Sanjay Ghodawat University Kolhapur



School of Engineering and Technology

Department of Aerospace Engineering

B. Tech. Aeronautical Engineering

Curriculum Structure and Syllabus (R25)

Semester: III-IV

Programme Structure for B Tech.: Second Year Aeronautical Engineering (R25)

Semester III: Teaching Scheme

Course code	Course name	Teaching scheme (Hrs/week)			Credits assigned			Total Credits
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	
UAEPC301	Aero Thermodynamics	3	-	-	3	-	-	3
UAEPC302	Fluid Mechanics	3	-	-	3	-	-	3
UAEPC303	Mechanics of Materials	2	-	-	2	-	-	2
UAEPC304	Digital Control Systems	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor I	2	-	-	2	-	-	2
UXXOE01X	Open Elective I	2	-	-	2	-	-	2
UCMEM001	Engineering Economics	2	-	-	2	-	-	2
UAEPC305	Aero Thermodynamics Lab	-	2	-	-	1	-	1
UAEPC306	Fluid Mechanics Lab	-	2	-	-	1	-	1
UAEPC307	Digital Control Systems Lab	-	2	-	-	1	-	1
USTVE004	Environmental Science and Sustainability	2	-	-	2	-	-	2
UHSAE008	Employability Skills	1	2	-	-	2	-	2
Total		**19**	**8**	**-**	**18**	**5**	**-**	**23**

Semester III: Evaluation Scheme

Course code	Course Name	Theory Marks					Practical Marks		Total
		Internal Assessment				SEE	Term work	Practical Oral/POE	
		T1	T2	FET	Total				
UAEPC301	Aero Thermodynamics	10	10	5	25	50	-	-	75
UAEPC302	Fluid Mechanics	10	10	5	25	50	-	-	75
UAEPC303	Mechanics of Materials	-	10	5	15	35	-	-	50
UAEPC304	Digital Control Systems	-	10	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor I	-	10	5	15	35	-	-	50
UXXOE01X	Open Elective I	-	10	5	15	35	-	-	50
UCMEM001	Engineering Economics	-	10	5	15	35	-	-	50
UAEPC305	Aero Thermodynamics Lab	-	-	-	-	-	25	-	25
UAEPC306	Fluid Mechanics Lab	-	-	-	-	-	25	-	25
UAEPC307	Digital Control Systems Lab	-	-	-	-	-	25	-	25
USTVE004	Environmental Science and Sustainability	-	10	5	15	35	-	-	50
UHSAE008	Employability Skills	-	-	-	-	-	25	25	50
								Total	**575**

Programme Structure for B Tech.: Second Year Aeronautical Engineering (R25)

Semester IV: Teaching Scheme

Course code	Course Name	Teaching scheme (Hrs/week)			Credits assigned			Total credits
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	
UAEPC401	Low Speed Aerodynamics	3	-	-	3	-	-	3
UAEPC402	Air Breathing Propulsion	3	-	-	3	-	-	3
UAEPC403	Theory of Machines	2	-	-	2	-	-	2
UXXMM0XX	Multidisciplinary Minor II	2	-	-	2	-	-	2
UXXOE02X	Open Elective II	2	-	-	2	-	-	2
UCMEM002	Project Management	2	-	-	2	-	-	2
UAEVE401	Artificial Intelligence in Aviation	2	-	-	2	-	-	2
UAEVS401	Software Proficiency I	-	4	-	-	2	-	2
UAEPC404	Low Speed Aerodynamics Lab	-	2	-	-	1	-	1
UAEPC405	Air Breathing Propulsion Lab	-	2	-	-	1	-	1
UAEPC406	Theory of Machines Lab		2	-	-	1	-	1
UAEFP401	Field Project	-	4	-	-	2	-	2
Total		**16**	**14**		**16**	**7**		**23**

Semester IV: Evaluation Scheme

Course code	Course Name	Theory Marks					Practical Marks		Total
		Internal Assessment				SEE	Term work	Practical Oral /POE	
		T1	T2	FET	Total				
UAEPC401	Low Speed Aerodynamics	10	10	5	25	50	-	-	75
UAEPC402	Air Breathing Propulsion	10	10	5	25	50	-	-	75
UAEPC403	Theory of Machines	-	10	5	15	35	-	-	50
UXXMM0XX	Multidisciplinary Minor II	-	10	5	15	35	-	-	50
UXXOE02X	Open Elective II	-	10	5	15	35	-	-	50
UCMEM002	Project Management	-	10	5	15	35	-	-	50
UAEVE401	Artificial Intelligence in	-	10	5	15	35	-	-	50
UAEVS401	Software Proficiency I	-	-	-	-	-	25	25	50
UAEPC404	Low Speed Aerodynamics Lab	-	-	-	-	-	25	-	25
UAEPC405	Air Breathing Propulsion Lab	-	-	-	-	-	25		25
UAEPC406	Theory of Machines Lab	-	-	-	-	-	25	-	25
UAEFP401	Field Project					-	25	25	50
								Total	**575**

Exit Option:

- Students will have the flexibility to enter a programme in odd semesters and exit a programme after the successful completion of even semesters as per their future career needs.
- Students exiting the Second Year Programme after securing minimum 80credits will be awarded UG Diploma in the relevant Discipline /Subject provided they secure additional 8 credits in skill-based vocational courses (skill-based courses, internship, mini projects etc) offered during summer vacation after the second year.

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC301	Aero Thermodynamics	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEPC301	Aero Thermodynamics	10	10	5	25	40%	50	40%	75

Course Description

Thermodynamics is the study of the relationships between properties of heat, temperature, energy, and work. It is crucial for understanding processes like energy conversion, heat engines, phase transitions, and chemical reactions.

Pre-requisites:-

Course Objectives

- To introduce the fundamental concepts on the basics and application of laws of thermodynamics.
- To introduce the concepts of air standard and vapor compression cycles.
- To impart knowledge on basic propulsion and heat transfer.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Explain**[2] the laws of thermodynamics and its applications.
- **CO2** **Explain**[2] the second law of thermodynamics and entropy principles for aerospace applications.
- **CO3** **Determine**[3] the efficiency of different air standard cycles.
- **CO4** **Determine**[3] the heat transfer in different conditions of working medium.
- **CO5** **Solve**[2] heat transfer problems in complex systems, related to conduction convention and radiation

Course Contents

Module	Unit	Description	Hours
1.0		**Fundamental Concept and First Law**	**9**
1	1.1	Concept of continuum, macroscopic approach, thermodynamic systems – closed, open and isolated.	
	1.2	Property, state, path and process, quasi-static process, work, internal energy, enthalpy, specific heat capacities and heat transfer, SFEE, application of SFEE to jet engine components, First law of thermodynamics, relation between pressure, volume and temperature for various processes, Zeroth law of thermodynamics.	
2.0		**Second Law and Entropy**	**9**
2	2.1	Second law of thermodynamics – Kelvin Planck and Clausius statements of second law.	
	2.2	Reversibility and Irreversibility, Thermal reservoir, Carnot theorem. Carnot cycle, Reversed Carnot cycle, efficiency, COP, Thermodynamic temperature scale - Clausius inequality, Concept of entropy, Entropy changes for various processes.	
3.0		**Air Standard Cycles**	**9**
3	3.1	Otto, Diesels, Dual, Ericsson, Atkinson, Stirling and Brayton cycles - Air standard efficiency – Mean effective pressure.	
4.0		**Fundamentals of Vapour Power Cycles**	**9**
4	4.1	Properties of pure substances – solid, liquid and vapour phases, phase rule, p-v, p-T T-v, T-s, h-s diagrams, p-v-T surfaces, thermodynamic properties of steam calculations of work done and heat transfer in non-flow and flow processes - standar Rankine cycle, Reheat and Regeneration cycle.	
	4.2	Heat rate, Specific steam consumption, Tonne of refrigeration.	
5.0		**Basics of Propulsion and Heat Transfer**	**9**
5	5.1	Classification of jet engines - basic jet propulsion arrangement	
	5.2	Engine station number, thrust equation – Specific thrust, SFC, TSFC, specific impulse, actual cycles, isentropic efficiencies of jet engine components, polytropic efficiency, conduction in parallel, radial and composite wall, Basics of convective and radiation heat transfer.	

Text Books

1. Nag.P.K., "Engineering Thermodynamics", 7th Edition, Tata McGraw Hill (2025), New Delhi.
2. Natarajan, E., "Engineering Thermodynamics: Fundamentals and Applications", 2nd Edition (2014), Anuragam Publications, Chennai.

References

1. Cengel, Y and M. Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill,9th Edition, 2019.
2. Chattopadhyay, P, "Engineering Thermodynamics", 2nd Edition Oxford University Press, 2016.
3. Rathakrishnan, E., "Fundamentals of Engineering Thermodynamics", 2nd Edition, Prentice Hall of India Pvt. Ltd, 2006.

Internal Assessment (T1, T2 and FET)

1. T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules, for 10 marks each.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 50 marks comprise of 5 questions, each carrying 10 marks.
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC302	Fluid Mechanics	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEPC302	Fluid Mechanics	10	10	5	25	40%	50	40%	75

Course Description

A course in fluid mechanics covers the study of fluid behaviour, including liquids and gases, and their interactions with solid boundaries. Topics typically include fluid statics, fluid dynamics, conservation laws, flow in pipes and ducts, external flow, compressible flow, open channel flow, dimensional analysis. The course aims to provide students with a fundamental understanding of fluid mechanics principles and their applications in engineering and science.

Pre-requisites: 11^{th} and 12^{th} standard Physics and Mathematics.

Course Objectives

- To introduce the students about property of the fluids, behaviour of fluids under static conditions.
- To impart basic knowledge of the dynamics of fluids and boundary layer concept.
- To expose to the applications of the conservation laws and significance of boundary layer theory and its thicknesses
- To expose the students to basic principles of working of hydraulic machineries including Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Explain**^{2} basic concepts of fluid mechanics and fluid properties
- **CO2** **Discuss**^{3} fundamental laws and their applications
- **CO3** **Explain**^{3} significance of dimensionless quantities associated with viscous flow
- **CO4** **Apply**^{4} dimensional analysis to fluid flow problems
- **CO5** **Explain**^{3} working Principle of Turbines and Pumps

Course Contents

Module	Unit	Description	Hours
1.0		**Fluid Properties and Flow Characteristics**	**9**
1	1.1	Properties of fluids – Fluid statics - Pressure Measurements - Buoyancy and floatation - Flow characteristics - Eulerian and Lagrangian approach	
	1.2	Concept of control volume and system - Reynold's transportation theorem - Continuity equation, energy equation and momentum equation - Applications.	
2.0		**Flow Through Pipes and Boundary Layer**	**9**
2	2.1	Reynold's Experiment - Laminar flow through circular conduits - Darcy Weisbach equation	
	2.2	Friction factor - Moody diagram - Major and minor losses - Hydraulic and energy gradient lines	
	2.3	Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness	
3.0		**Dimensional Analysis and Model Studies**	**9**
3	3.1	Fundamental dimensions - Dimensional homogeneity	
	3.2	Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters	
	3.3	Similitude and model studies - Distorted and undistorted models	
4.0		**Turbines**	**9**
4	4.1	Impact of jets - Velocity triangles - Theory of Rotary dynamic machines - Classificatio of turbines - Working principles - Pelton wheel	
	4.2	Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube	
	4.3	Specific speed - Performance curves for turbines - Governing of turbines.	
5.0		**Pumps**	9
5	5.1	Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller	
	5.2	Performance curves - Reciprocating pump working principle - Indicator diagram and it's variations - Work saved by fitting air vessels - Rotary pumps	

Text Books

1. Streeter, V.L, and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.
2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi (7th edition), 1995.
3. Vasandani, V.P., "Hydraulic Machines -Theory and Design", Khanna Publishers, 1992.

References

1. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John-Wiley and Sons, Singapore, 2011.
2. Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016
3. Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014.
4. S K Som; Gautam Biswas and S Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill Education Pvt. Ltd., 2012.
5. Streeter, V. L. and Wylie E. B., Fluid Mechanics, McGraw Hill Publishing Co., 2010.

Internal Assessment (T1, T2 and FET)

1. T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules, for 10 marks each.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 50 marks comprise of 5 questions, each carrying 10 marks.
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC303	Mechanics of Materials	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEPC303	Mechanics of Materials	-	10	5	15	40%	35	40%	50

Course Description

This course introduces the fundamental concepts of Strength of Materials, focusing on the behavior of structural members under various types of loading. Topics include stress–strain relationships, axial loading, bending, shear, torsion, beam deflection, and thin pressure vessels. Analytical and energy methods are used to determine stresses and deformations in statically determinate and indeterminate systems.

Pre-requisites: Pre-requisites:11th and 12th standard Mathematics, Basic Physics and Engineering Mechanics.

Course Objectives

- To introduce the fundamental concepts of stress, strain, and elastic behavior of materials under different loading conditions.
- To introduce the process of analysis of structural members subjected to axial load, bending, shear, torsion, and combined loading.
- To impart the procedure of determining the stresses, strains, and deformations in statically determinate and indeterminate structures using analytical and energy methods.
- To develop problem-solving skills and structural intuition required for advanced courses in structural analysis and aerospace/mechanical design.

Course Outcomes: After the successful completion of the course students will be able to:

- **CO1** **Apply**^{3} fundamental concepts of stress–strain relationships to analyze axially loaded members and determine deformation.
- **CO2** **Construct**^{3} shear force and bending moment diagrams and evaluate bending and shear stresses in beams.
- **CO3** **Determine**^{3} slope and deflection of beams using analytical and energy methods.
- **CO4** **Analyze**^{4} circular shafts under torsion and evaluate stresses in thin cylindrical and spherical pressure vessels.
- **CO5** **Evaluate**^{5} principal stresses and maximum shear stresses under combined loading conditions using analytical and graphical methods.

Course Contents

Module	Unit	Description	Hours
1.0		**Basics and Axial Loading**	**6**
1	1.1	Stress and Strain – Hooke's Law – Elastic constants and their relationship– Statically determinate cases - statically indeterminate cases –composite bar.	
	1.2	Thermal Stresses – stresses due to freely falling weight.	
2.0		**Stresses in Beams**	**6**
2	2.1	Shear force and bending moment diagrams for simply supported and cantilever beams-	
	2.2	Bending stresses in straight beams-Shear stresses in bending of beams with rectangular, I& T etc cross sections-beams of uniform strength.	
3.0		**Deflection of Beams**	**6**
3	3.1	Double integration method – McCauley's method - Area moment method	
	3.2	Conjugate beam method-Principle of super position-Castigliano's theorem and its application.	
4.0		**Torsion**	**6**
4	4.1	Torsion of circular shafts - shear stresses and twist in solid and hollow circular shafts – closely coiled helical springs.	
5.0		**Bi Axial Stresses**	**6**
5	5.1	Stresses in thin circular cylinder and spherical shell under internal pressure – volumetric Strain.	
	5.2	Combined loading – Principal Stresses and maximum Shear Stresses – Analytical and Graphical methods.	

Text Books

1. F. P. Beer, E. R. Johnston, Jr., J. T. DeWolf, and D. F. Mazurek, Mechanics of Materials, 7th ed. New York, NY, USA: McGraw-Hill Education, 2014.
2. R. K. Bansal, Strength of Materials, 7th ed. New Delhi, India: Laxmi Publications, 2011.
3. S. S. Rattan, Strength of Materials, 3rd ed. New Delhi, India: McGraw-Hill Education, 2011.

References

1. J. M. Gere and B. J. Goodno, Mechanics of Materials, 8th ed. Boston, MA, USA: Cengage Learning, 2012.
2. A. Pytel and F. L. Singer, Strength of Materials and Structures, 2nd ed. Stamford, CT, USA: Cengage Learning, 2007.
3. A. P. Boresi and R. J. Schmidt, Advanced Mechanics of Materials, 6th ed. Hoboken, NJ, USA: Wiley, 2002.

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC304	Digital Control Systems	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEPC304	Digital Control Systems	-	10	5	15	40%	35	40%	50

Course Description

This course provides a thorough understanding of the basics involved in analyzing and designing discrete-time control systems. It covers fundamental concepts such as sampling, stability, and system response in the discrete domain. Students will learn various techniques and tools used for modeling and designing controllers for digital systems. Overall, the course aims to equip learners with the knowledge required to handle modern control applications in digital environments.

Pre-requisites: -

Course Objectives

- To introduce the concepts of control systems and assemble various components associated with it and advantages compared to the analog type.
- To introduce the mathematical models of physical systems into the standard state space form.
- To examine the stability of the system using different tests

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Describe**[3] the various control blocks and components of digital control systems.
- **CO2** **Describe**[2] mathematical models of physical systems.
- **CO3** **Design**[2] a digital controller/ compensator in frequency domain
- **CO4** **Design**[2] a digital controller/ compensator in time domain.

Course Contents

Module	Unit	Description	Hours
1.0		**Introduction to Discrete-Time Control Systems**	
1	**1.1**	Introduction, digital control systems, quantizing and quantization error, examples of control systems, closed-loop control versus open-loop control system,	**6**
	1.2	Data acquisition, conversion, and distribution systems, types of analog-to-digital converter, error in analog-to-digital converter, digital-to-analog converter, T.F. of close loop and digital controller system.	
2.0		**Design of Discrete-Time Control Systems by Conventional Methods**	**6**
2	2.1	Introduction, mapping between the s plane and the z plane, stability analysis of close loop system in the z plane, methods for testing absolute stability, the Jury stability test, Routh stability criteria, comments on stability of close loop control system,	
	2.2	Transient and steady state response analysis, design based on the root locus method, design based on the frequency-response method, Bode diagram, design procedure in the W plane.	
3.0		**State-Space Analysis**	**6**
3	3.1	Introduction, concept of the state space model, state-space representations of discrete-time systems, solving discrete time state-space equations,	
	3.2	Pulse transfer-function matrix, discretization of continuous-time state-space equations	
4.0		**Time Harmonic Response Analysis**	**6**
4	4.1	Time response- Impulse time response of first-order and second-order systems, step response of first-order system, general form for the step response of discrete time system,	
	4.2	Correlation between analog and discrete time response, steady-state errors, harmonic response of discrete systems	
5.0		**Compensation of Digital Control Systems**	**6**
5	5.1	Introduction, indirect design methods- selection of sampling rate, direct design method- design via analytical methods, design using the root locus method of the characteristic equation , design in frequency domain,	
	5.2	PID digital controller- digital PID controller tuning, phase lead/lag digital compensators	

Text Books

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition

References

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003 .
2. Digital Control and State Variable Methods by M.Gopal, TMH .

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCMEM001	Engineering Economics	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UCMEM001	Engineering Economics	-	10	5	15	40%	35	40%	50

Course Description

The course focuses on economic of engineering projects, giving insights on different techniques and methods used on economic feasibility studies relating to design and implementation of engineering projects. The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Pre-requisites: - Mathematics

Course Objectives

- To introduce the importance of economy in engineering field.
- To develop the ability to apply knowledge of economic comparisons for selecting best alternative
- To introduce the concept of depreciation
- To explain the importance of working capital management

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Explain**^{2} importance of economy in engineering field.
- **CO2** **Correlate**^{2} knowledge of economy in decision making
- **CO3** **Correlate**^{2} knowledge of deprecation for engineering field
- **CO4** **Explain**^{2} importance of working capital management in business.

Course Contents

Module	Unit	Description	Hours
1.0		**Fundamentals Economy**	**06**
1	1.1	Introduction to Engineering Economy, Time value of money, Cash flow, cash flow diagrams, simple Interest and compound Interest, inflation, economic factors.	
2.0		**Economic Comparison of Alternatives**	**06**
2	2.1	Present worth comparisons, Comparisons of assets with equal, unequal lives, comparison of deferred investments, Equivalent uniform annual cost (EUAC) method , Rate of return method , Future worth method, NPV method.	
3.0		**Comparisons of Alternatives**	**06**
3	3.1	Payback period method- conventional and discounted payback period method, Benefit cost ration methods , break even analysis method.	
4.0		**Depreciation and Inflation**	**06**
4	4.1	Definition method for calculating depreciation straight line method., constant percentage method, sinking fund method, Switching between different depreciation methods, inflation effect of inflation.	
5.0		**Working capital management**	**06**
5	5.1	Introduction, need of working capital management, financial ratio, Income statement, Financial statements	

References

1. Leland Blnak, Anthony Tarquin, Engineering Economy , Tata McGraw Hill Publishing Company, New Delhi,
2. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015.
3. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001
4. Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 2011

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC305	Aero Thermodynamics Lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEPC305	Aero Thermodynamics Lab	25	40%	-	-	25

Course Outcomes: After the successful completion of the course students will be able to:

- **CO1** Analyze the performance of IC engines and timing diagrams.
- **CO2** Evaluate heat transfer characteristics and thermal properties
- **CO3** Determine the COP of refrigeration and air-conditioning systems.

List of Experiments

All the experiments will be based on the course content of **UAEPC301 Aero Thermodynamics**

Ex. No	Experiment Name
1.	Performance test on a 4-stroke engine
2.	Valve timing of a 4 – stroke engine and port timing of a 2-stroke engine
3.	Determination of effectiveness of a parallel flow heat exchanger
4.	Determination of effectiveness of a counter flow heat exchanger
5.	Determination of heating value of a fuel
6.	Determination of thermal conductivity of solid.
7.	Determination of thermal resistance of a composite wall.
8.	COP test on a vapour compression refrigeration test rig 1
9.	COP test on a vapour compression air-conditioning test rig

References

1. Paul G. A. Cizmas – Aerothermodynamics and Jet Propulsion (Cambridge University Press, 2021)
2. Ernst Heinrich Hirschel – Basics of Aerothermodynamics (Springer, 2015 original edition)
3. Ethirajan Rathakrishnan – High Enthalpy Gas Dynamics (John Wiley, approx. 2015)

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and TERM WORK assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC306	Fluid Mechanics lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEPC306	Fluid Mechanics lab	25	40%	-	-	25

Course Outcomes: After the successful completion of the course, students will be able to:

- **CO1** Verify and apply the Bernoulli equation for flow measurement, like an Orifice/ Venturi meter.
- **CO2** Measure the friction factor in pipes and compare it with the Moody diagram, and verify the momentum conservation law.
- **CO3** Determine the performance characteristics of Rotary dynamic pumps, positive displacement pumps and turbines.

List of Experiments

All the experiments will be based on the course content of **UAEPC302 Fluid Mechanics**

Ex. No.	Experiment Name
1.	Flow through Orifice meter.
2.	Flow through a Venturi meter.
3.	Friction factor for flow through pipes.
4.	Characteristics of Centrifugal Pump.
5.	Characteristics of the Gear Oil Pump.
6.	Characteristics of a Submersible Pump.
7.	Characteristics of a Reciprocating Pump.
8.	Characteristics of the Pelton Wheel.
9.	Characteristics of the Francis Turbine.

References

1. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2015.
2. Modi P.N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House. New Delhi, 2017.
3. Subramanya K, Fluid Mechanics and Hydraulic Machines, Tata McGraw Hill Edu. Pvt. Ltd., 2011.

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student, with every assignment graded from time to time.
2. The grades will be converted to marks as per the ‘credit and grading system’ manual and should be added and averaged.
3. Based on the above scheme, grading and TERM WORK assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC307	Digital Control Systems Lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEPC307	Digital Control Systems Lab	25	40%	-	-	25

Course Code	Course Name	In Semester Evaluation		End Semester Exam (OE/POE)		
		Term work	Min pass	Marks	Min pass	Total (Marks)
UAEPC307	Digital Control Systems Lab	25	40%	-	-	25

Course Outcomes: After the successful completion of the course, students will be able to:

- **CO1** **Explain**[2] the different transfer function in systems
- **CO2** **Analyse**[2] the various responses of system for different input.
- **CO3** **Compare**[3] the different techniques of system stability

List of Experiments

All the experiments will be based on the course content of **UAEPC304 Digital Control Systems**

References

1. Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003 .
2. Digital Control and State Variable Methods by M. Gopal, TMH .

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student, with every assignment graded from time to time.
2. The grades will be converted to marks as per the 'credit and grading system' manual and should be added and averaged.
3. Based on the above scheme, grading and TERM WORK assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
USTVE004	Environmental Science and Sustainability	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
USTVE004	Environmental Science and Sustainability	-	10	5	15	40%	35	40%	50

Course Description

To provide a general understanding of our environment, problems during exploitation of natural resources, the importance of biodiversity and the need for its conservation, pollution and its impacts, and approaches for environment sustainability.

Pre-requisites: -

Course Objectives

- Understand the importance of natural resources and their conservation.
- Explain ecosystem structure, energy flow, and ecological balance.
- Assess biodiversity, its threats, and conservation measures.
- Identify environmental pollution and explore sustainable solutions

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Illustrate** the scope and significance of environmental science and evaluate the role of individuals in achieving sustainable development.
- **CO2** **Classify** and explain **natural resources, ecosystem structure and functions**, including energy flow, food chains, and ecological balance.
- **CO3** **Evaluate biodiversity, its levels, values, and threats**, and recommend appropriate conservation strategies with reference to India.
- **CO4** **Interpret** the **causes, impacts, and control measures of environmental pollution and climate change**, including waste management practices.
- **CO5** **Analyse environmental policies, laws, global initiatives, and sustainability practices**, and apply them to real-life environmental management and green development.

Course Contents

Module	Unit	Description	Hours
1.0		**Foundations and Importance of Environmental Science**	**06**
1	1.1	Multidisciplinary nature of environmental science; scope and importance; need for environmental awareness, Renewable and non-renewable resources, United Nations Conference on the Human Environment 1972; World Commission on Environment and Development and concept of sustainable development, Role of individuals in environmental protection.	
2.0		**Natural Resources, Ecosystems and Biodiversity**	**06**
2	2.1	**Natural Resources:** land degradation, soil erosion, desertification, Water resources (floods, droughts, conservation); forest resources and deforestation, Alternative energy resources: solar, wind, biomass, hydropower, geothermal and tidal.	
	2.2	**Ecosystem and Biodiversity:** Structure and function of ecosystems; types (terrestrial and aquatic), Food chain, food web, ecological pyramids and energy flow. Biodiversity: concept, values and levels, India as a mega-diverse nation; threats and conservation methods (in-situ and ex-situ).	
3.0		**Environmental Pollution and Climate Change**	**06**
	3.1	Types, causes, effects and control of air, water and soil pollution, Solid waste management: municipal waste, biomedical waste, e-waste, plastic pollution and microplastics.	
4.0		**Environmental Governance and Legal Framework**	**06**
	4.1	Environment Protection Act, Air (Prevention & Control of Pollution) Act, Water (Prevention & Control of Pollution) Act, Wildlife Protection Act, Environmental Impact Assessment (EIA), Environmental Management System (ISO 14001), Environmental audit.	
	4.2	**Environmental Treaties and Legislation:** Major International organizations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN) and Intergovernmental Union panel on climate change (IPCC)	

5.0		**Sustainability and Green Development Practices**	**06**
5	5.1	**Sustainable Development:** Concept and pillars of sustainable development; Sustainable Development Goals (SDGs). Carbon footprint and sustainable resource use.	
	5.2	**Green Practices and Movements:** Green technology, green buildings, Eco-labeling, Green business, Environmental movements: Chipko Movement, Silent Valley Movement, Bishnoi community and Bhopal Gas Disaster.	
	5.3	Documentation of campus biodiversity.	
	5.4	Campus environmental management activities such as solid waste disposal, water management, and sewage treatment.	

Textbooks

1. Anubha Kaushik and C.P. Kaushik (2004) "Perspective of Environmental Studies"
2. Dr P. D. Raut (2021) "Environmental Studies", Seventh Edition

Reference books:

1 . Eldon D. Enger (2016) "Environmental Science: A study of interrelationships"
2 . Jennifer A. Elliot (2012) "An Introduction to Sustainable Development", 4th Edition

Internal Assessment (T1, T2 and FET)

1. T1 should be based on First to Two modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total Credits
UHSAE008	Employability Skills	01	02	-	-	02	-	02

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UHSAE008	Employability Skills	25	40%	25	40%	50

Course Description

Engineering education can no longer remain confined to technical knowledge alone. Employers today expect graduates not only to possess disciplinary understanding, but also to demonstrate communication ability, professional conduct, problem-solving capacity, workplace awareness, and increasing comfort with digital tools, including emerging AI-enabled environments. The shift is visible across sectors. Whether a student enters core engineering, IT services, analytics, manufacturing, design, operations, entrepreneurship, or higher studies, employability now depends as much on readiness for work as on academic performance.

A common employability course, therefore, is not an add-on. It is a foundational academic intervention. It prepares students to understand themselves better, communicate more effectively, work with others, think with structure, and present themselves with greater clarity in professional settings. It also introduces them to the changing nature of work, where digital literacy, responsible use of AI tools, and professional judgment are becoming increasingly relevant.

This course has been designed as common offering for all engineering streams, keeping the content broad-based, practical, interactive, and immediately relevant. The intention is not to overload students with theory, but to build awareness, confidence, and observable workplace behaviors that will support both campus readiness and long-term career development.

Pre-requisites: -

Course Objectives

- To develop greater self-awareness regarding their strengths, interests, learning gaps, and professional aspirations.
- To communicate more clearly and confidently in academic and workplace-like settings.
- To demonstrate basic professional etiquette, ethical awareness, and responsible conduct.
- To develop the skills of structured thinking to simple problems and participate effectively in team-based activities.
- To develop placement-oriented aptitude, workplace expectations, and early career preparation.
- To acquaint learners with the growing relevance of digital tools and AI in professional environments and use such tools with responsibility and awareness.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** Explain the importance of employability skills in engineering careers;
- **CO2** Present themselves with greater confidence through self-introduction, written communication, and presentations;
- **CO3** Participate constructively in group discussions and team tasks;
- **CO4** Demonstrate basic aptitude readiness and structured problem-solving ability;
- **CO5** Prepare a basic résumé and articulate career goals;
- **CO6** Identify responsible and productive uses of digital and AI tools in learning and work contexts.

Course Contents

Module	Unit	Description	Hours
1.0		**Employability Awareness and Self-Discovery**	04
	1.1	Faculty input on employability, workplace expectations, and factors beyond academic performance (attitude, communication, reliability);	
	1.2	Structured self-assessment covering strengths, habits, communication gaps, and first impressions (worksheet-based activity);	
	1.3	Guided reflection with peer discussion to identify improvement areas and employability gaps;	
	1.4	Classroom discussion and preparation of a personal employability improvement statement (visible output);	
2.0		**Professional Mindset, Ethics and Responsibility**	04
	2.1	Input on professional mindset: discipline, accountability, ownership, and workplace ethics;	
	2.2	Case-based learning on missed deadlines, communication gaps, responsibility, and ethical dilemmas;	
	2.3	Role-play exercises demonstrating weak vs effective workplace behavior;	
	2.4	Reflection on “habits that influence professional credibility” and behavior correction strategies;	
3.0		**Analytical Thinking, Aptitude, Emotional Intelligence and Decision-Making**	04
	3.1	Introduction to critical thinking: distinguishing facts vs assumptions, identifying problems, and structured analysis;	
	3.2	Emotional intelligence in academic and workplace settings: empathy, listening, self-control, and response vs reaction;	
	3.3	Aptitude orientation: speed, accuracy, logical reasoning, and problem-solving strategies;	

	3.4	Practice exercises on reasoning and aptitude with focus on error analysis and improvement;	
	3.5	Decision-making in workplace scenarios: prioritization, judgment, and handling ambiguity;	
	3.6	Case-based activities integrating thinking, behavior, and decision-making with group discussion and reflection;	
4.0		**Career Readiness, Resume Building and Digital Presence**	06
	4.1	Overview of career pathways: core engineering, IT, analytics, higher studies, and entrepreneurship; preparation of personal career planning sheet;	
	4.2	Résumé structure workshop covering sections, clarity, and recruiter expectations;	
	4.3	Resume Writing I: **ATS-friendly resume**, keyword optimization, achievement-based content, and project representation;	
	4.4	Resume Writing II: **visual resume, video resume, and e-profile development** (formats, scripting, and presentation guidelines);	
5.0		**Group Discussion and Team Interaction**	06
	5.1	Introduction to group discussion norms and evaluation parameters (content, clarity, listening, structure, and collaboration);	
	5.2	Practice group discussions on familiar topics (e.g., technology in student life, workplace expectations);	
	5.3	Techniques for entering, sustaining, and concluding discussions; building arguments and responding to others;	
	5.4	Observation of speaking balance, idea contribution, listening behavior, and team dynamics during GD;	
	5.5	Team reflection on communication effectiveness and group behavior; identification of strengths and improvement areas;	
	5.6	Feedback using GD rubric and preparation of individual improvement note;	
6.0		**Presentation Skills and Personal Interview**	06
	6.1	Introduction to interview process: types of interviews, employer expectations, and common mistakes;	
	6.2	Body language, confidence, listening skills, and professional conduct during interviews;	
	6.3	Common HR questions, behavioural responses, and answer structuring techniques (clarity, relevance, examples);	
	6.4	Mock interviews (triad format) with peer and teacher evaluation using structured rubric;	
	6.5	Presentation skills: structure (opening, flow, conclusion), clarity, voice modulation, and audience engagement;	
	6.6	Student presentations (2–3 minutes) followed by peer observation, faculty feedback, and improvement note;	

7.0		**Digital Readiness, AI Awareness and Responsible Use (Only for Non-CSE and AIML Branches)**	02
	7.1	Faculty-led discussion on AI in workplace tasks and engineering contexts	
	7.2	Examples of AI-assisted writing, coding, research support	

Note: This course will be taught in PBL mode; hence, the focus will be on teaching applications of content in the syllabus in real life situations.

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and TERM WORK and POE assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC401	Low Speed Aerodynamics	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEPC401	Low Speed Aerodynamics	10	10	5	25	40%	50	40%	75

Course Description

Aerodynamics course focuses on the study of the flow of air about a body, and the body can be an airplane, but many of the concepts explored are relevant to a wide variety of applications from sailboats, automobiles and birds. This course will enable learners to gain a fundamental understanding of concepts and models used to aerodynamically analyze and some classical theories which are useful for design of aircraft components. This course is the prerequisite course for high speed aerodynamics as well as can be an advanced subject for students with aerodynamics as specialization.

Pre-requisites: 11^{th} and 12^{th} standard Mathematics.

Course Objectives

- To impart the fundamental knowledge on basics of aerodynamics and aerodynamic characteristics of wings, airfoils.
- To introduce the mathematical models for lift and drag coefficient of finite wing and wing of infinite aspect ratio.
- To introduce the concepts of flow over non-lifting bodies from method of singularities and investigation of the interference effect.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Solve**^{3} the lift characteristics of wing of infinite aspect ratio from classical thin airfoil for selecting suitable airfoil
- **CO2** **Identify**^{2} the effect of wing twist, wing taper and wing sweep for perceiving the aerodynamic characteristics of finite wing.
- **CO3** **Develop**^{2} the mathematical model of non-lifting, lifting flow over circular cylinder for identifying relation between lift and circulation
- **CO4** **Examine**^{3} the flow over finite wing using the concept of Prandtl's lifting line theory for determining the effect of span wise flow on the lift distribution.

Course Contents

Module	Unit	Description	Hours
1.0		**Introductory Topics for Aerodynamics**	**9**
1	1.1	Fundamental Aerodynamic Variables & Units, Aerodynamic Forces and Moments, Pressure Coefficient, Center of Pressure, Dimensional Analysis: The Buckingham Pi Theorem	
	1.2	Flow Similarity, Fluid Statics : Buoyancy Force, Types of Flow : Continuum Flow ,Free Molecule Flow, Inviscid Flow, Viscous Flow, Incompressible Flow, Compressible Flow, Mach Number Regimes.	
2.0		**Aerodynamics Fundamental Principles and Equations**	**9**
2	2.1	Models of the Fluid : Control Volumes and Fluid Elements, Finite Control Volume Approach, Infinitesimal Fluid Element Approach, Molecular Approach.	
	2.2	Continuity Equation, Momentum Equation, Drag of a Two-Dimensional Body Energy Equation.	
	2.3	Pathlines, Streamlines, and Streaklines of a Flow, Angular Velocity, Vorticity, and Strain, Circulation, Stream Function, Velocity Potential, Relationship Between the Stream Function and Velocity Potential.	
3.0		**Inviscid, Incompressible Flow**	**9**
3	3.1	Bernoulli's Equation, Flow in a Duct, Measurement of Airspeed, Condition on Velocity for Incompressible Flow, Laplace's Equation.	
	3.2	Uniform Flow, Source Flow, Combination of a Uniform Flow with a Source and Sink, Doublet Flow, Non lifting and Lifting Flow over a Circular Cylinder, Vortex Flow.	
	3.3	The Kutta-Joukowski Theorem and the Generation of Lift.	
4.0		**Incompressible Flow Over Airfoil**	**9**
4	4.1	Aerofoil nomenclature, aerodynamic characteristics, The Kutta Condition, Circulation Theorem, Starting Vortex.	
	4.2	Classical Thin Airfoil Theory, Cambered Airfoil, Aerodynamic Centre, Vortex Panel Numerical Method, Modern Low-Speed Airfoils.	
	4.3	Viscous Flow: Introduction to Boundary Layers, Airfoil Drag.	
5.0		**Finite Wing Theory**	**9**
5	5.1	Downwash and Induced Drag, The vortex filament, Biot-Savart Law, Helmholtz Theorem, Prandtl's Classical Lifting Line theory, Elliptical Lift Distribution, General Lift Distribution, Effect of aspect ratio, The Delta Wing, Three-Dimensional Source and Doublet, flow over a sphere.	

Text Books

1. J. D. Anderson, “Fundamentals of Aerodynamics”, McGraw Hill Book Co., New York, 5th Edition, 1985.
2. John D. Anderson, Jr., “INTRODUCTION TO FLIGHT” McGraw Hill Book Co., New York, 3rd Edition

References

1. Clancey, L J., “Aerodynamics", Pitman, 1986.
2. John J Bertin., “Aerodynamics for Engineers", Pearson Education Inc, 2002.
3. Kuethe, A.M and Chow, C.Y, “Foundations of Aerodynamics”, Fifth Edition, John Wiley & Sons, 2000.

Internal Assessment (T1, T2 and FET)

1. T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules, for 10 marks each.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 50 marks comprise of 5 questions, each carrying 10 marks.
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC402	Air Breathing Propulsion	03	-	-	03	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEPC402	Air Breathing Propulsion	10	10	5	25	40%	50	40%	75

Course Description

This course is at second semester of second year Engineering. It examines gas turbine engine design methodology. Covers aerodynamics or gas dynamics of air breathing engine components: inlets, compressors, turbines, and nozzles. Studies the on-design and off-design performance of gas turbine engines. Includes combustion, emissions, noise, and advanced air breathing propulsion systems.

Pre-requisites: Aero Thermodynamics Fluid Mechanics, Basic Compressible flows

Course Objectives

- To establish the fundamental approach and application of jet engine components.
- To impart the knowledge about the analysis of flow phenomenon and estimation of thrust developed by jet engine.
- To introduce the application of various equations in Gas Turbine Engines.
- To introduce the concepts of jet engine combustion chambers.
- To impart the knowledge on compressors and turbines.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Apply**[4] control volume and momentum equation to estimate the forces produced by aircraft propulsion systems
- **CO2** **Describe**[2] the principal figures of merit for aircraft engine
- **CO3** **Describe**[2] the principal design parameters and constraints that set the performance of gas turbine engines.
- **CO4** **Apply**[4] ideal and actual cycle analysis to a gas turbine engine to relate thrust and fuel burn to component performance parameters.
- **CO5** **Estimate**[4] the performance of a compressor or turbine stage.

Course Contents

Module	Unit	Description	Hours
1.0		**Principles of Air Breathing Engines**	**6**
1	1.1	Illustration of working of gas turbine engine - Thrust equation - Factors affecting thrust. Effect of pressure, velocity and temperature changes of air entering compressor. Methods of thrust augmentation. Characteristics of turboprop, turbofan and turbojet - Performance characteristics.	
2.0		**Jet Engine Intakes and Exhaust Nozzles**	**12**
2	2.1	Ram effect, Internal flow and Stall in subsonic inlets – relation between minimum area ratio and eternal deceleration ratio – diffuser performance – modes of operation - supersonic inlets – starting problem on supersonic inlets – shock swallowing by area variation	
	2.2	Real flow through nozzles and nozzle efficiency – losses in nozzles – ejector and variable area nozzles - interaction of nozzle flow with adjacent surfaces – thrust reversal.	
3.0		**Jet Engine Combustion Chamber**	**6**
3	3.1	Classification of combustion chambers - Important factors affecting combustion chamber design - Combustion process - Combustion chamber performance - Effect of operating variables on performance - Flame tube cooling - Flame stabilization - Use of flame holders.	
4.0		**Jet Engine Compressors**	**12**
4	4.1	Euler's turbo machinery equation, Principle operation of centrifugal compressor, Principle operation of axial flow compressor– Work done and pressure rise – velocity diagrams – degree of reaction	
	4.2	Free vortex and constant reaction designs of axial flow compressor – performance parameter axial flow compressors– stage efficiency.	
	4.3	Compressor blade design - Centrifugal and Axial compressor performance characteristics.	
5.0		**Jet Engine Turbines**	**9**
5	5.1	Principle of operation of axial flow turbines– limitations of radial flow turbines- Work done and pressure rise – Velocity diagrams – degree of reaction – constant nozzle angle designs.	
	5.2	Performance parameters of axial flow turbine– turbine blade cooling methods – stage efficiency calculations – basic blade profile design considerations – matching of compressor and turbine.	

Text Books

1. Hill, P.G. & Peterson, C.R. “Mechanics & Thermodynamics of Propulsion” Pearson education (2009)

References

1. Cohen, H. Rogers, G.F.C. and Saravanamuttoo, H.I.H. “Gas Turbine Theory”, Pearson Education Canada; 6th edition, 2008.
2. Mathur, M.L. and Sharma, R.P., “Gas Turbine, Jet and Rocket Propulsion”, Standard Publishers & Distributors, Delhi, 2nd edition 2014.
3. Oates, G.C., “Aero thermodynamics of Aircraft Engine Components”, AIAA Education Series, New York, 1985.

Internal Assessment (T1, T2 and FET)

1. T1 (Test 1) should be based on first two modules and T2 (Test 2) should be based on next two modules, for 10 marks each.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 50 marks comprised of 5 questions, each carrying 10 marks.
2. The duration of Semester End Examination shall be Two hours.
3. The students need to write all 5 questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the mod

Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC403	Theory of Machines	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEPC403	Theory of Machines	-	10	5	15	40%	35	40%	50

Course Description

This course provides a comprehensive understanding of the principles governing the kinematics and dynamics of machines. It focuses on the analysis and design of mechanisms such as four-bar linkages, slider-crank mechanisms, cams, and gear trains. The course introduces students to velocity and acceleration analysis using graphical and analytical methods, as well as force analysis under static and dynamic conditions.

Pre-requisites: Engineering Mechanics, Strength of Materials, Engineering Mathematics

Course Objectives

- To introduce the principles in the formation of mechanisms and their kinematics.
- To introduce the basic concepts of toothed gearing and kinematics of gear trains.
- To study the effect of friction in different machine elements.
- To explain the procedure of analyzing the forces and torque acting on simple mechanical systems.
- To explain the importance of balancing and vibrations.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Design**[5] the linkages and the cam mechanisms for specified output motions.
- **CO2** **Determine**[3] the gear parameters of toothed gearing and speeds of gear trains in various applications.
- **CO3** **Evaluate**[5] the frictional torque in screw threads, clutches, brakes and belt drives.
- **CO4** **Determine**[3] the forces on members of mechanisms during static and dynamic equilibrium conditions.
- **CO5** **Determine**[3] the balancing masses on rotating machineries and the natural frequencies of free and forced vibratory systems.

Course Contents

Module	Unit	Description	Hours
1.0		**Kinematic Analysis in Simple Mechanisms and Cams**	**6**
1	1.1	Mechanisms – Terminology and definitions – kinematics inversion and analysis of 4 bar and slider-crank chain	
	1.2	velocity and acceleration polygons – cams – classifications – displacement diagrams – layout of plate cam profiles.	
2.0		**Toothed Gearing and Gear Trains**	**6**
2	2.1	Gear terminology – law of toothed gearing – involute gearing	
	2.2	Gear tooth action – Interference and undercutting – gear trains – parallel axis gear trains – epicyclic gear trains.	
3.0		**Friction Aspects in Machine Components**	**6**
3	3.1	Surface contacts – Sliding and Rolling friction – Friction drives	
	3.2	Friction in screw threads – Friction clutches – Belt drives – Friction aspects in brakes.	
4.0		**Static And Dynamic Force Analysis**	**6**
4	4.1	Applied and Constrained Forces – Free body diagrams – Static equilibrium conditions – Static force analysis in simple mechanisms –	
	4.2	Dynamic Force Analysis in simple machine members- Inertia forces and inertia torque – D'Alembert's principles.	
5.0		**Balancing of Rotating Masses and Vibration**	**6**
5	5.1	Static and dynamic balancing – Balancing of revolving masses – Balancing machines – free vibrations – natural frequency	
	5.2	Damped Vibration – bending critical speed of simple shaft – Forced vibration – resonance – Torsional vibration.	

Text Books

1. Uicker, J.J., Pennock G.R and Shigley, J.E., " Theory of Machines and Mechanisms" , Oxford University Press, 2017.
2. K. R. Reddy and B. S. S. Reddy, "Mechanism and Machine Theory" , New Age International Pvt Ltd, 2006.

References

1. G. Bansal, V., N. K. Nandal, "Mechanism of Machines" , Oxford University Press, 2015.
2. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
3. Rao, J.S., "Theory of Machines" , McGraw Hill Education Pvt. Ltd., 2014.
4. Thomas Bevan, "The Theory of Machines" , Pearson Education Ltd., 2010.

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UCMEM002	Project Management	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UCMEM002	Project Management	-	10	5	15	40%	35	40%	50

Course Description

This course presents the principles and techniques of managing engineering projects from the initiation phase, through planning, execution, control and closeout. Students will develop the analytical skills and awareness necessary on the management side of engineering projects.

Pre-requisites: -

Course Objectives

- To introduce the principles of management and their application in engineering contexts.
- To introduce the procedure of analysis of organizational structures, leadership styles, and decision-making processes.
- To develop the skills to apply project management techniques to engineering problems.
- To explain the procedure for evaluation of financial and economic aspects of engineering projects.
- To develop skills in strategic planning, innovation, and technology management.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Explain**[2] the fundamentals of management and organizational behaviour.
- **CO2** **Apply**[3] project planning and scheduling techniques in engineering projects.
- **CO3** **Analyze**[4] financial statements and cost estimation for engineering decisions.
- **CO4** **Evaluate**[5] leadership, motivation, and communication strategies in organizations.
- **CO5** **Analyze**[4] strategic plans for innovation and technology management.

Course Contents

Module	Unit	Description	Hours
1.0		**Principles of Management and Organizational Behaviour**	**06**
	1.1	Evolution of management thought. Functions of management: Planning, Organizing, Staffing, Directing, Controlling. Organizational structures and design. Motivation theories, leadership styles, communication in organizations	
2.0		**Project Management**	**06**
	2.1	Project life cycle. Project planning and scheduling (PERT, CPM, Gantt charts). Resource allocation and leveling. Risk management in engineering projects.	
3.0		**Financial and Cost Management**	**06**
	3.1	Basics of engineering economics. Cost estimation and budgeting. Breakeven analysis. Financial statements and ratio analysis. Capital budgeting techniques	
4.0		**Decision-Making and Quality Management**	**06**
	4.1	Decision-making models and tools. Total Quality Management (TQM) and Six Sigma. Productivity measurement and improvement. ISO standards and quality audits.	
5.0		**Strategic Management and Technology Innovation**	**06**
	5.1	Strategic planning and competitive advantage. Technology management and innovation strategies. Change management in engineering organizations. Case studies in engineering management	

Text Books

1. Pravin Kumar, "Engineering Management", Pearson Education, 2013
2. Harold Koontz & Heinz Weihrich "Essentials of Management"
3. K. Anil Kumar "Engineering Management" McGraw-Hill Education, 10th Edition, 2015

References

1. Peter F. Drucker – Management: Tasks, Responsibilities, Practices Harper & Row (reprint: HarperBusiness), 1973
2. James A. F. Stoner – Management Prentice Hall, 1982
3. Harold Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Wiley, 11th Edition, 2013
4. Samuel J. Mantel Jr., Jack R. Meredith, Scott M. Shafer & Margaret M. Sutton, Project Management in Practice, Wiley, 4th Edition, 2011

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEVE401	Artificial Intelligence in Aviation	02	-	-	02	-	-

Evaluation Scheme

Course Code	Course Name	Evaluation Scheme (In Semester)					Semester End Exam (SEE)		Total Marks
		T1	T2	FET	Total	Min pass	Marks	Min pass	
UAEVE401	Artificial Intelligence in Aviation	-	10	5	15	40%	35	40%	50

Course Description

This course introduces the basics of Artificial Intelligence and its applications in aviation, including flight operations, maintenance, and airport systems. It also covers autonomous systems, safety, and ethical considerations in the aviation context.

Pre-requisites: - Basic knowledge of mathematics and programming

Course Objectives

- To introduce the fundamental concepts of Artificial Intelligence and its relevance to aviation
- To explain the role of data and AI in flight operations and decision-making
- To explore AI applications in aircraft maintenance and airport systems
- To introduce the autonomous systems and human–AI interaction in aviation
- To examine safety, ethical, and regulatory aspects of AI in aviation

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Describe**[2] basics of AI and its role in aviation
- **CO2** **Illustrate**[2] aviation data and AI applications in flight operations
- **CO3** **Apply**[3] AI in maintenance and airport operations
- **CO4** **Analyze**[3] autonomous systems and human–AI interaction
- **CO5** **Evaluate**[3] ethical, safety, and regulatory aspects of AI in aviation

Course Contents

Module	Unit	Description	Hours
1.0		**Foundations of Intelligence and AI**	**06**
	1.1	Meaning of intelligence, human decision-making, patterns and learning, introduction to AI, machine learning and automation, rule-based vs learning systems, importance of data, everyday AI applications	
2.0		**Data and AI in Flight Operations**	**06**
	2.1	Aviation data types (flight, weather, passenger), flight path optimization, fuel efficiency planning, weather prediction, air traffic flow management	
3.0		**AI in Maintenance and Airport Operations**	**06**
	3.1	Predictive maintenance, fault detection, condition monitoring, passenger flow management, baggage handling, security screening, facial recognition	
4.0		**Autonomous Systems and Human Interaction**	**06**
	4.1	Autopilot vs autonomous systems, decision-support systems, drones/UAVs, risks in AI, automation dependency, human vs machine decisions, supervision	
5.0		**Regulations, Ethics and Indian Context**	**06**
	5.1	DGCA regulations, AI adoption in India, infrastructure challenges, ethical issues, data privacy, bias in AI systems	

Text Books

1. Stuart Russell & Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 3rd Edition, 2010
2. Ethem Alpaydin, "Introduction to Machine Learning" , MIT Press, 3rd Edition, 2014
3. Ian Goodfellow, Yoshua Bengio & Aaron Courville, "Deep Learning" , MIT Press, 2016

References

1. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
2. Federal Aviation Administration (FAA), Roadmap for Artificial Intelligence Safety Assurance, FAA (USA), 2024
3. International Civil Aviation Organization (ICAO), Artificial Intelligence (AI) Contribution to Aviation, ICAO Working Paper (A42-WP/489), 2025
4. International Civil Aviation Organization (ICAO), The Impact of Artificial Intelligence on the Aviation Sector, ICAO Working Paper, 2025

Internal Assessment (T1, T2 and FET)

1. T2 should be based on First to Fourth modules, for 10 marks.
2. FET shall be assessed for 5 marks separately.

Semester End Examination

1. Question paper will be of 35 marks comprise of 5 questions, each carrying 07 marks
2. The duration of Semester End Examination shall be Two hours.
3. The students need to solve all questions.
4. Question No.1 will be compulsory and based on entire syllabus.
5. Remaining question (Q.2 to Q.5) will be selected from all the modules

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEVS401	Software Proficiency I	-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEVS401	Software Proficiency I	25	40%	25	40%	50

Course Description

A CATIA course typically covers the fundamentals and advanced features of CATIA software, which is a powerful 3D modeling, design, and simulation tool used primarily in the aerospace, automotive, and manufacturing industries.

Pre-requisites: -

Course Objectives

- To develop Proficiency in CATIA: The primary objective is to equip participants with the skills and knowledge needed to proficiently navigate and utilize CATIA software for 3D modeling, design, and simulation tasks.
- To introduce the basic concepts to ensure that participants have a solid understanding of fundamental concepts such as sketching, part modeling, assembly design, and drawing creation within the CATIA environment.

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Demonstrate**[3] competency with multiple drawing and modification commands in CATIA
- **CO2** **Create**[2] three-dimensional solid models.
- **CO3** **Create**[2] three-dimensional assemblies incorporating multiple solid models

List of Experiments

Module	Contents
Introduction	**CATIA as a CAD software: -** Concept of Parametric Modeling, Feature Based Modeling, User Interface, Mouse operations, File types and Management, drawing profiles. Major user industries of Catia. WhyCatia is preferred?
Sketcher	**Sketcher**: Profile toolbar, operation (corner,chamfer, eliminations, transformations, project 3D element), constraints, types of constraints, workbench.
	Sketcher:- sketch tools, tools(Sketch solvingstatus, sketch analysis, output feature), visualization toolbar, user selection filter.
Modelling of Machined Component (Part Modelling)	**Modeling of Machined component**, Material Addition and Removal (Pad, Pocket, Shaft, Groove), Sketch and Positioned Sketch, Types of Fillets, Types of Chamfer, Types of Hole.
	Modeling of Machined component - 2. Pattern (Rectangular, Circular, User) , Thread/Tap, Datum Features (Plane, Axes,Points),Simple Draft. Frequently used commands for Machined components in Catia / Creo
	Advance Design features :- Axis System, Types of draft, Shell, Stiffener, rib slot, **Multi section solid, Removed multi sectionsolid**, Apply Material, Measure, Render.
	Introduction To Multi body concept:- Copy Paste, Paste special, Insert body, Boolean Operations (Add, remove, Intersect), **Transformation** (Translation, Mirror, Scaling, Affinity).
	Multi body concept:- Standard example , Negative body concept (Boolean Operations)
	Advance Features:- Parameters, Formula,Relations, Design Table.
Drafting	**Introduction To Drafting & Detailing Theory:-** (types Generative – Interactive),Initial Drafting setting, Sheet Background, Views (ortho, ISO), Dimensions (Types- Generate Dimension & Create Dimension).
	Views:- (Aux, Section, Details, Clipping,Broken), View properties, DATUMS & Tolerance
	Annotations:- GD & T, Symbols, Note, Leaders, Table, Symbols (Machining, Roughness, Welding, Custom), Dress-upToolbar.
	Surfacing Modeling based Plastic Component:- Environment, Tool bars, Surface Creation (Extrude, Revolve, Sphere,Cylinder), Surface Modification, Surface Editing (Trim, Split, Shape Fillet, Close Surface, Thickness).
	Surfacing:- Offset(All 3 types), Fill, Blend,Join, healing, Project-Combine.
	Advanced Surfacing:- Adaptive Sweep,Sweep(ALL), Multi section Surface.
Wire-frame Modeling	**Wire-frame Modeling:-** Point, Line, Planes,Curves, Circle-Conic, STANDARD EXAMPLES. Use of wire frame modeling,
BIW	**BIW Templates:-** What is BIW, Junction, Diabolo, Hole, Mating Flange, Bead, BlendCorner.

Templates	
Assembly & Mechanism	**Introduction to Assembly:-** Types of assembly approach, Types of Constrains andDOF, placement of components in the Assembly, Manipulating Components, **BOTTOM UP Approach**
	TOP DOWN Approach:- Part, Product, Component, Space Analysis, Reuse Pattern,Save management.
	Assembly Drafting:- Scene(Exploded View), Bill of material, Ballon creation,Graph Tree Reordering.

References

1. CADFolks, CATIA V5-6R2014 For Beginners, CreateSpace Independent Publishing Platform
2. CAD Desk,CATIA REFERENCE GUIDE BOOK, January 2019
3. Kirstie Plantenberg, “An Introduction to CATIA V5” Release 16

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
3. Based on above scheme grading and TERM WORK and POE assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC404	Low Speed Aerodynamics Lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEPC404	Low Speed Aerodynamics Lab	25	40%	-	-	25

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Interpret**[2] the behaviour of flow properties over different models using subsonic wind tunnel.
- **CO2** **Demonstrate**[3] experimentally the pressure distribution over circular, symmetric and cambered airfoils and evaluate lift and drag.

List of Experiments

All the experiments will be based on the course content of **UAEPC401 Low Speed Aerodynamics**

Ex.No	Experiment Name
1.	Preparation of NACA series Airfoil
2.	Calibration of subsonic wind tunnel
3.	Lift and Drag Estimation of symmetrical Airfoil
4.	Lift and Drag Estimation of Cambered Airfoil
5.	Pressure Distribution over symmetrical Airfoil
6.	Pressure Distribution over Cambered Airfoil
7.	Variation of Cl with AOA and estimation of Stalling AOA for symmetrical Airfoil
8.	Variation of Cl with AOA and estimation of Stalling AOA for Cambered Airfoil
9.	Estimation of Drag Polar for symmetrical Airfoil
10.	Estimation of Drag Polar for Cambered Airfoil

References

1. L. J. Clancy, “Aerodynamics”, Pitman, 1st Edition, 1986.
2. Alan pope, “Low Speed Wind Tunnel Testing”, John Wiley, 2nd Edition, 1999.
3. N. M. Komerath, “Low Speed Aerodynamics”, Extrovert, 1st Edition, 2012.

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per ‘credit and grading system’ manual and should be added and averaged.
3. Based on above scheme grading and TERM WORK assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC405	Air Breathing Propulsion Lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEPC405	Air Breathing Propulsion Lab	25	40%	-	-	25

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Identify**[1] components and information of piston and gas turbine.
- **CO2** **Visualize**[3] flow phenomenon in supersonic flow.
- **CO3** **Analyze**[4] the behaviour of flow through ducts and jet engine components.

List of Experiments

All the experiments will be based on the course content of **UAEPC402 Air Breathing Propulsion**

Ex.No	Experiment Name
1.	Study of gas turbine engines and its components
2.	Determine the velocity profiles of free jets
3.	Determine Velocity profiles of wall jets.
4.	Nozzle / Diffuser Flow Measurement
5.	Fuel Injection Characterization Test
6.	Performance test of propeller
7.	Performance test of Ramjet Engine
8.	Demonstration of Aircraft engines models/cut section
9.	Preparation of Solid propellant
10.	Determine pressure/velocity distribution using Supersonic free jet apparatus
11.	Study of aircraft piston and its components.

References

1. Rolls Royce "Rolls Royce Jet Engine",; 4th revised edition, 1986
2. Oates, G.C., "Aero thermodynamics of Aircraft Engine Components", AIAA Education Series, New York, 1985.
3. Ltd Mathur, M.L. and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion", Standard Publishers & Distributors, Delhi, 2nd edition 2014

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and TERM WORK assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEPC406	Theory of Machines Lab	-	02	-	-	01	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEPC406	Theory of Machines Lab	25	40%	-	-	25

Course Outcomes: After the successful completion of the course students will able to:

- **CO1** **Analyse**[3] velocity and acceleration in simple mechanisms.
- **CO2** **Evaluate**[2] frictional torque in screw threads and brakes.
- **CO3** **Determine**[1] gear parameters and analyse gear train systems.

List of Experiments

All the experiments will be based on the course content of **Air Breathing Propulsion U11PC405**

Ex.No	Experiment Name
1.	Kinematic analysis of Slider-Crank mechanism – Determination of displacement, velocity and acceleration using graphical method.
2.	Kinematic analysis of Four-Bar mechanism – Velocity and acceleration analysis.
3.	Cam profile generation – Drawing cam profile for different follower motions and verification of displacement diagram.
4.	Determination of gear parameters using gear tooth vernier (module, pressure angle, addendum, dedendum).
5.	Study of Gear Train apparatus – Simple, compound and epicyclic gear trains.
6.	Determination of frictional torque in Screw Jack.
7.	Determination of friction in Journal Bearing.
8.	Determination of braking torque in Band Brake / Shoe Brake.
9.	Static balancing of rotating masses.
10.	Dynamic balancing of rotating masses.
11.	Determination of natural frequency of a spring-mass system.

References

1. G. Bansal, V., N. K. Nandal, "Mechanism of Machines", Oxford University Press, 2015.
2. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
3. Rao, J.S., "Theory of Machines", McGraw Hill Education Pvt. Ltd., 2014.
4. Thomas Bevan, "The Theory of Machines", Pearson Education Ltd., 2010.

Evaluation Scheme

1. TERM WORK assessment shall be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and TERM WORK assessment should be done.

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Course Code	Course Name	Teaching Scheme (Hr/week)			Credits Assigned		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
UAEFP401	Field Project I	-	04	-	-	02	-

Evaluation Scheme

Course Code	Course Name	In Semester Evaluation		Semester End Exam (OE/POE)		Total Marks
		Term work	Min pass	Marks	Min pass	
UAEFP401	Field Project I	25	40%	25	40%	50

Course Description:

The Field Project in Aeronautical Engineering provides students with an opportunity to apply their knowledge and skills in a real-world setting. Working under the guidance of faculty advisors, students will engage in a practical project that addresses a relevant problem or explores a specific application area within Aviation. Through this project, students will gain hands-on experience in project management, problem-solving, data analysis, and model implementation.

Pre-requisites: -Completion of core courses in Aeronautical Engineering.

Course Objectives:

- Apply theoretical knowledge and practical skills acquired in Aeronautical courses to solve real-world problems.
- Gain experience in project planning, execution, and management within the context of Aviation projects.
- Develop proficiency in data collection, preprocessing, analysis, and interpretation.
- Implement and evaluate machine learning models to address specific tasks or challenges.

Communicate project findings effectively through written reports and oral presentations.

Course Outcomes: After the successful completion of the course students will be able to:

- **CO1** **Identify**[2], analyze, and solve real-world problems within their chosen field of study or industry through the application of relevant theories, methodologies, and techniques.
- **CO2** **Develop**[2] research skills such as literature review, data collection, analysis, and interpretation, enabling them to make informed decisions and draw meaningful conclusions in the context of their project
- **CO3** **Apply**[1] technical skills relevant to their field of study or industry,

Course Structure:

1. **Project Proposal:** Students will submit a project proposal outlining the problem statement, objectives, methodology, and expected outcomes of their field project. Proposals will be reviewed and approved by the faculty advisor. Resources for writing effective project proposals will be provided, including sample proposals and guidelines for proposal writing.
2. **Project Implementation:** Students will work on their projects under the guidance of their faculty advisors. This phase involves data collection, preprocessing, model development, experimentation, and evaluation. Regular progress updates and consultations with advisors will be scheduled. Resources for project implementation will include tutorials on data preprocessing, model development, and experimental design, as well as access to relevant datasets and computing resources.
3. **Project Documentation:** Students will prepare a comprehensive report documenting their project, including background, methodology, results, and conclusions. The report should adhere to academic standards and include relevant citations. Guidelines for writing technical reports and templates for structuring project documentation will be provided.
4. **Final Presentation:** Each student group will deliver a final presentation summarizing their project work, key findings, and implications. Presentation's will be followed by Q&A sessions with faculty and peers. Resources for preparing effective presentation's will include tips for public speaking, presentation design, and handling questions from the audience.

Here are detailed instructions for the Field Project

- For this course students will need to form group of 4-5 Members
- Project Selection: identify a project topic that aligns with real word problems
- Follow the timeline and milestones outlined in your project proposal.

Evaluation Scheme:

1. TERM WORK assessment must be based on the overall performance of the student with every assignment graded from time to time.
2. The grades will be converted to marks as per 'credit and grading system' manual and should be added and averaged.
3. Based on above scheme grading and TERM WORK assessment should be done.

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