. –Drills, tapes & reamers. – Identification of all types of fluid line fittings. Materials, metallic and non-metallic -Plumbing Connectors – Cables –Swaging procedures, tests, Advantages of swaging over splicing		

i. Text Books and reference book:

1. Aviation Maintenance Technician Hand Book –General" -Federal Aviation Administration.
2. Kroes Watkins Delp, "Aircraft Maintenance and Repair" –McGraw-Hill, New York 1993
3. A & P Mechanics, "Aircraft Hand Book" – F. A. A. Himalayan Book House, New Delhi, 1996

a. **Course Name :** Aircraft General Engineering & Maintenance Practices Laboratory
b. **Course Code : 03010104PE08**
c. **Prerequisite:** Fundamental knowledge of Aircraft components and aerodynamics.
d. **Rationale :** Aircraft design is one of the core areas in the field of aviation. To enter the world of aircraft modeling, one has to start with the conceptual design and all the fundamentals related to aircraft systems.

e. **Course Learning Objective:**

CLOBJ 1	To develop the habit of following Aircraft Maintenance Manuals (AMM) and strict hangar safety protocols
CLOBJ 2	To introduce basic Non-Destructive Testing (NDT) methods for detecting structural flaws
CLOBJ 3	To instill industry-standard techniques for safety wiring, riveting, and fluid line fabrication

f. **Course Learning Outcomes:**

CLO 1	Execute airworthy safety wiring and locking of aircraft fasteners.
CLO 2	Fabricate and repair sheet metal joints using correct riveting patterns
CLO 3	Perform precise measurements of engine and airframe parts to determine wear limits

g. **Teaching & Examination Scheme:**

Teaching Scheme (Hrs./Week)			**Credit**	**Examination Scheme**					
				External		**Internal**			
L	**T**	**P**		**T**	**P**	**T**	**P**	**CE**	**TOTAL**
0	0	2	1	0	30	0	20	0	50

h. **Course Content:**

List of Practical	
1.	**To study Hazardous Materials and Safety Practices**
2.	**To study Aircraft Fabric Covering**
3.	**To study Aircraft Jacking and Leveling**
4.	**To study Aircraft Assembly and Rigging**
5.	**To Study About Aircraft Painting and Marking**
6.	**To understand standard inspection techniques and procedures**
7.	**To understand Aircraft engine overhauling procedure**
8.	**To study Aircraft Rules and Regulations**

i. **Text Books Reference Book:**

5. Michael J.Kroes, William A.Watkins ad Frank Delp, “Aircraft Maintenance and Repair”, TataMcGraw Hill Education Private Limited, Seventh Edition, New Delhi, 2013.
6. Airframe and Power plant Mechanics, “Aircraft hand Book” Federal Aviation Administration, Shroff publishers and distributors Pvt. Ltd. New Delhi 2010