KUMARAGURU COLLEGE OF TECHNOLOGY,

An Autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049

B.E AERONAUTICAL ENGINEERING

REGULATION 2024

CURRICULUM & SYLLABUS

Semesters I to IV

Department of Aeronautical Engineering

DEPARTMENT VISION

To attain excellence and global reputation in Aeronautical Engineering Education and Research.

DEPARTMENT MISSION

- Provide quality education in Aeronautical Engineering to students to build their career and do quality research and thus contribute to the field of Aviation and Aerospace.
- Prepare students for higher studies in core and inter-disciplinary research to contribute to the advanced technological needs of Aeronautical engineering.
- Encourage faculty to update their knowledge and teaching-learning process through continuous learning.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives of Aeronautical Engineering Undergraduate Program are:

PEO1: To provide in-depth knowledge in aeronautical engineering related fields to students and encourage them to practice in the chosen profession with professional ethics.

PEO2: To enable the graduates to pursue postgraduate degrees and conduct research at leading technological universities to contribute to the advancement in the field of Aviation and Aerospace industries.

PEO3: To continue their professional development by utilizing educational and career building opportunities through their employer, educational institutions, or professional bodies.

PROGRAM OUTCOMES (POs)

Graduates of the Aeronautical Engineering Undergraduate Program should have the ability to:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of the Aeronautical Engineering Undergraduate Program will have the ability to:

PSO1: Apply concepts and principles of Aerodynamics, Aircraft Structures, Aircraft Propulsion, Aerospace Materials, UAV and Avionics, Artificial Intelligence to provide solutions to critical industrial problems, while adhering to industrial standards.

PSO2: Use the software packages in the design, manufacturing, testing and maintenance of aeronautical and aerospace-based components and systems.

KUMARAGURU COLLEGE OF TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

REGULATION 2024

B.E. Aeronautical Engineering - Curriculum

Semester I

S. No.	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST101	Heritage of Tamils	Theory	HS	1	0	0	0	1
2	24MAI111	Linear Algebra and Calculus	Embedded	BS	3	0	2	0	4
3	24PHI106	Engineering Physics	Embedded	BS	3	0	2	0	4
4	24MEI101	Engineering Graphics	Embedded	ES	2	0	2	0	3
5	24EET105	Basics of Electrical and Electronics Engineering	Theory	ES	3	0	0	0	3
6	24ADP001	Basics of Artificial Intelligence	Practical	ES	0	0	2	0	1
7	24INP102	Innovation Practicum – 1	Practical	ES	0	0	2	0	1
8	24HSP111	Holistic Wellness – 1	Practical	HS	0	0	2	0	1
9	24INP101	Design Thinking	Practical	ES	0	0	2	0	1
10	24INO1- -	FCLF – General Stack – 1	Practical	OE	0	0	2	0	1
								Total Credits	**20**
								Total Contact Hours/week	**28**

Semester II

S. No.	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST102	Tamils and Technology	Theory	HS	1	0	0	0	1
2	24HST103 / 24HST104	Effective Communication / Professional Communication	Theory	HS	2	0	0	0	2
3	24MAI121	Advanced Calculus and Laplace Transforms	Embedded	BS	3	0	2	0	4
4	24CYI104	Material Chemistry	Embedded	BS	3	0	2	0	4
5	24MET104	Engineering Mechanics	Theory	ES	3	0	0	0	3
6	24PHT107	Materials Science for Aeronautical Engineering	Theory	ES	3	0	0	0	3
7	24CSI101	Logical thinking and Problem Solving	Embedded	ES	3	0	2	0	4
8	24INP103	Innovation Practicum – 2	Practical	ES	0	0	2	0	1
9	24HSP112	Holistic Wellness – 2	Practical	HS	0	0	2	0	1
10	24INO1- -	FCLF – General Stack – 2	Practical	OE	0	0	2	0	1
								Total Credits	**24**
								Total Contact Hours/week	**30**

KUMARAGURU COLLEGE OF TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

REGULATION 2024

B.E. Aeronautical Engineering - Curriculum

Semester III

S. No.	Course Code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HSP005	Mastering Conversations	Practical	HS	0	0	2	0	1
2	24MAT231	Partial Differential Equations and Transforms Techniques	Theory	BS	3	1	0	0	4
3	24AEI201	Aero Engineering Thermodynamics	Embedded	PC	2	0	2	0	3
4	24AEI202	Engineering Fluid Mechanics and Hydraulics	Embedded	PC	2	0	2	0	3
5	24AET203	Solid Mechanics	Theory	PC	3	0	0	0	3
6	24AET204	Principles of Flight	Theory	PC	3	0	0	0	3
7	24INM201	UHV-II: Understanding Harmony	Theory	HS	1	0	0	0	1
8	24AEP205	CAD Laboratory	Practical	PC	0	0	2	0	1
9	24INP201	Innovation Practicum – 3	Practical	ES	0	0	2	0	1
10	24INO---	FCLF – General Stack – 3	Practical	OE	0	0	2	0	1
11	-	Internship/Mini Project-1	Project	PRJ	0	0	0	2	1
								Total Credits	**22**
								Total Contact Hours/week	**29**

Semester IV

S. No.	Course Code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HSP006	Mastering Group Discussion and Presentation Skills	Practical	HS	0	0	2	0	1
2	24MAI241	Numerical Methods and Probability	Embedded	BS	3	0	2	0	4
3	24AEI206	Aerodynamics I	Embedded	PC	2	0	2	0	3
4	24AEI207	Aircraft Structures I	Embedded	PC	2	0	2	0	3
5	24AEI208	Aircraft Propulsion	Embedded	PC	2	0	2	0	3
6	24AET209	Aircraft Mechanisms and Machine Dynamics	Theory	PC	3	0	0	0	3
7	24AET210	Aircraft Systems and Instruments	Theory	PC	3	0	0	0	3
8	24INM102	Indian knowledge Systems in Science and Engineering	Theory	HS	1	0	0	0	1
9	24INP202	Innovation Practicum – 4	Practical	ES	0	0	2	0	1
10	24INO---	FCLF – Technical Stack – 1	Practical	OE	0	0	2	0	1
11	24INO---	FCLF – Emerging Stack – 1	Practical	OE	0	0	2	0	1
								Total Credits	**24**
								Total Contact Hours/week	**32**

Semester-1

24HST101	தமிழர் மரபு / HERITAGE OF TAMILS (Common to all Departments)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	4, 11, 16			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அம்சங்களை அறிமுகப்படுத்துதல், அதன் தொன்மைக்காலம் முதல் நவீனகாலம் வரையிலான வளர்ச்சியை விளக்கம் செய்யுதல். Introduce students to the foundational aspects of Tamil language and literature, tracing its evolution from ancient to modern times.
2	தமிழகத்தின் செழுமையான கலாச்சார பாரம்பரியத்தை அறிமுகப்படுத்துதல், பாறை ஓவியக் கலையிலிருந்து நவீன சிற்ப கலையின்படி அதன் கலை வெளிப்பாடுகளை ஆராய்தல். Familiarize students with the rich cultural heritage of Tamil Nadu, exploring its artistic expressions from rock art paintings to contemporary sculptures.
3	தமிழகத்தின் நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகளை அறிதல்- தினணக்கோட்பாடுகளை ஆராய்தல்- இந்திய தேசிய இயக்கத்தில் தமிழர்களின் பங்கினை அறிதல். To know the folk arts and heroic ames of Tamilnadu-explore the concept of thinai -to know the role of Tamils in Indian National movement.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தின் அடிப்படை அறிவை மேம்படுத்துதல். மொழி பண்பாட்டில் எவ்வாறு இணைந்துள்ளது என்பதை உணர்தல். Enhance the fundamental knowledge of Tamil language and literature	U
CO2	பழங்கால பாறை ஓவியங்கள், சிற்பம் என கலைகள் நவீன காலம்வரை எவ்வாறு பயணிக்கிறது என்பதை புரிந்துகொள்ளுதல். Understand the heritage, rock art paintings to modern art sculpture	U
CO3	நாட்டுப்புறக் கலைகள் தற்காப்புக் கலைகளாகவும், உடல் ஆரோக்கியத்தை மேம்படுத்தும் விதமாகவும் அமைவதை அறிந்து கலைகள் மீதான ஆர்வத்தை அதிகரிக்கச் செய்தல்- தமிழர்களின் அகத்திணை, புறத்திணை கோட்பாட்டினை புரிந்து கொள்ளுதல். இந்திய பண்பாட்டில் தமிழர்களின் பங்களிப்பை அறிதல். Acquire essential knowledge in the folk and martial arts-understanding the Agam and puram concept- to know the contribution of Tamils in Indian culture.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1							3	2	2		2		
2							3	3	2		2		
3							3	2	2		2		

Course Content

மொழி மற்றும் இலக்கியம் இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தொடக்கம் -பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு. **LANGUAGE AND LITERATURE** Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	**3 Hours**
மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புற தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு. **HERITAGE – ROCK ART PAINTINGS TO MODERN ART SCULPTURES** Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	**3 Hours**
நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள். **FOLK AND MARTIAL ARTS** Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Ciabatta, Valari, Tiger dance - Sports and Games of Tami	**3 Hours**
தமிழர்களின் திணைக்கோட்பாடுகள் தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பொடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் தமிழர்களின் வெற்றி. **THINAI CONCEPTS OF TAMIL** Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	**3 Hours**
இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு. **CONTRIBUTIONS OF TAMIL TO INDIAN NATIONAL MOMENT AND INDIAN CULTURE** Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	**3 Hours**

Theory Hours: 15	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 15

Learning Resources

Reference books:

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Textbook and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL)

Online Educational Resources:

1. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e
2. https://www.youtube.com/watch?v=j6_ddjn_gLc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=2
3. https://docs.google.com/presentation/d/1pf0jbyuDTNdvlcKMnOfoPjbqha7JqdOc/edit#slide=id.p1
4. https://www.youtube.com/watch?v=IKPwEmsmuZc&list=PLMMrJE4pHZmc0iJZIE6lBpFoPK_9Y325e&index=1

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE), Assignments, Quiz, Library Record

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institutions	Internal Expert
Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Suriya Prakash Department of Language

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MAI111	LINEAR ALGEBRA AND CALCULUS (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Understand the matrix theory for diagonalization, transformations, and their applications in engineering.
2	Solve optimization problems using differential calculus.
3	Apply partial differentiation for constrained optimization and numerical evaluation.
4	Use integral calculus, including double and triple integrals, to solve engineering problems.
5	Implement mathematical concepts using MATLAB to solve practical engineering problems.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply eigenvalues for matrix diagonalization and transformations and analyse results using computational tools.	Ap
CO2	Apply differentiation for solving optimization problems and enhance solutions through computational tools.	Ap
CO3	Analyse and solve unconstrained and constrained optimization problems using the Lagrange multiplier method and determine the maxima and minima of functions with two or more variables relevant to engineering application	An
CO4	Apply integral calculus and computational tools to solve engineering problems.	Ap
CO5	Apply double integrals and computational tools for solving engineering problems.	Ap
CO6	Apply triple integrals techniques and computational tools to solve complex problems.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2	2		1	1								
2	1	2		1	1								
3	1	1		1	1								

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
4	1	1		1	1								
5	1	1		1	1								
6	1	1		1	1								

Course Content:

MATRICES Eigenvalues and Eigenvectors of a real matrix - Properties of eigenvalues and eigenvectors - Orthogonal matrices - Orthogonal transformation of a symmetric matrix to diagonal form - Reduction of quadratic form to canonical form by orthogonal transformation. **Practical Component** • Use MATLAB to compute Matrix Operations - Addition, Multiplication, Transpose, Inverse and Rank of a matrix. • Determining Eigenvalues and Eigenvectors of Matrices.	**9 Hours** **6 Hours**
DIFFERENTIAL CALCULUS Representation of Functions – Limit and Continuity – Differentiation – Rolles Theorem and Mean Value Theorem-Maxima and Minima **Practical Component** • Evaluating Limits and Derivatives • Determining Maxima and Minima of a function of one variable.	**9 Hours** **6 Hours**
PARTIAL DIFFERENTIALS Total derivative – Taylor's series expansion – Maxima and minima of functions of two variables – Constrained maxima and minima: Lagrange's multiplier method with single constraints – Jacobians. **Practical Component** • Function Approximations with Taylor Series • Determining Maxima and Minima of a function of two variables.	**9 Hours** **6 Hours**
INTEGRAL CALCULUS Definite and Indefinite integrals - Techniques of Integration: Substitution rule, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction. **Practical Component** • Integration of Rational Functions • Integration of Trigonometric Functions	**9 Hours** **6 Hours**
MULTIPLE INTEGRALS Double integration in Cartesian coordinates – Change of order of integration - Triple integration in Cartesian coordinates – Area as double integral and Volume as triple integral. **Practical Component** • Evaluating double integral with constant and variable limits. • Evaluating triple integral with constant and variable limits.	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2023.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill Publishing Company Limited., New Delhi, 2018.
3. Kreyzig E., "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, 2023.

Reference books

1. Veerarajan T., "Engineering Mathematics (for First Year)", Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2008.
2. Joel R. Hass, Christopher E. Heil, Maurice D. Weir, Przemyslaw Bogacki, George B. Thomas, "Thomas' Calculus", Pearson education 15th Edition, 2024.
3. G.B. Thomas and R.L. Finney, "Calculus and Analytical Geometry", 11th Edition, Pearson Education, 2010.
4. James Stewart, Daniel Clegg, Saleem Watson, "Calculus: Early Transcendentals", Cengage Learning, New Delhi, 9th Edition, 2020.
5. William J. Palm III, "MATLAB for Engineers: Global Edition", McGraw-Hill Education, 5th Edition, 2018.

Online Resources (Web Links)

1. Linear Algebra | Mathematics | MIT Open Courseware https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/
2. Matrix Algebra for Engineers | Coursera https://www.coursera.org/learn/matrix-algebra-engineers
3. Differential Calculus | Khan Academy https://www.khanacademy.org/math/calculus-1
4. Multivariable Calculus | Mathematics | MIT Open Courseware https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
5. Integral Calculus | Khan Academy https://www.khanacademy.org/math/calculus-2
6. Multivariable Calculus | Khan Academy https://www.khanacademy.org/math/multivariable-calculus
7. Brilliant | Learn Interactively https://www.brilliant.org/

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr.Jayakumar Venkatesan,	Dr.T.Govindan, Government College of Engineering, Srirangam, Trichy. Dr.C.Porkodi,	1. Dr. N.Anitha, 2. Ms. S. Sivasakthi, 3. Dr. S.Selvanayaki, Department of Mathematics

Valles Marineras International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore	PSG College of Technology, Coimbatore. Dr.P.Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.		
Recommended by BoS on	16.8.2024		
Academic Council Approval	No: 27	**Date**	24.8.2024

24PHI106	ENGINEERING PHYSICS (Common for AE, AU, ME)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Provide students with a strong understanding of the principles of elasticity, quantum mechanics, and laser technology.
2	Enable students to analyze and apply techniques related to non-destructive testing and surface coatings for various engineering applications.
3	Introduce and assess green energy technologies, guiding students in recommending sustainable solutions for energy use.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the principles of elasticity to solve problems related to stress, strain, and bending of beams.	U
CO 2	Analyse the fundamentals of quantum mechanics to interpret the behaviors of particles at the atomic and subatomic levels	Ap
CO 3	Evaluate the principles of laser operation to assess their applications in various fields such as imaging and holography.	Ap
CO 4	Examine the methods of non-destructive testing to categorize and select appropriate surface coating techniques.	Ap
CO 5	Assess various green energy technologies to recommend efficient solutions for sustainable energy use.	U
CO 6	Apply scientific methods and experiment techniques to enhance understanding of fundamental concepts and their application in various technological fields.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2			1						2		
2	3	2			1								
3	3	2			1								

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
4	3	2		2	1						2		
5	3	2			1						2		
6	3	2			1								

Course Content

PROPERTIES OF MATTER — **9 Hours**

Hooke's Law - Elastic moduli - Relation between elastic constants - Poisson's Ratio – Stress - Strain Diagram and its uses – factors affecting elastic modulus – Bending of beams – Expression for bending moment and depression - Cantilever - Depression of a cantilever - experimental determination of Young's modulus by Non uniform bending – I shape girders.

6 Hours

Practical Component

1. Non-uniform bending – Determination of Young's modulus
2. Compound pendulum – Determination of acceleration due to gravity

QUANTUM PHYSICS — **9 Hours**

Necessity of quantum mechanical picture- Planck's concept (hypothesis) - Wave particle duality - de-Broglie waves - Physical significance of wave function - Schrodinger equation- Time independent and time dependent equation - Particle in a box- Eigen values and Eigen function- Superposition Principle- Quantum mechanical tunnelling through a barrier.

6 Hours

Practical Component

1. Determination of Planck's constant – Electroluminescence method.

LASERS — **9 Hours**

Interaction of light and matter - Quantization of electromagnetic radiation – Absorption, Spontaneous emission and Stimulated emission - Einstein's theory of stimulated emission- Population inversion - Sources of excitation - Active medium -Laser beam output- Nd-YAG laser - CO2 laser - Applications – Laser Imaging and Holography- Laser gyroscopes.

Practical Component — **6 Hours**

1. Semiconductor laser:
   a. Determination of wavelength of laser
   b. Determination acceptance angle and numerical aperture of an optical fiber.
   c. Determination of particle size
2. Spectrometer – Determination of wavelength of mercury source using grating

NDT AND SURFACE COATINGS NDT: — **9 Hours**

Liquid penetrant method – ultrasonic flaw detector: A scan, B scan and C scan – X- ray radiography and fluoroscopy – thermography Surface Coatings: Thin film deposition through - Electro deposition – Spin coating – Electrospinning- Physical Vapour Deposition (PVD)- Industrial Applications - Automotive Industry and aerospace Industry.

Practical Component — **6 Hours**

1. Determination of thermal conductivity of a bad conductor – Lee's Disc method
2. Melde's string – Determination of frequency of a tuning fork
3. Determination of magnetic susceptibility of a solid material – B-H curve apparatus

GREEN ENERGY — **9 Hours**

Introduction to Green energy – Solar energy: Energy conversion by photovoltaic principle – Solar cells – Efficiency measurements – Types (First, Second and Third Generation) of Solar Cells - Wind energy: Basic components and principle of wind energy conversion systems –

Ocean energy: Wave energy – Wave energy conversion devices. Futuristic Energy: Hydrogen – Methane Hydrates – Carbon capture and storage (CCS). **Practical Component** 1. Determination of efficiency of solar cell 2. Determination of band gap of a semiconductor	**6 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**75**

Learning Resources

Textbooks:

1. M N Avadhanulu, P.G. Kshirsagar, and TVS Arun Murthy. A Textbook of Engineering Physics, 11th Edition. S. Chand Publications (2018).
2. R.K. Gaur and S.L. Gupta. Engineering Physics, 10th Edition. Dhanpat Rai Publications (P) Ltd., New Delhi (2016).
3. Arthur Beiser, Shobhit Mahajan, and S. Rai Choudhury. Concepts of Modern Physics, 7th Edition. McGraw Hill Education, New Delhi (2017).
4. V. Rajendran. Applied Physics. Tata McGraw Hill Publishing, New Delhi (2017).

References:

1. Brij Lal and Subrahmanyam. Properties of Matter. S. Chand & Co Ltd., New Delhi (2014).
2. Satya Prakash. Quantum Mechanics. Pragati Prakashan Publishers (2015).
3. K. Thiagarajan and Ajoy Ghatak. Lasers: Fundamentals and Applications. Springer Science & Business Media (2010).
4. Marcel Dekker. Ultrasonics: Fundamentals, Technology, Applications, Second Edition. New York (1988).
5. William Silfvast Hill. Laser Fundamentals. Cambridge University Press (2018).
6. S.O. Pillai. Solid State Physics, Ninth Edition. New Age International Press (2020). Godfrey Boyle. Renewable Energy: Power Sustainable Future, Second Edition. Oxford University Press, UK (2019).
7. Chetan Singh Solanki. Solar Photovoltaics – Fundamentals, Technologies and Applications. PHI Learning Private Limited (2019).

Online Resources (Weblinks)

1. https://www.khanacademy.org/science/physics/forces-newtons-laws/hookes law-and-elasticity
2. https://ocw.mit.edu/courses/1-050-solid-mechanics-fall-2004/
3. https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/
4. https://spie.org/PA/conferencedetails/holography-and-diffractive-optics#_=_
5. https://archive.nptel.ac.in/courses/113/106/113106070/
6. https://onlinecourses.nptel.ac.in/noc24_ge56/preview
7. https://ocw.mit.edu/courses/ec-s07-photovoltaic-solar-energy-systems-fall 2004/

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
-	-	Dr R Sengodan & Dr M Selvambikai Department of Physics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MEI101	ENGINEERING GRAPHICS (Common to AE, AU, CE, FT, ME, MR, TT)	L	T	P	J	C
		2	0	2	0	3
ES		SDG		4, 9, 11		

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the importance of graphics in the design process, including visualization, communication, and documentation.
2	Develop proficiency in constructing various curves, orthographic projections, and using drafting tools.
3	Gain the ability to project and section simple solids and develop lateral surfaces and isometric projections.
4	Learn to use AutoCAD for sketching, editing objects, and creating detailed engineering drawings.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Apply the construction of curves such as ellipses, parabolas, and hyperbolas to accurately visualize and communicate design ideas using drafting tools.	Ap
CO 2	Analyze the projections of points, lines, and planes to determine true lengths and inclinations for effective representation of objects in design.	An
CO 3	Evaluate the projections and sections of solids like prisms, pyramids, cylinders, and cones to create accurate sectional views and true shapes in engineering drawings.	An
CO 4	Create developments of surfaces for simple solids and construct isometric projections to enhance the design process with three-dimensional visualizations.	An
CO 5	Design free-hand sketches of orthographic views using AutoCAD.	Ap
CO 6	Apply AutoCAD commands to demonstrate object selection and editing techniques, enabling precise modifications in engineering drawings.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											**Program Specific Outcomes (PSO)**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2	2			2								
2		2		2						2			
3		2	2				2						
4	2		2		2								
5	2				2					2			
6	2				2					2			

Course Content	
PLANE CURVES, PROJECTION OF POINTS, LINES AND PLANES • Importance of graphics in design process, visualization, communication, documentation and drafting tools, Construction of curves - ellipse, parabola, and hyperbola by eccentricity method only. Orthographic projection of points. • Construction of cycloid — Construction of spirals - Construction of involutes of square and circle. • Drawing of tangents and normal to the above curves. • Projections of straight lines located in first quadrant - determination of true length and true inclinations. • Projections of plane surfaces - polygonal lamina and circular lamina, located in the first quadrant and inclined to one reference plane.	**6 Hours** **6 Hours**
PROJECTION AND SECTION OF SOLIDS • Projection of simple solids - prism, pyramid, cylinder and cone. Drawing views when the axis of the solid is inclined to one reference plane. • Sectioning of simple solids - prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane.	**6 Hours** **6 Hours**
DEVELOPMENT OF SURFACES, ISOMETRIC PROJECTIONS • Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones. • Isometric projection, Isometric scale, Isometric views of simple solids, truncated prisms, pyramids, cylinders and cones.	**6 Hours** **6 Hours**
FREE-HAND SKETCHING AND INTRODUCTION TO AUTOCAD • Free hand sketching techniques, sketching of orthographic views from given pictorial views of objects, including free-hand dimensioning. Free hand sketching of isometric views from orthographic views. • Introduction to Drafting Software (AutoCAD) & its Basic Commands. Introduction to coordinate systems, object selection methods, selection of units and precession. Annotation and dimensions, Object properties.	**6 Hours** **6 Hours**
DRAWING ORGANIZATION AND HOUSE PROJECT AutoCAD - Sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer. Isometric views of simple solid blocks.	**6 Hours** **6 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 60

Learning Resources

Textbooks:

1. Basant Agrawal and CM Agrawal, Engineering Drawing, McGraw-Hill, New Delhi, First Edition, 2008.
2. Venugopal K. and Prabhu Raja V., Engineering Graphics, New Age International (P) Limited, New Delhi, 2008.

References:

1. Nataraajan K.V., Engineering Drawing and Graphics, Dhanalakshmi Publisher, Chennai, 2005.
2. Warren J. Luzadder and Jon. M. Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt. Ltd., New Delhi, Eleventh Edition, 2005.
3. Gopalakirishna K.R., Engineering Drawing (Vol. I & II), Subhas Publications, 2001.
4. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.

Online Resources (Open sources):
1. https://www.khanacademy.org/math/differential-calculus 2. https://nptel.ac.in/courses/106105171 3. https://swayam.gov.in/nd1_noc19_cs42/preview

Assessment (Embedded course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert from Industry	**Expert from Higher Education Institutions**	**Internal Expert**	
Mr. G. Vergin Vino Design Engineer TANCAM, Chennai	Dr. V. Prabhuraja Professor Department of Mechanical Engineering PSG College of Technology, Coimbatore	Dr. K. M Senthil Kumar Associate Professor Department of Mechanical Engineering	
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24EET105	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	J	C
		3	0	0	0	3
ES		SDG	7, 9, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Understand the fundamental laws and concepts to analyse simple DC and AC circuits
2	Illustrate the components of electrical installations, including LT switchgear, wiring, earthing, and batteries.
3	Understand the construction, working principles, and applications of electrical machines and their application in aircraft systems
4	Familiarize the students with the construction, operation, and applications of semiconductor devices
5	Understand and design the fundamental digital logic concepts, including logic gates, adder and flip-flops.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse the fundamentals principles of DC and AC circuits	An
CO 2	Apply various protective devices and Energy storage systems for various applications with a focus on energy efficiency and safety	Ap
CO 3	Analyse the construction and working of DC motor, transformer, and induction motors and choose the motor for aircraft applications.	Ap
CO 4	Illustrate the working of semiconductor devices and understand their applications in aircraft systems.	Ap
CO 5	Apply the fundamentals of Boolean logic to design digital logic circuits.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	1											
2	3					1							
3	2											1	
4		1										1	
5	2	2										1	

Course Content	
DC AND AC CIRCUITS Basic circuit elements and sources, Ohms law, Kirchhoff's laws, Series and parallel connection of circuit elements, Power, Work, Energy, Capacitance, Energy stored in a capacitor, DC circuits in Aircraft systems. Alternating voltages and current, Sinusoidal waveform, Cycle and frequency, RMS value, Alternating current through Resistance, Inductance and Capacitance, Power factor, Active and Reactive power, AC circuits in Aircraft systems.	**9 Hours**
ELECTRICAL INSTALLATIONS Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Aircraft storage Batteries - Important Characteristics for Batteries - Elementary calculations for energy consumption, power factor improvement.	**9 Hours**
ELECTRICAL MACHINES (Qualitative Treatment Only) Construction and working Principle of DC Motors, PMDC motors, Single phase Transformers, Alternators and single-phase induction motors, PM Stepper motor, Applications of Electrical machines in Aircraft systems.	**9 Hours**
SEMICONDUCTOR CIRCUITS Construction and working Principle of PN junction diode, Zener Diode, Half wave and Full wave rectifiers, BJT, CE and CB Configurations, MOSFET, Operational amplifiers, A/D and D/A converters.	**9 Hours**
DIGITAL CIRCUITS Logic Gates - Boolean algebra - Half and Full Adders, subtractors - Multiplexer - Demultiplexer - Encoders - Decoders - Flip flops - Introduction to Microprocessors and Microcontrollers**.**	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks

1. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj - Basic Electrical and Electronics Engineering, 3rd Edition, McGraw Hill Education, 2021
2. S.L. Uppal, G.C. Garg - Electrical Wiring, Estimating and Costing, 6th Edition, Khanna Publishers, 2022

Reference books

1. Mike Tooley and David Wyatt, 'Aircraft Electrical and Electronic Systems Principles, Operation and Maintenance', Elsevier, 2018
2. P.S. Bimbhra - Electrical Machinery, 8th Edition, Khanna Publishers, 2023
3. V.K. Mehta, Rohit Mehta - Principles of Electrical Engineering, 2nd Edition, S. Chand Publishing, 2022
4. B.L. Theraja, A.K. Theraja - A Textbook of Electrical Technology - Vol. 2: AC & DC Machines, 25th Edition, S. Chand Publishing, 2023
5. Adel S. Sedra, Kenneth C. Smith - Microelectronic Circuits, 8th Edition, Oxford University Press, 2023

Online Resources (Web Links)

1. https://www.coursera.org/learn/electronics
2. https://archive.nptel.ac.in/courses/108/105/108105053/

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert from Industry	**Expert from Higher Education Institution**	**Internal Expert(s)**	
Dr. T. Viswanathan Bosch Global Software Technologies, Coimbatore	Dr. Sundaram M Associate Professor/EEE PSG College of Technology, Coimbatore	Dr. N.Prakash Assistant Professor -III Department of EEE Dr.S.Senthil Kumar Assistant Professor -I Department of Aeronautical Engineering	
Recommended by BoS on	14.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24ADP001	BASICS OF ARTIFICIAL INTELLIGENCE (Common to all Departments except CS, IT, AD)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	8, 9, 16			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Introduce students to the fundamentals of Artificial Intelligence (AI) and Generative AI, and its key concepts
2	Enable students to explore and experiment with common generative AI models and tools for generating text, images, audio, video, and code
3	Equip students with the techniques and best practices for crafting effective prompts for AI models

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand the fundamentals of AI and generative AI, including its potential impact, issues, limitations, and ethical concerns and its practical use cases in real-world scenarios.	U
CO 2	Explore common generative AI models and tools for text, code, image, audio, and video generation.	E
CO 3	Apply common prompt engineering techniques and approaches for writing effective prompts.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1 Engineering Knowledge	2 Problem Analysis	3 Design/Development of Solutions	4 Conduct Investigations of Complex Problems	5 Engineering Tool Usage	6 The Engineer and The World	7 Ethics	8 Individual and Collaborative Team work	9 Communication	10 Project Management and Finance	11 Life-Long Learning	PSO-1	PSO-2
1	2						2						
2	2		2										
3					2					2			

Course Content

INTRODUCTION TO ARTIFICIAL INTELLIGENCE (AI) **PRACTICAL COMPONENT** Introduction to Artificial Intelligence (AI) - Generative AI Overview and Use Cases - Impact and Examples of AI - Application Domains for AI - Generative AI Applications. AI Concepts, Terminology - Cognitive Computing (Perception, Learning, Reasoning) - Terminology and Related Concepts of AI- Machine Learning Techniques and Training - Deep Learning - Neural Networks - Natural Language Processing, Speech, Computer	**8 Hours**

Vision - Self Driving Cars. AI: Issues, Concerns and Ethical Considerations - AI Ethics, Regulations, Governance, and ESG. The evolution and future of AI - The AI Ladder - The Journey for Adopting AI Successfully - Hotbeds of AI Innovation.	
GENERATIVE AI: INTRODUCTION AND APPLICATIONS **PRACTICAL COMPONENT** Introduction and Capabilities of Generative AI - Applications of Generative AI - Tools for Text Generation - Tools for Image Generation - Tools for Audio and Video Generation - Tools for Code Generation	**6 Hours**
GENERATIVE AI: PROMPT ENGINEERING BASICS **PRACTICAL COMPONENT** Introduction to Prompt and Prompt Engineering - Best Practices for Prompt Creation - Common Prompt Engineering Tools - Hands on Lab: Getting to Know Our AI Prompting - Experimenting with Prompts - Naive Prompting and Persona Pattern. Prompt Engineering Techniques and Approaches - Text-to-Text Prompt Techniques - Interview Pattern Approach - Chain-of-Thought Approach - Tree-of-Thought Approach - Future of Human-Crafted Prompts - Text-to-Image Prompt Techniques - Hands-on Lab: Effective Text Prompts for Image Generation.	**7 Hours**
PROJECT AND WRAP UP **PRACTICAL COMPONENT** Graded Quiz Final Project: Generating Text, Images, and Code.	**9 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**30**

Learning Resources

Textbooks:

1. George F. Luger "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" (6th Edition), Pearson, 2021.
2. Anna Jordan, Robert S. Menzies, Kristine P. Schwab, "AI-Powered Creativity: Generative AI and the Future of Content Creation" Routledge, 2023.

References:

1. https://platform.openai.com/docs/overview
2. https://towardsdatascience.com/
3. https://gemini.google.com/

Online Resource (Weblinks)

1. Introduction to Artificial Intelligence (AI) | Coursera
2. Generative AI: Introduction and Applications | Coursera
3. Generative AI: Prompt Engineering Basics | Coursera

Assessment (Practical course)

MCQ, Mini project and viva-voce

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
-	-	Dr. S. Sangeetha, Associate Professor Department of AI&DS

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24INP102	INNOVATION PRACTICUM – 1 (Common to all Departments)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Analyse the effectiveness of systems thinking and problem-solving methodologies in applying data-driven insights for innovative solution design.
2	Evaluate the impact of transdisciplinary collaboration on creating functional hardware prototypes through fabrication techniques.
3	Understand the future trends and implications of technology in developing innovative products.

Course Outcomes:

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Recall the fundamental principles of custom hardware design.	R
CO2	Understand the appropriate tools and their applications for solving hardware-related problems.	U
CO3	Apply systems engineering concepts to real-world hardware design challenges.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2		1										
2	2				1								
3		2	2	1									

Course Content

ENGINEERING FUNDAMENTALS AND INNOVATION — **3 Hours**

Why engineering? The concept of street fight engineering - Real-world design process and problem-solving methodology - Data-driven insights and concept generation - Case studies of successful engineering innovations.

TRANSDISCIPLINARY SYSTEMS AND MANU'FUTURING Transdisciplinary systems to accelerate innovation - Manu'Futuring: Technology in hardware manufacturing and manufacturing of hardware technologies - Future scopes with product case studies.	**6 Hours**
BUILDING CUSTOM HARDWARE How to build a basic custom hardware - Electronics fundamentals and components - Software for hardware control - Fabrication techniques.	**6 Hours**
SYSTEM THINKING AND ENGINEERING Introduction to system thinking - Real world as a system - Concept of system engineering and its application – iLenSys.	**7 Hours**
CREATIVITY TIME AND TECH TEARDOWN Creativity exercise: Apply system thinking to a real-world problem - Tech teardown: Analyse a product or system to understand its engineering principles - Presentation: Present your creative project and tech teardown with an engaging title	**8 Hours**

Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:
0	0	30	0	30

Learning Resources

Textbooks:

1. Sanjoy Mahajan - Street Fighting Mathematics
2. Donald Knuth - The Art of Computer Programming
3. Think like a programmer: An introduction to creative problem solving
4. Thinking in Systems: A Primer

References:

1. Learning to code: How to think like a programmer
2. How to find innovative ideas: Ramesh Raskar's note
3. Case study: How Tesla changed the auto industry
4. Ultimate Guide: How to develop a new electronic hardware product

Online Resources (Weblinks)

1. https://www.ifixit.com/Teardown?srsltid=AfmBOorwzDG9RhJoL3L5tlZ_Dr4sVcey-vPC-pkKTj2E0mWJWtFYlikY
2. https://www.symmetryelectronics.com/technology-teardowns/

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert from Industry	Expert from Higher Education Institutions	Internal Expert
Dr. Mahesh Veezhinathan Director - Innovation Practicum Associate VP - Forge. Innovation	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSP111	HOLISTIC WELLNESS-1 (Common to all Departments)	L	T	P	J	C
		0	0	2	0	1
HS		SDG	2, 3			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce first-year students to the foundational concepts of holistic wellness, emphasizing the integration of physical, mental, emotional, and Internal well-being.
2	Create a balanced lifestyle that promotes overall health and happiness through practical activities.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand the basic principles of holistic wellness.	U
CO 2	Apply strategies for maintaining physical health, including nutrition and exercise	Ap
CO 3	Practice mindfulness techniques to enhance mental and emotional well-being.	Ap
CO 4	Develop a personal wellness plan incorporating various aspects of holistic health.	C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1						2		1					
2						2							
3						1					3		
4						2					3		

Course Content

INTRODUCTION TO HOLISTIC WELLNESS: • Overview of holistic wellness: physical, mental, emotional, and internal health. • The importance of balance in overall well-being. • Hands-on activity: Self-assessment of current wellness status.	**4 Hour**
PHYSICAL WELLNESS: • Importance of physical activity and exercise.	**14 Hours**

• Understanding nutrition and its role in health. • Sleep hygiene and its impact on well-being. • Hands-on activity: Designing a personalized fitness and nutrition plan.	
MENTAL AND EMOTIONAL WELLNESS: • Stress management techniques. • The role of Yoga, mindfulness and meditation in mental health. • Emotional intelligence and its impact on relationships. • Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises.	**6 Hours**
INTERNAL WELLNESS: • Exploring the concept of Internal wellness. • The role of purpose and meaning in life. • Introduction to meditation and reflective practices. • Hands-on activity: Developing a personal reflection, Yoga and meditation routine.	**4 Hours**
INTEGRATING WELLNESS PRACTICES: • Combining physical, mental, emotional, and Internal wellness practices into daily life. • Developing a balanced wellness plan. • Hands-on activity: Creating a comprehensive personal wellness plan.	**2 Hours**

Theory Hours:	0	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	30

Learning Resources

Textbooks:

1. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
2. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).

References:

1. B.K.S Iyengar., Yoga: The Path to Holistic Health., Dorling Kindersley Limited, City of Publication (2001)
2. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
3. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
4. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
5. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart ., WS Press, Newtown, PA (2023)

Online Resources (Weblinks)

1. Learning Suryanamskar
2. Yoga for well-being
3. Nutritional Educational contents
4. Introduction to Psychology
5. Guided Meditation
6. Simplified physical exercises instructions
7. Simplified Physical Exercises
8. Life skills and value education
9. James Allen Library

Assessment (Practical course)
Participation, Practical activities and assignments, personal wellness plan and reflection.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
-	-	Dr. Ezhilarasi Principal- KCT	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24INP101	DESIGN THINKING (Common to all Departments)	L	T	P	J	C
		0	0	2	0	1
ES		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Introduces first-year engineering students to Design Thinking, focusing on practical, user-centered problem-solving techniques
2	Empathize with users, generate ideas, and create models to test and refine their solutions
3	Understand iteration, empathy, and critical reflection to cultivate a creative mindset

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply problem-solving techniques and the Design Thinking process to engineering problems using simple models	Ap
CO 2	Understand user needs through various empathy techniques and develop/refine models iteratively based on user insights.	U
CO 3	Reflect critically on their learning journeys and the emotional demands of problem-solving. Collaborate effectively in teams to develop innovative solutions	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	1		2			2		2			1		
2	1							2			1		
3	1		2			2		1			1		

Course Content

INTRODUCTION TO PROBLEM SOLVING AND GROUND RULES Introduction to problem-solving strategies without mentioning Design Thinking-Emphasize problem-solving attitudes, mindsets, and behaviours necessary for iterative problem solving (e.g., openness to failure, patience, empathy)-Set ground rules for the course, including incentives for creative risk-taking and penalties for non-participation or lack of reflection-Overview of the Design Thinking process and its importance.	**6 Hours**

EMPATHY AND PROBLEM DEFINITION Techniques for understanding user needs, including observation, interviews, **surveys** and **focus groups**-Importance of secondary research as a complement for the above-mentioned methods-Introduction to empathy cycles: involve students in two empathy cycles before and after problem definition-Finetuning problem definition based on user insights.	**6 Hours**
IDEATION AND CONCEPT MODELLING Brainstorming ideas and selecting feasible solution-Creating concept modelling to visualize ideas-Include an empathy cycle after students propose solutions, allowing them to revisit and reshape their solutions based on further insights from users.	**6 Hours**
PROTOTYPING AND TESTING WITH MODELS Building basic prototypes using simple materials (e.g., cardboard, clay)- Introduction to different prototyping methods (e.g., **low-fidelity** vs **high-fidelity models**) for different contexts: product design, space design, policy, and digital/e-commerce solutions-Conduct an empathy cycle after the prototype is developed to gather user feedback and refine the prototype.	**6 Hours**
ITERATION AND FINAL MODELLING PROJECT Students refine their prototypes based on feedback from the empathy cycle-Finalize prototypes for presentation based on consistent feedback loops.	**6 Hours**
PRESENTATION, REFLECTION, AND LEARNING SUMMARIES Students present their final projects and reflect on their learning journeys, including how their understanding of problem-solving and empathy evolved during the course-**Learning Summary Activity:** Each student presents their individual journey and learning outcomes from the empathy cycles and iterations-Peer review and group discussions.	**6 Hours**

Theory Hours:	**0**	**Tutorial Hours:**	**0**	**Practical Hours:**	**30**	**Project Hours:**	**0**	**Total Hours:**	**30**

Learning Resources

Textbooks:

1. Handbook of Design Thinking, Christian Muller – Roterberg, Kindly Direct Publishing
2. The Art of Innovation, Tom Kalley
3. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company.

Online Resources (Weblinks)

1. Survey and focus group design guides
2. Guidance on Designing, Administering and Analyzing Focus Groups and Interviews
3. Empathy mapping tools
4. How to Make a Concept Model
5. Brainstorming Techniques: 15 Creative Activities
6. 10 Brainstorming Techniques for Developing New Ideas
7. Brainstorming templates
8. 5 Common Low-Fidelity Prototypes and Their Best Practices
9. UX Prototypes: Low Fidelity vs. High Fidelity
10. Low-fidelity vs. High-fidelity Design Prototypes (and when to use which)

Case study 1: Iterative Design and Prototype Testing of the NN/g Homepage

Case study 2: Using iterative design to optimise the user flow of a product

11. Reflective practice toolkit

Assessment
Formative: Assignments, Mini project

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**	
-	-	Dr. Padhmanand Sudhagar R Department of Bio-Tech Dr. Arul H Department of Physics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

Semester-2

24HST102	தமிழரும் தொழில்நுட்பமும்/ TAMILS AND TECHNOLOGY	L	T	P	J	C
		1	0	0	0	1
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தை அறிமுகப்படுத்துதல், சங்க கால கட்டிட தொழில்நுட்பத்தை விளக்குதல், கோயில்கள் மற்றும் சிற்பக்கலைகளை ஆராய்தல். Introducing weaving and pottery technology of Tamils -Explaining the building technology of the Sangam Period-Explore temples and sculptures.
2	கப்பல், இரும்பு, நாணயங்கள், மணி உருவாக்கும் தொழிற்சாலைகள், ஆகியவற்றை விளக்கம் செய்தல், தமிழகத்தின் தொல்லியல் சான்றுகளின் பழமையை உணர்த்துதல். Explain Ship, Iron, Coins, Beads Making Factories. Realizing the Antiquity of Archaeological Evidence of Tamil Nadu
3	வேளாண்மை மற்றும் அறிவியல் தமிழைப் பற்றி அறிதல், இணையத்தில் தமிழின் தேவையை உணர்த்துதல்,தமிழ் மென்பொருள்களை அறிமுகம் செய்தல். Knowledge of Agricultural and Scientific Tamil, Realizing the need for Tamil on the Internet, Introducing Tamil software.

Course Outcomes:

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	தமிழர்களின் நெசவு மற்றும் பானைத் தொழில்நுட்பத்தின் முக்கியத்துவத்தினை அறிந்து கொள்ளுதல். சங்ககால தமிழர் வளர்த்த அழகுக் கலைகளைத் தெரிந்து கொள்ளுதல். Know the importance of weaving and pottery technology of Tamils-To know the Aesthetics arts developed by Sangam Tamils	U
CO 2	கப்பல் கட்டும் கலை, இரும்புத் தொழிற்சாலை, நாணயங்கள் அச்சடித்தல், மணி உருவாக்கும் தொழிற்சாலைகள், சிலப்பதிகாரத்தில் உள்ள மணிகளின் வகையை அறிதல். Knowledge of ship building, ironworks, coinage, minting, and beads making factories,Knowing the types of beads in Silapathikaram.	U
CO 3	வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தை அறிந்து கொள்ளல். அறிவியல் தமிழ் மற்றும் கணினித் தமிழைப் புரிந்து கொள்ளுதல்.	Ap

	Know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil.	

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2		2				3	2	2		2		
2	2		2				3	2	2		2		
3	2		2				3	2	2		2		

Course Content	
நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள். Weaving Industry during Sangam Age - Ceramic technology - Black and Red Ware Potteries (BRW)-Graffiti on Potteries.	**3 Hours**
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் ரூ சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் -சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை. Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	**3 Hours**
உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள்- நாணயங்கள் அச்சடித்தல் - மணி	

உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள். Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel-Copper and gold- Coins as source of history - Minting of Coins - Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidence - Gem stone types described in Silappathikaram.	**3 Hours**
வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம்- கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்- வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம். Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries - Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	**3 Hours**
அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள்- சொற்குவைத் திட்டம். Development of Scientific Tamil - Tamil computing- Digitalization of Tamil Books- Development of Tamil Software - Tamil Virtual Academy - Tamil Digital Library - Online Tamil Dictionaries - Sorkuvai Project.	**3 Hours**

Theory Hours: 15	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 15

Reference books

1. தமிழக வரலாறு மக்களும் பண்பாடும் கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL- (in print)
6. Social Life of the Tamils the Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

8. The Contributions of the Tarnils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Textbook and Educational Services Corporation> Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation> Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) - Reference Book.

Online Resources

1. https://www.youtube.com/watch?v=Gp1ratX2sOE&list=PLtyn2o7hocf40PtPibRqJTf_dQL3eOtLl
2. https://www.youtube.com/watch?v=jteRvnNiD6w

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
-	-	-	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HST103	EFFECTIVE COMMUNICATION	L	T	P	J	C
		2	0	0	0	2
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to

1	Enhance students' abilities to communicate ideas effectively, both orally and in writing, by developing skills in organizing thoughts clearly and logically and expressing them through well-structured paragraphs and concise summaries.
2	Enable students to critically evaluate and synthesize information from multiple sources and utilize suitable writing techniques and formats to produce professional-quality content tailored to various contexts.
3	Foster active listening, critical reading, and reflective thinking, empowering students to create engaging, relevant, and informative content by applying effective communication strategies across diverse platforms.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Demonstrate proficiency in delivering ideas effectively, both in speaking and writing, with a deeper understanding of the content and the ability to convey complex ideas through well-structured paragraphs and summaries.	Ap
CO2	Create and present original content by evaluating information from multiple sources and employing appropriate formats and writing strategies across various professional contexts.	C
CO3	Produce engaging and informative content through active listening, reading, reflection, and effective communication skills.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1							2	2	3		3		
2							2	2	3		3		
3							2	2	3		3		

Course Content	
TEXT ANALYSIS Composition of Coherent Paragraphs (Expository, Descriptive, Narrative, Evaluative) - Loud Reading (Reading Extracts will be given were students identify the main idea of paragraphs or sections and debrief)	**6 Hours**
VISUAL & WRITTEN ANALYSIS Process writing (Drafting effective introduction, process and conclusion using appropriate transition words and phrases) - Describing Visuals (Line graph, Bar Chart, Flow Chart, Pie Chart, Table, Tree diagram) - Note Making & Summarizing	**6 Hours**
PROFESSIONAL CORRESPONDENCE Crafting Professional Emails - Writing Instruction for Manuals – Reading technical documents (Reading extracts will be given to construct sentences from the new words found in the document)	**6 Hours**
RESEARCH AND DOCUMENTATION Library Reading (Identify at least three sources and extract information, Summarize the main ideas and key findings from each source, compile them findings into a brief report that includes the main points, sources, and relevance to the topic)- Report Writing (Title Page, Abstract, Introduction, Methodology, Results, Discussion, Conclusion and recommendation)	**6 Hours**
TALK ANALYSIS AND PODCAST SKILLS Listening to and analyzing TED talks – Preparing Podcast-PRISM (Professional Rhetoric Improvement and Speech Mastery) to share facts, opinions and experiences - Writing Reviews on products.	**6 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 30

Learning Resources

References:

1. Swamy, V. R. Narayana. Strengthen Your Writing. Orient Longman, 2003.
2. Sasikumar, V., and P. V. Dhamija. Spoken English: A Self-Learning Guide to Conversation Practice. Tata McGraw Hill, New Delhi (1993).
3. Maison, Margaret M. Examine Your English. Orient Longman, 1999.
4. Rizwi, Ashraf. Effective Technical Communication. Tata McGraw Hill, 2005.
5. Pickett, Nell Ann, and Ann A. Laster. Technical English: Writing, Reading, and Speaking.
6. Harpercollins College Div, 1993.

Online Resources (Weblinks)

1. https://owl.purdue.edu/owl/general_writing/academic_writing/paragraphs_and_paragraphing/index.html
2. https://learnenglish.britishcouncil.org/skills/writing/upper-intermediate b2/describing-trends
3. https://hbr.org/2016/07/how-to-write-email-with-military-precision
4. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/reports and_memos/index.html

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Dr. Arokia Lawrence Vijay Dr. Sreejana Dr. Tissaa Department of English	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

24HST104	PROFESSIONAL COMMUNICATION (Common to all Departments)	L	T	P	J	C
		2	0	0	0	2
HS		SDG	4, 8			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to

1	Develop students' abilities to craft clear, concise, and well-structured technical content and professional communications
2	Enhance students' communication skills in team settings
3	Equip students with cross-cultural communication skills and effective listening techniques

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Demonstrate proficiency in crafting clear, concise, and well-structured technical content and professional communications, including emails that meet industry standards.	Ap
CO2	Communicate effectively in team settings, showcasing collaboration, conflict resolution, and leadership skills, while employing creative writing techniques to convey complex ideas.	An
CO3	Apply principles of cross-cultural communication and effective listening techniques to engage successfully in diverse, globalized professional environments.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1						2	1	3	1		3		
2						2	3	3	2		3		
3						1	1	3	1		3		

Course Content

MASTERING PROFESSIONAL COMMUNICATION Industry-specific terminology (Business / Technical Register) - Crafting professional emails - Essential elements of an effective email (subject line, salutation, body, closing) - reading and responding to email communication – Networking Emails - Analyzing and interpreting technical texts (Loud Reading).	**6 Hours**

NAVIGATING DIGITAL MEDIA Introduction to Digital media and online communication tools (instant messaging, video conferencing, social media, blogs, forums) - Listening and analyzing advanced audio materials - Creative & Blog Writing (General & Technical).	**6 Hours**
TECHNICAL WRITING TECHNIQUES Writing Reflective Essays / Experience Sharing, Process writing, Transcoding graphics (interpreting technical texts), Writing Reviews (Research Articles & Books).	**6 Hours**
BUILDING A PROFESSIONAL DIGITAL PRESENCE Creating Digital Profile - Overview of different digital platforms (LinkedIn, GitHub, personal websites) - Setting Up a LinkedIn Profile – Crafting a Video Resume – Digital Etiquette and Professionalism - Cross-cultural communication and diversity awareness.	**6 Hours**
SOCIAL RESPONSIBILITY IN PRACTICE Environmental and social responsibilities - Case studies and real-world applications - Project Work - Writing Project reports.	**6 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 30

Learning Resources

Reference books

1. Baker, W., & Ishikawa, T. Transcultural Communication Through Global Englishes: An Advanced Textbook for Students. Routledge, 2021.
2. Bodnar, O., Fedak, S., Hinsirovska, I., Denysiuk, N., Perenchuk, O., Plavutska, I., ... & Shchur, N. English for Study and Work: A Coursebook In-class Activities. 2017.
3. Doff, A., Thaine, C., Puchta, H., Stranks, J., & Lewis-Jones, P. Cambridge English Empower Advanced Student's Book. Cambridge University Press, 2016.
4. Hewings, M., Thaine, C., & McCarthy, M. Cambridge Academic English C1 Advanced Student's Book: An Integrated Skills Course for EAP. Cambridge University Press, 2012.
5. Beer, D. F., & McMurrey, D. A. A Guide to Writing as an Engineer. John Wiley & Sons, 2019.

Online Resources (Web Links)

1. https://hbr.org/2016/07/how-to-write-email-with-military-precision
2. https://ocw.mit.edu/courses/comparative-media-studies-writing/21w-732-scientific-and-technical-communication-spring-2015/
3. https://www.coursera.org/learn/digital-media
4. https://owl.purdue.edu/owl/subject_specific_writing/professional_technical_writing/reports_and_memos/index.html

Assessment (Theory course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University, Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Dr. Arokia Lawrence Vijay Dr. Hema Department of English

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24MAI121	ADVANCED CALCULUS AND LAPLACE TRANSFORMS (Common to AE, AU, ME, MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9			

Pre-requisite courses	24MAI111/ Linear Algebra and Calculus	Data Book / Codes books (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Utilize gradient, divergence, and curl, along with Green's, Stokes', and Gauss' theorems to solve complex vector calculus problems.
2	Focus on first order and higher-order linear ordinary differential equations, including Bernoulli's and Leibniz's equations, relevant to engineering contexts.
3	Use Laplace transforms to solve linear ordinary differential equations of second order and understand the behavior of simple and periodic functions.
4	Explore Cauchy-Riemann equations for analytic functions and construct these functions using the Milne-Thomson method
5	Employ the residue theorem to determine complex integrals and resolve real definite integrals effectively.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply gradient, divergence, and curl to solve vector calculus problems using Green's, Stokes', and Gauss' theorems.	Ap
CO 2	Analyse first-order linear ordinary differential equations like Leibnitz's and Bernoulli's equations and higher-order linear homogeneous ordinary differential equations in engineering applications.	An
CO 3	Apply the properties of Laplace transforms to solve simple and periodic functions	Ap
CO 4	Apply Laplace transforms to solve linear ordinary differential equations of second order.	Ap
CO 5	Analyse analytic functions using Cauchy-Riemann equations and construct analytic functions using Milne-Thomson method.	An
CO 6	Determine complex integrals and apply the residue theorem to solve real definite integrals.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
ourse Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2			2								

2	2	3	1		1								
3	2	2			2								
4	2	2		1	2								
5	3	2		2	2								
6	3	2			2								

Course Content

VECTOR CALCULUS Gradient, divergence, and curl, Line integrals, Green's theorem –Stoke's theorem – Gauss divergence theorem (without proofs) **Practical Component** • Evaluating gradient, divergence and curl. • Evaluating line integrals and work done. • Verifying Green's theorem in the plane.	**9 Hours** **9 Hours**
ORDINARY DIFFERENTIAL EQUATIONS Leibnitz's equation – Bernoulli's equation – Linear equations of higher order with constant coefficients – Euler's and Legendre's linear equations – Method of variation of parameters. **Practical Component** • Solving of second and higher order ordinary differential equations.	**9 Hours** **3 Hours**
LAPLACE TRANSFORMS Definition - Properties: Superposition, Shift in t or Time Delay, Shift in s, Time Derivatives, Time Integral – Initial Value Theorem – Final Value Theorem - Transform of periodic functions - Inverse transforms – Convolution theorem – Solution of linear ordinary differential equations of second order with constant coefficients. **Practical Component** • Evaluating Laplace transforms and inverse Laplace transforms of functions. • Applying the technique of Laplace transform to solve differential equations.	**9 Hours** **6 Hours**
ANALYTIC FUNCTIONS Functions of a complex variable – Analytic functions – Necessary and sufficient conditions in Cartesian coordinates, Cauchy – Riemann equations (excluding proofs) – Properties of analytic function – Construction of analytic function by Milne Thomson method **Practical Component** • Verifying the analyticity of a function. • Construction of analytic functions by Milne Thomson method.	**9 Hours** **6 Hours**
COMPLEX INTEGRATION Cauchy's integral theorem – Cauchy's integral formula –Taylor's and Laurent's series – Singularities and zeros –Residues –Residue theorem –Application of residue theorem for evaluation of real definite integrals. **Practical Component** • Verification of Cauchy's integral formula and integral theorem. • Evaluation of real definite integrals using Complex integration.	**9 Hours** **6 Hours**

Theory	Tutorial	Practical	Project	Total
Hours: 45	Hours: 0	Hours: 30	Hours: 0	Hours: 75

Learning Resources

Textbooks

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2020.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 11th Reprint, 2018.
3. Kreyzig E., "Advanced Engineering Mathematics" International students' version, 10th Edition, John Wiley and sons, 2023.

Reference books

1. Veerarajan T., "Engineering Mathematics (for First Year)", Tata McGraw Hill Pub. Co. Ltd., New Delhi, Revised Edition, 2008.
2. Weir, MD, Hass J, Giordano FR, "Thomas' Calculus", Pearson education 15th Edition, 2022.
3. G.B. Thomas and R.L. Finney, "Calculus and Analytical Geometry", 11th Edition, Pearson Education, 2006.
4. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 9th Edition, New Delhi, 2020.

Online Resources (Weblinks)

1. **Multivariable Calculus by MIT OpenCourseWare (Free)**
   https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/
2. **Khan Academy: Multivariable Calculus (Free)**
   https://www.khanacademy.org/math/multivariable-calculus
3. **Coursera: Introduction to MATLAB Programming by Vanderbilt University**
   https://www.coursera.org/learn/matlab

Assessment

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore. Mr. Jayakumar Venkatesan, Valles Marineris International Private Limited- Chennai. Mr. Imran Khan, GE Transportation Company, Bangalore.	Dr. T. Govindan, Government College of Engineering, Srirangam, Trichy. Dr. C. Porkodi, PSG College of Technology, Coimbatore. Dr. P. Paramanathan, Amrita Vishwa Vidyapeetham, Coimbatore.	Dr. S.MeenaPriyadarshini Dr.K.Maheswari Ms. A.Shamugavadivu Department of Mathematics

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24CYI104	MATERIAL CHEMISTRY (Common to AE, AU, ME)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	7, 9, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Understand the fundamental principles of nano chemistry and its applications in aerospace and automotive industries, focusing on size-dependent properties of nanomaterials.
2	Explore alloys, phase diagrams, and materials processing techniques used in high-performance automotive and aerospace components.
3	Analyze electrochemical principles and corrosion mechanisms with an emphasis on prevention strategies for engineering systems.
4	Investigate advanced engineering materials such as composites, smart materials, and high-performance lubricants used in various mechanical systems.
5	Study sustainable fuels, emission control technologies, and environmental impact assessment for aerospace and automotive applications.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply fundamental nano chemistry concepts to distinguish between nanoparticles, molecules, and bulk materials.	Ap
CO 2	Analyze various synthesis methods, such as sol-gel and laser ablation, to identify their applications in nanomaterial production.	An
CO 3	Apply the properties of carbon nanotubes and graphene to demonstrate their significance in aerospace and automotive applications.	Ap
CO 4	Analyze phase diagrams to interpret key reactions in advanced alloy systems used in engineering.	Ap
CO 5	Analyze different corrosion prevention techniques to determine the most effective methods for material protection in aerospace and automotive systems.	An
CO 6	Evaluate new material combinations using 3D printing technologies for customized mechanical parts and aerospace components.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2			2		2				2		

2	3	2	2										
3	3			2			2						
4	3		2						2				
5							2			2	2		
6	2			3	1	1	2	2		2	1		

Course Content

NANO CHEMISTRY Introduction to nano chemistry - Distinction between molecules, nanoparticles, and bulk materials - Size-dependent properties of nanomaterials. Synthesis methods: Sol-gel, solvothermal - chemical vapor deposition - laser ablation. Carbon nanotubes and Graphene: Applications in lightweight aerospace structures - automotive body panels - high-strength mechanical components. Nanowires and Nanocomposites: Applications in sensors for engine diagnostics, reinforced aircraft panels, and wear-resistant automotive coatings. **Practical Component:** • Preparation of Standard solutions. • Synthesis of Nanoparticle using Solvothermal Method. • Determination of conductance of nano coated objects	**9 Hours** **6 Hours**
ALLOYS, PHASE RULE AND MATERIALS PROCESSING **Alloys:** Introduction - Solid solutions, Substitutional and Interstitial alloys - Advanced alloys: Lightweight automotive frames (Advanced high-strength steels (AHSS)), and high-temperature engine components (Titanium Aluminides (TiAl)). **Phase diagrams:** Identification and Interpretation of Eutectic, Peritectic, Eutectoid, Peritectoid reactions in alloy systems for engineering applications **Powder Metallurgy:** Preparation and Applications in gears for automotive transmissions, aircraft brake components, and custom-shaped mechanical parts. **Additive manufacturing:** 3D printing of complex aerospace components, customized automotive parts, and rapid prototyping for mechanical systems - Process parameters and material properties. **Practical Component:** • Estimation of metal ion solution by Spectrophotometry • Estimation of copper content in brass by Complexometric method • Investigation of Phase Transitions in Ethylene Glycol ($C_2H_6O_2$) to understand its role as an Antifreeze and Coolant in Automotive Applications Through Phase Diagram Analysis	**9 Hours** **6 Hours**
ELECTRO CHEMISTRY AND CORROSION Electrochemical principles: Electrode potential and electrochemical series - Concentration cells and their applications in fuel cell sensors for vehicles. Corrosion: Chemical corrosion - Electrochemical corrosion - Forms of corrosion: Galvanic corrosion in multi-material aircraft structures - pitting corrosion in automotive exhaust systems - intergranular corrosion in heat-affected zones of welded mechanical components - stress corrosion cracking in aerospace fasteners – Factors Influencing Corrosion	**9 Hours**

Corrosion prevention strategies: Cathodic protection for underground fuel tanks - Anodic protection for chemical storage vessels – Anodising - Protective coatings for aircraft exteriors and mechanical systems - Failure analysis and prevention **Practical Component:** • Determination of electrode potentials of the cell and construct feasible cell. • Measurement of rate of corrosion on zinc/mild steel by weight loss method • Estimation of metal ion solution using potentiometric titration	**6 Hours**
ADVANCED ENGINEERING MATERIALS High-performance lubricants: Properties and Applications in high-temperature aircraft engines, long-life automotive transmissions, and precision mechanical bearings - Synthetic lubricants - Nano lubricants. Composite materials: Polymer matrix composites in aircraft fuselages - metal matrix composites in automotive brake rotors - ceramic matrix composites in gas turbine components - Fabrication techniques and mechanical properties. Smart materials: Shape memory alloys in aircraft actuators - piezoelectric materials in fuel injectors, - magnetorheological fluids in adaptive automotive suspensions. **Practical Component:** • Determination of Viscosity of Lubricants • Determination of cloud and pour point of Lubricants • Determination of Flash and Fire point of Lubricants	**9 Hours** **6 Hours**
SUSTAINABLE FUELS AND COMBUSTION TECHNOLOGY Introduction to alternative fuels: Biofuels for aviation - hydrogen fuel cells in automotive applications - natural gas for long-haul transportation - Advantages and challenges. Advanced biofuels: Cellulosic ethanol for automotive use - algal biofuels for aviation - synthetic biofuels for rocket propulsion - Hydrogen production, storage, and utilization in fuel cell vehicles Emission characteristics and control technologies (catalytic converters and particulate filters) - Environmental impact assessment of fuels in commercial aviation and automotive fleets - Regulations and standards for emissions control - Future trends. **Practical Component**: • Extraction of Biofuel from vegetable oil by saponification method. • Determination of Calorific Value of Biofuels. • Determination of Viscosity of Biofuel	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

References:

1. Mishra, M., & Singh, P. (2017). Nanotechnology: Principles and practices. New Age International Publishers.
2. Kumar, C. S. S. R., & Mohan, Y. K. (2012). Nanotechnology: Principles and practices. Wiley-VCH.

3. Huang, Y., & Wu, T. (2014). Nanomaterials: Synthesis, characterization, and applications. Wiley.
4. Callister, W. D., & Rethwisch, D. G. (2020). Materials science and engineering: An introduction (10th ed.). Wiley.
5. Wulff, J. E., & Kuntz, D. R. (2006). Powder metallurgy: Science, technology, and applications. Springer.
6. Jain, P. C., & Jain, M. (2017). Engineering chemistry (16th ed.). Dhanpat Rai Publishing Company.
7. Puri, B. R., Sharma, L. R., & Pathania, M. S. (2017). Principles of physical chemistry. Vishal Publishing Co.
8. Rangwala, S. C. (2009). Engineering materials. Charotar Publishing House.
9. Rajput, R. K. (2006). Engineering materials. S. Chand & Company Ltd.
10. Atkins, P., & de Paula, J. (2009). Atkin's physical chemistry (9th ed.). Oxford University Press.
11. Singh, A., & Gupta, R. (2018). Advanced functional materials: Applications in engineering and technology. Narosa Publishing House.
12. Sarkar, S. (2009). Fuels and combustion (3rd ed.). Orient Longman.
13. Dara, S. S., & Umare, S. S. (2014). A textbook of engineering chemistry. S. Chand and Company Limited.
14. Rao, S. S. (2010). Engineering materials: Properties and applications of metals and alloys. Narosa Publishing House.
15. Mukhopadhyay, A. K., & Pandey, K. N. (2010). Composite materials: Science and engineering. Narosa Publishing House.
16. Davies, G. J. (2012). Materials for automobile bodies (2nd ed.). Butterworth-Heinemann.
17. Demirbas, A. (2008). Biofuels: Securing the planet's future energy needs. Springer.
18. Roco, M. C., & Bainbridge, W. S. (2018). Nanotechnology research directions for societal needs in 2020: Retrospective and outlook. Springer.

Online Resources (Weblinks)

- https://www.youtube.com/watch?v=qDnzI05vvSc&list=PLMlC7Vx5awsenMs5y02xcW6i5NmdEIRGx
- https://www.youtube.com/watch?v=2rxbxNem1iI&list=PLyqSpQzTE6M_ON8uXt-PP8uX6hMWJeYSJ
- https://www.youtube.com/watch?v=mYGfyO3sPxk&list=PLyqSpQzTE6M9PegzhuWS5Vt4dffN_Rgy8&index=2
- https://www.youtube.com/watch?v=RYdbG4K6DwQ
- https://www.youtube.com/watch?v=Fyq4Q5yWDDU&list=PLyqSpQzTE6M927gXIZdVbbsyj9cmxam-b

Assessment (Embedded course)

CAT, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Dr. Muthuraja Perumal General Manager - Research & Development Rohith Industries, APIIC Industrial Park, Andhra Pradesh	Dr. Venkatakrishnan Professor, School of Chemical Sciences Indian Institute of Technology (Mandi) Himachal Pradesh India	Dr. R. Mayildurai, Department of Chemistry	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No.27	**Date**	24.08.2024

24MET104	ENGINEERING MECHANICS (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	0	0	0	3
ES		SDG	9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Apply principles of equilibrium to analyse rigid body systems in 2D space
2	Calculate geometry-dependent properties such as centroid and moments of inertia
3	Analyse the effects of friction in mechanical systems
4	Understand the kinematics and kinetics of rigid bodies in plane motion

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze the principles of transmissibility and moments to determine equilibrium conditions in rigid bodies.	Ap
CO 2	Evaluate the geometry-dependent properties like center of gravity and moment of inertia to assess their impact on mechanical systems	Ap
CO 3	Examine the laws of friction to distinguish between different types of friction in practical scenarios.	An
CO 4	Analyze and solve problems related to the kinematics of rigid bodies in plane motion	An
CO 5	Apply Newton's laws and principles of kinetics to solve problems involving the motion of rigid bodies.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3					2							
2	3					2							
3	3					2							
4	3					2							
5	3					2							

Course Content	
STATICS OF RIGID BODIES Resolution of a Force into Components, Free body diagram. Equivalent systems of forces acting on a rigid body in 2D space: Principle of transmissibility – Moment of force about a point – Varignon's theorem – Moment of a couple – Equivalent couple –Moment of force about an axis – Coplanar non-concurrent forces acting on rigid bodies – Resultant and equilibrium – Resolution of a given force into force couple system – Equilibrium of a rigid bodies 2D space – Reactions and supports. Analysis of structures.	**9 Hours**
GEOMETRY DEPENDENT PROPERTIES Centre of gravity, Centre of mass and Centroid – Moment of Inertia of simple and complex areas – Transfer formula – Radius of gyration – Polar moment of inertia – Product of inertia - Mass moment of Inertia of simple solids, thin plates, composite bodies.	**9 Hours**
FRICTION Laws of friction – coefficient of friction – Dry friction – wedge friction – ladder friction – rolling resistance. Applications of friction by analytical approach in belt drives (open belt drive), clutches (plate and cone clutches), brakes (single shoe brake)	**9 Hours**
KINEMATICS OF RIGID BODIES - PLANE MOTION Kinematics of rigid bodies: Plane motion, translation and rotation **General plane motion:** Absolute velocity, relative velocity, instantaneous centre of rotation, absolute acceleration, relative acceleration.	**9 Hours**
KINETICS OF RIGID BODIES - PLANE MOTION Equations of motion of a rigid body - angular momentum, D'Alembert's principle; Principle of work and energy for a rigid body, work of forces acting on a rigid body, kinetic energy of a rigid body in plane motion, conservation of energy; Impulse-momentum principle for the plane motion of a rigid body; Overview of Lagrange's equations of motion.	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks

1. Ferdinand P. Beer, Jr. Johnston, E. Russell, Mechanics for Engineers: Statics and Dynamics, McGraw-Hill Inc.,US (1987).
2. Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 15th edition, Prentice Hall, 2022

Reference books

1. Beer, Ferdinand P., E. Russell Johnston, David Mazurek, Phillip Cornwell, and Brian Self. *Vector Mechanics for Engineers: Statics and Dynamics*. 2024 ed. New Delhi: Tata McGraw-Hill, 2024. ISBN 9781260710892.
2. .James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics Statics , 9th edition, Wiley student edition, 2020.
3. James L. Meriam, L. G. Kraige, J. N. Bolton: Engineering Mechanics: Dynamics, 9th edition, Wiley student edition, 2020.
4. P. Boresi & J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
5. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics, Fourth Edition – PHI / Pearson Education Asia Pvt. Ltd., 2006.

6. Rajasekaran S and Sankarasubramanian G, “Engineering Mechanics-Statics and Dynamics”, Vikas Publishing House Pvt. Ltd., New Delhi, 2006

Assessment (Theory course)
CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert from Industry	**Expert from Higher Education Institution**	**Internal Expert**	
Mr. Babin. T, Design Engineer Lead |Mechanical Product Design Engineer-III at SLB, Singapore.	Dr S Parimala Murugaveni Associate Professor, Department of Mechanical Engineering, Government College of Technology, Coimbatore.	Dr. N. Sangeetha, Associate Professor, Department of Mechanical Engineering	
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24PHT107	MATERIALS SCIENCE FOR AERONAUTICAL ENGINEERING	L	T	P	J	C
		3	0	0	0	3
ES		SDG	9			

Pre-requisite courses	Engineering Physics	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Understand the fundamental concepts of crystal structures and imperfections.
2	Gain knowledge of aircraft materials and their applications.
3	Understand the strengthening mechanisms and high-temperature material performance.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse using basic concepts of crystal structures and explain the impact of crystal imperfections on material properties.	An
CO 2	Analyse the general properties and selection criteria of aerospace materials and state their application in aircraft structures.	An
CO 3	Analyse by applying knowledge of aircraft metal alloys and superalloys to assess their suitability for various aerospace applications.	An
CO 4	Analyse by applying the mechanisms of material strengthening to interpret and differentiate between brittle and ductile fracture mechanisms at the application	An
CO 5	Apply knowledge of mechanical and thermal properties in high-temperature materials to state how well they meet the requirements for aerospace applications."	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2									2		
2	3										2		
3	3		2								2		
4	3	2									2		
5	3										2		

Course Content	
FUNDAMENTALS OF CRYSTAL STRUCTURES Space lattice – unit cell – lattice planes – Bravais space lattices – Miller indices – calculation of interplanar distances – atomic radius – co- ordination number – packing factor for SC, BCC, FCC and HCP structures. Crystal imperfections: point defects – line defects – surface defects – volume defects – effect of crystal imperfections.	**9 Hours**
INTRODUCTION TO AIRCRAFT MATERIALS General properties of materials, Requirements of aircraft materials, Application trends in aircraft structures and engines, Introduction to smart materials (SMAs), Selection criteria of materials for use in aircraft. Ablation process, ablative materials and applications in aerospace – Phenomenon of super conduction, super conducting materials and applications in aerospace (Qualitative only).	**9 Hours**
AIRCRAFT METAL ALLOYS AND SUPERALLOYS Aluminium alloys, Magnesium alloys, Titanium alloys, Plain carbon and Low carbon Steels, Corrosion and Heat-resistant steels, Maraging steels, Copper alloys, Producibility and Surface treatments for each of the above – Super alloys, Nickel based super alloys, Cobalt based super alloys, and Iron based super alloys, manufacturing processes associated with super alloys, Heat treatment and surface treatment of super alloys.	**9 Hours**
STRENGTHENING OF MATERIALS Strengthening mechanisms for the improvement of mechanical properties - cold working precipitation hardening, solute hardening and diffusion hardening - Fracture-Mechanism of brittle fracture (Griffith's theory) and Ductile fracture - difference between brittle and ductile fracture - fatigue failure and its prevention - creep different stages in creep curve- Factors affecting mechanical properties Grain size and heat treatment.	**9 Hours**
HIGH TEMPERATURE MATERIALS & CHARACTERIZATION Classification, production and characteristics – Methods and testing – Determination of mechanical and thermal properties of materials at elevated temperatures – Application of these materials in Thermal protection systems of Aerospace vehicles – High temperature material characterization.	**9 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 0	Project Hours: 0	Total Hours: 45

Learning Resources

Textbooks:

1. Pillai, S.O., Solid State Physics, New Age International Publication, New Delhi (2022).
2. Gaur, R.K., and Gupta, S.L., Engineering Physics, Dhanpat Rai Publications (P) Ltd., New Delhi (2016).
3. Raghavan, V., Materials Science and Engineering, Prentice Hall of India, New Delhi (2015)

References:

1. Avadhanalu, M.N., and Kshirsagar, P.G., A Textbook of Engineering Physics, S. Chand & Company Ltd., New Delhi (2019).
2. Van Vlack, L.H., Elements of Material Science and Engineering, Pearson Education India (2008).
3. Callister, W.D., Jr., Materials Science and Engineering: An Introduction, John Wiley and Sons Inc., New York (2018).
4. Titterton, G., Aircraft Materials and Processes, Pitman Publishing Co., London (1998).
5. Martin, J.W., Engineering Materials: Their Properties and Applications, Wykedham Publications (London) Ltd., London (1987).

Online Resources (Weblinks)
1. https://archive.nptel.ac.in/courses/112/106/112106293/ 2. https://archive.nptel.ac.in/courses/101/104/101104010/ 3. https://archive.nptel.ac.in/courses/113/106/113106101/ 4. https://ntrs.nasa.gov/404?original=%2Fcitations%2F20060024092\

Assessment (Theory course)
CAT, Mini project, Qualitative assignments (PrBL/Activity based), Real case studies about aircraft structures and materials, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
		Fg Offr.Dr R Sengodan Dr M Selvambikai Department of Physics	
Recommended by BoS on	16.08.2024		
Academic Council Approval	No:27	**Date**	24.08.2024

24CSI101	LOGICAL THINKING AND PROBLEM SOLVING	L	T	P	J	C
		3	0	2	0	4
ES	(Common to all Programmes)	SDG	8, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Gain a comprehensive understanding of computing systems, including their classification, processing units, memory structures, storage hierarchies, and the essential functions and types of operating systems
2	Develop strong logical and analytical thinking skills, enabling the systematic analysis and solution of computational problems using reasoning techniques, algorithms, and flowcharts.
3	Acquire a solid foundation in C programming, mastering the use of data types, operators, control structures, and input/output operations to create efficient and effective programs.
4	Apply advanced programming techniques, including the use of arrays, structures, pointers, and functions, to solve complex real-world problems with a focus on modular and efficient coding practices.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Understand the basic concepts of hardware, software, Operating systems, and the logic behind the functioning of the Computing systems.	U
CO2	Apply logical thinking and reasoning to solve computing problems using tools like algorithms and flowcharts.	Ap
CO3	Understand the structured programming paradigms, memory organization and how the language can be used as a tool to solve problems.	U
CO4	Develop simple programs using data types, operators, control structures, pointers, and functions as appropriate in real world applications.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2												
2	3	2	1									3	
3		1										2	
4	3	2	1									3	

Course Content	
FUNDAMENTALS OF COMPUTERS AND COMPUTING Generations of computers, and classification of computers (supercomputers, mainframes, minicomputers, microcomputers). Processing Units (CPU, GPU, TPU), memory (RAM, ROM), storage devices and hierarchy, input / output and peripheral devices. System software, application software. Operating Systems - Functions (process management, memory management, file system management, device management, security), types of operating systems (desktop, mobile, networking, distributed, real-time, embedded). **Number Systems**: Introduction to different number systems (binary, octal, decimal, hexadecimal), conversions between number systems, and binary arithmetic (addition, subtraction, multiplication, division). **Practical Component** Exploring hardware and software components	**6 Hours** **4 Hours**
LOGICAL THINKING, REASONING AND TOOLS Problem Analysis – Logical Thinking vs Critical Thinking vs Design Thinking - Inference – Inductive Reasoning – Deductive Reasoning – **Logical Thinking Tools: Algorithms**: Definition and importance, characteristics of algorithms (finite, clear and unambiguous, well-defined inputs and outputs, feasible). Algorithm representation Techniques: Pseudocode, stepwise refinement, and top-down design. **Flowcharts**: Symbols used in flowcharts, creating flowcharts, and examples of flowchart-based problem-solving. **Practical Component** Algorithm writing and Flowcharts,	**8 Hours** **4 Hours**
PROGRAMMING PARADIGMS AND INTRODUCTION TO C PROGRAMMING **Programming Paradigms**: Structured programming - functional programming - object-oriented programming. **Introduction to C Programming**: History of C - features of C - structure of a C program – input / output statements. **Data Types**: Primitive data types (int, char, float, double) - derived data types, typecast. **Operators**: Arithmetic operators - relational operators - logical operators - bitwise operators - assignment operators - operator precedence. **Conditional Statements**: If - if-else - nested if - switch-case. **Looping Statements**: For loop - while loop - do-while loop. Pre-processor Directives and Command line arguments, Storage Classes. **Practical Component** Programs on Operator precedence, Decision Making, Iterations	**11 Hours** **10 Hours**
ARRAYS AND STRUCTURES **Collections**: Arrays – 2D Arrays – String Manipulation. **Structures and Unions**: Definition - declaration - accessing members - differences between structures and unions - applications. **Practical Component** Programs on Arrays, Structures, Union,	**10 Hours** **6 Hours**
POINTERS AND FUNCTIONS **Pointers**: Definition - declaration - pointer arithmetic - pointers and arrays. **Functions**: Definition - declaration - types of functions (user-defined, library functions) - parameter passing (by value, by reference) pointers and functions, recursion. **Practical Component** Pointers and Functions. Additional programs on Files to be discussed.	**10 Hours** **6 Hours**

Theory Hours:	45	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	75

Learning Resources

Textbooks:

1. Kanetkar, Yashavant. Let Us C. BPB Publications, New Delhi (2023).
2. Rajaraman, V. Fundamentals of Computers. PHI Learning, New Delhi (2020).
3. Dromey, R.G. How to Solve it by Computer. Prentice Hall International, New York (2008).

Reference

1. Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. Introduction to Algorithms. MIT Press, Cambridge (2022).
2. Balagurusamy, E. Programming in ANSI C. McGraw Hill Education, New York (2021).
3. Kernighan, Brian W., and Dennis M. Ritchie. The C Programming Language. Prentice Hall, New York (2017).
4. Patterson, David A., and John L. Hennessy. Computer Organization and Design: The Hardware/Software Interface. Morgan Kaufmann, San Francisco (2017).

Online Resources (Weblinks)

1. https://nptel.ac.in/courses/106105214
2. https://www.coursera.org/learn/computer-fundamentals
3. https://www.khanacademy.org/computing/computer-science/algorithms
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-006-introduction-to-algorithms-fall-2011/
5. https://www.geeksforgeeks.org/c-programming-language/

Assessment (Embedded course)

CAT, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
-	-	Dr. S. Kavitha, Department of Information Technology

Recommended by BoS on	16.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24INP103	INNOVATION PRACTICUM – II	L	T	P	J	C
		0	0	2	0	1
ES	(Common to All branches)	SDG	9, 11, 12			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Equip students with essential tools and techniques for leveraging open-source technologies to develop proof-of-concepts and prototypes
2	Provide hands-on experience and participants will gain a comprehensive understanding of the entire product development process
3	Final prototyping, empowering them to transform their ideas into tangible outcomes

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyse the effectiveness of various electronic tools and techniques in product development processes	An
CO 2	Develop and implement functional software prototypes using open-source tools	Ap
CO 3	Design and fabricate 3D models using digital fabrication techniques	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	2	2	2								
2	2	2	2		2								
3	2	2	3	2	2								

Course Content

INTRODUCTION TO OPEN-SOURCE TOOLS AND TECHNIQUES Explore the concept of open-source, its underlying principles and its contrast with proprietary software, Discuss the advantages of using open-source tools, such as lower costs, increased innovation, educational value, and community support, walk through to the commonly used open-source tools for electronics design (KiCad, FreeCAD), software development (Python, Eclipse), and fabrication (Cura, LinuxCNC).	**3 Hours**
ELECTRONICS FUNDAMENTALS AND TOOLS Introduction to basic electronic components (resistors, capacitors, transistors, etc.), Understanding of electronic circuits and their functions, Hands-on practice with CircuitJS and Falstad, Simulating and analysing electronic circuits, Introduction to Arduino and Raspberry	**6 Hours**

Pi, exploring their capabilities and applications, Designing PCBs using KiCad and EasyEDA, Understanding PCB fabrication processes	
SOFTWARE PROTOTYPING AND TOOLS Benefits of rapid prototyping in product development, Iterative design and testing, Wireframing tools (Balsamiq, Figma), UI design tools (Sketch, Figma), Programming languages (Python, JavaScript), Testing frameworks (Selenium), No-code platforms (Bubble, Adalo, Wix, AppGyver), Building functional prototypes without extensive coding	**6 Hours**
FABRICATION AND PROTOTYPING Overview of fabrication techniques (3D printing, laser cutting, CNC machining), Prototyping methods for physical products, using tools like Blender, TinkerCAD, or Fusion 360, Creating 3D models for physical prototypes, Hands-on experience with laser cutting and engraving, Understanding their applications and limitations	**7 Hours**
SIMULATION & DEMONSTRATION Integrated project demonstration, explaining the design process, technical choices, and outcomes, simulation showcase to demonstrate their understanding of various technical tools and prototyping techniques	**8 Hours**

Theory Hours:	0	Tutorial Hours:	0	Practical Hours:	30	Project Hours:	0	Total Hours:	30

Learning Resources

Textbooks:

1. Damir Godec, Joamin Gonzalez-Gutierrez, Axel Nordin, Eujin Pei, Julia Ureña Alcázar, A guide to additive manufacturing, Springer – 2022. https://doi.org/10.1007/978-3-031-05863-9
2. Introducing SolidWorks, Dassault Systems.

References:

1. Insight into Electronics
2. Microcontroller Programming with Arduino and Python
3. Fundamentals of 3D modelling

Online Resources (Weblinks)

1. Google Play store apps:
   a. https://play.google.com/store/apps/details?id=com.electronicslab
   b. https://play.google.com/store/apps/details?id=it.android.demi.elettronica
2. https://engservices-ece.sites.olt.ubc.ca/files/2020/01/SolidWorks-3D-Printing-Tutorial-R2.pdf

Assessment (Practical course)

Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert from Industry	Expert(s) from Higher Education Institution	Internal Expert
Dr. Mahesh Veezhinathan Director - Innovation Practicum Associate VP - Forge. Innovation	-	Dr. Samuel Ratna Kumar P S Assistant Professor – III Department Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24HSP112	HOLISTIC WELLNESS-II (Common to all Departments)	L	T	P	J	C
		0	0	2	0	1
HS		SDG	3, 4			

Pre-requisite courses	Holistic Wellness-I	Data Book / Code book (If any)	-

Course Objectives:

The purpose of taking this course is to:

1	Build on the foundation laid in Holistic Wellness -I and deepening into the practices and principles of holistic wellness.
2	Explore advanced techniques in mental, emotional, and spiritual well-being, with an emphasis on creating sustainable wellness habits.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply advanced techniques in mindfulness, meditation, and stress management.	Ap
CO 2	Understand the role of community and social connections in wellness.	U
CO 3	Develop resilience and adaptability in maintaining wellness.	E
CO 4	Refine and sustain a personalized holistic wellness plan.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1						2		2					
2						2							
3						2					3		
4						2					3		

Course Content

ADVANCED MINDFULLNESS AND MEDITATION: • Deepening mindfulness practices for enhanced mental clarity. • Exploring different forms of meditation (e.g., guided, transcendental, movement-based). • Hands-on activity: Daily meditation practice and journaling reflections.	**6 Hours**
EMOTIONAL RESILIENCE AND MENTAL HEALTH: • Building emotional resilience through positive psychology practices.	**6 Hours**

• Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	
SOCIAL AND ENVIRONMENTAL WELLNESS: • The impact of social connections and community on wellness. • Creating a supportive environment for personal growth. • Hands-on activity: Building a community wellness project or group activity.	**6 Hours**
INTERNAL GROWTH AND PURPOSE: • Exploring the deeper aspects of internal wellness and self-actualization. • Reflective practices for discovering life purpose and meaning. • Hands-on activity: Creating a vision board or personal mission statement.	**6 Hours**
SUSTAINING WELLNESS PRACTICES: • Strategies for maintaining wellness habits over the long term. • Adapting wellness plans to life changes and challenges. • Hands-on activity: Revising and finalizing a long-term personal wellness plan.	**6 Hours**

Theory Hours: 0	Tutorial Hours: 0	Practical Hours: 30	Project Hours:	Total Hours: 30

Learning Resources

Textbooks:

1. Hanh, Thich Nhat. The Miracle of Mindfulness: An Introduction to the Practice of Meditation. Beacon Press, Boston (1975).
2. Tolle, Eckhart. The Power of Now: A Guide to Spiritual Enlightenment. New World Library, Novato (1997).
3. Patel, Kamlesh. Heartfulness Way: Heart-Based Meditations for Spiritual Transformation, Kamlesh Patel, 2018.

References:

1. Goleman Daniel., Emotional Intelligence., Bloomsbury India, India, (2021).
2. James Allen., As a Man Thinketh., Maple Press, Noida, (2010)
3. Swami Budhanandha., Will power and its development., Advaita Ashrama Mayavati, Pithoragarh, Himalayas from its Publication Department, Calcutta. (2001)
4. Rosenberg, Marshall Bertram., Nonviolent Communication: A Language of Life., Puddle Dancer Press, Encinitas, CA (2015).
5. Jayanna, Krishnamurthy., Science & Practice of Integrative Health & Wellbeing Lifestyle., White Falcon Publishing (2020).
6. Lipton, Bruce., The Biology of Belief 10th Anniversary Edition: Unleashing the Power of Consciousness, Matter & Miracles, Hay House, Carlsbad (2015).
7. Kalderdon Adizes Ichak., What Matters in Life: Lessons I Learned from Opening My Heart WS Press, Newtown, PA(2023).
8. Murphy, Joseph., The Power of Your Subconscious Mind [Original Edition (Complete)], Prentice-Hall, Englewood Cliffs (1963).
9. Kamlesh D. Patel., Designing Destiny: The Heartfulness Way, Heartfulness Institute, Chennai (2021)

Online Resources (Weblinks)

- Introduction to Psychology
- Guided Meditation
- Life skills and value education
- James Allen Library

Assessment (Practical course)
Participation, Practical activities and assignments, personal wellness plan and reflection.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
		Dr. Ezhilarasi Principal- KCT	
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

Semester-3

24HSP005	MASTERING CONVERSATIONS	L	T	P	J	C
		0	0	2	0	1
Course Category: HS		SDG	4 & 8			

Pre-requisite courses - Nil	NIL	Data Book / Codes / Standards (If any)	Nil

Course Objectives:	The purpose of taking this course is to: (3 to 5)
1	Demonstrate understanding of different perspectives by analyzing complex personal and professional situations.
2	Engage in thoughtful dialogue and discussions about complex, real-world issues, utilizing critical thinking to assess different viewpoints.
3	Apply role-playing as a tool to enhance understanding of workplace dynamics, conflict resolution, and team collaboration.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Empathize with and understand people in both professional and personal contexts, reflecting on situations from multiple perspectives and participating in activities that mirror career-related scenarios	Ap
CO 2	Analyze and converse critically on complex subjects, demonstrating the ability to approach and deal with various social contexts effectively	An
CO 3	Exhibit skills in role-playing and enacting given situations to navigate diverse social interactions and career-related contexts.	C

BTL: R, U, Ap, An, E, C (Remember, Understand, Apply, Analysis, Evaluate, Create)

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1						3			3	2	3		
2									1	2			
3									3	2			

Course Content	
PRACTICAL COMPONENT / ROLEPLAYS DYNAMICS Introduction to Role play - Benefits of role plays - Importance of gesture, tone and modulation-Skill development through role play activities - Types of role plays - Conversation Building through communicative functions-Initiating a dialogue- Framing questions- Receiving feedback	**6 Hours**
PRACTICAL COMPONENT /ROLEPLAYS ON SOCIAL SKILL **Social Interactions:** - (Ordering food at a restaurant- Making a reservation at a hotel-- Shopping at a store-- Attending a party or social gathering) **Travel and Tourism:** (Asking for directions- Booking a flight or hotel-- Exploring a new city- Interacting with local people) **Community and Volunteering:** (Participating in a charity event- Volunteering at a local organization- Discussing community issues- Organizing a community project)	**6 Hours**
PRACTICAL COMPONENT / ROLEPLAYS ON EDUCATION AND TECHNOLOGY **Education and Personal Growth:** (Setting goals-(Short term & Long term)- Creating a study plan- Participating in a workshop- Reflecting on personal growth) **Technology and Online Interactions:** (Participating in an online meeting- Creating a social media post- Writing an email or text message- Making an online purchase) **Technology and Science:** (Explaining a scientific concept- Discussing emerging technologies- participating in Hackathons- Presenting a research paper)	**6 Hours**
PRACTICAL COMPONENT / ROLEPLAYS ON STRATEGIC INSIGHTS **Critical Thinking:** (Evaluating a news article-solving a moral dilemma-Decision with incomplete information-Assessing a historical event) **Problem-Solving:** (Resolving a conflict- Negotiating a deal - Making a complaint-Apologizing for a mistake) **Business and Entrepreneurship:** (Pitching an idea- Negotiating a contract- Conducting a market Research- Presenting a product launch)	**6 Hours**
PRACTICAL COMPONENT / ROLEPLAYS ON CULTURAL EXCHANGE **Cultural Exchange:** (Sharing customs and traditions- Discussing cultural differences-Exploring historical events- Participating in a cultural festival) **Media and Entertainment:** (Event planning- Creating an advertisement-Digital Marketing-Conducting interviews- Creating news broadcast- Writing and Performing a script- Enacting one act plays) **Arts and Culture:** (Visiting an art gallery – Attending / organizing a concert or play - Discussing literature- Creating a piece of art)	**6 Hours**

Theory Hours:	Tutorial Hours:	Practical Hours: 30	Project Hours:	Total Hours: 30

Learning Resources*
Reference books/ Web Links
1. Bonwell, C. C., & Eison, J. A. (1991). Active learning: Creating excitement in the classroom. Washington, DC: The George Washington University.

2. Harbour, E., & Connick, J. (2005). Role playing games and activities rules and tips. Retrieved fr https://www.businessballs.com/roleplayinggames.htm
3. Lebaron, J., & Miller, D. (2005). The potential of jigsaw role playing to promote the social construction of knowledge in an online graduate education course. Retrieved from http://paws.wcu.edu/jlebaron/Jigsaw-FnlTCRpdf_050812.pdf
4. Davies, A. (2018). Teaching and learning through role-play: A practical guide. Maidenhead, UK: McGraw-Hill Education.
5. Young, K. C. (2016). The art of role play: Developing realistic scenarios for skill development. Boston, MA: Pearson.
6. Yardley-Matwiejczuk, K. M. (1997). Role play: Theory and practice. London, UK: SAGE Publications Ltd.

Online Resources

1. https://www.niu.edu/citl/resources/guides/instructional-guide
2. https://positivepsychology.com/role-playing-scripts/

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	Quizzes and written assignments, Participation in group activities

Course Curated By

Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Mr.Vijayan Ramanathan , Project manager, Toppan Merrill. Technologies, Coimbatore	Dr. Aninditha Sahoo, IIT, Madras Dr.P.R.Sujatha Priyadharshini, Anna University Chennai Dr. E. Justin Ruben, CIT, Coimbatore	Dr. Arokia Lawrence Vijay Dr. Tissaa Tony

Approved by: BoS Chairman	BOS
BoS Approval date:	**16-8-2024**

24MAT231	PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS TECHNIQUES (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	1	0	0	4
BS		SDG	7,9			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	NA

Course Objectives:	The purpose of taking this course is to:
1	**Apply the analytical methods** to solve selected PDEs, including suitable method of characteristics.
2	**Construct Fourier series expansions** for functions defined on a finite interval.
3	Develop the ability to **formulate and solve** the one-dimensional wave equation and steady-state heat equation using **analytical methods**.
4	Introduce students to the **mathematical formulation** of the steady-state two-dimensional heat conduction equation in Cartesian coordinates.
5	Enable students to **compute Fourier transforms** of standard functions and understand their properties.
6	Apply the Z-transform technique to **solve linear difference equations** with constant coefficients.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	Solve certain types of partial differential equations.	Ap
CO2	Determine the Fourier Series and half range Fourier Series of a function.	Ap
CO3	Solve one dimensional wave equation, one dimensional heat equation in steady state using Fourier series.	Ap
CO4	Apply Fourier series to solve the steady state two-dimensional heat equation in cartesian coordinates.	Ap
CO5	Identify Fourier transform, Fourier sine and cosine transform of certain functions and use Parseval's identity to evaluate integrals.	Ap
CO6	Evaluate Z – transform of sequences and inverse Z – transform of functions and solve difference equations.	Ap

	Program Outcomes (PO)(Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2											

	Program Outcomes (PO)(Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
2	3	2											
3	3	2											
4	3	1		2									
5	3	1		2									
6	3	1		2									

Course Content

PARTIAL DIFFERENTIAL EQUATIONS Solution of PDE by direct integration - solution of standard types of first order partial differential equations (excluding reducible to standard types) - Lagrange's linear equation – Linear homogeneous partial differential equations of second order with constant coefficients.	**9 + 3 Hours**
FOURIER SERIES Dirichlet's conditions – Fourier series – Odd and Even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.	**9 + 3 Hours**
BOUNDARY VALUE PROBLEMS – ONE DIMENSIONAL EQUATIONS Classification of second order quasi linear partial differential equations – Solution of one-dimensional wave equation – Solution of one-dimensional heat equation (excluding insulated ends) – (Cartesian coordinates only).	**5 + 2 Hours**
BOUNDARY VALUE PROBLEMS – TWO DIMENSIONAL EQUATIONS Steady state solution of two-dimensional heat equation in infinite plate (Insulated edges excluded) – (Cartesian coordinates only)	**4 + 1 Hours**
FOURIER TRANSFORM Statement of Fourier integral theorem – Infinite Fourier transforms – Sine and Cosine Transforms – Properties (Proofs excluded)– Transforms of simple functions – Convolution theorem – Parseval's identity.	**9 + 3 Hours**
Z –TRANSFORM Z-transform - Properties (Proofs excluded) – Convolution theorem- Inverse Z – transform (by using partial fractions, residues and convolution theorem) – Solution of difference equations using Z - transform.	**9 + 3 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**15**	**Practical Hours:**		**Project Hours:**		**Total Hours:**	**60**

Learning Resources

Textbooks

1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, edition 2016.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 45th Edition, 2024.

Reference books/ Web Links

1. Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 2020 Revised 10th edition.
2. Ian Sneddon., "Elements of partial differential equations", McGraw – Hill, New Delhi, 2022.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd., New Delhi, 2018.

Online Resources
1. Partial differential equations – https://www.classcentral.com/course/swayam-partial-differential-equations-17721 2. Fourier series – https://www.classcentral.com/subject/fourier-series 3. Fourier Transform - https://www.classcentral.com/subject/fourier-transform

Assessment	
Formative	Summative
Assignments-Open Book Test/Quiz/Case Study Analysis/Group Presentation/Poster Preparation/Mathematical Models, etc.,	MCQ, CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore.	1. Dr. M. Sivakumar Assistant Professor Sr. Grade Vellore Institute of Technology, Vellore 2. Dr. Ramesh Babu Assistant Professor (SG) Amrita University Coimbatore, Tamil Nadu.	1. Ms. S. Sivasakthi 2. Dr. S. Meenapriyadarshini 3. Ms. A. Shanmughavadivu

Recommended by BoS on	25.4.2025		
Academic Council Approval		**Date**	

24AEI201	AERO ENGINEERING THERMODYNAMICS	L	T	P	J	C
		2	0	2	0	3
Professional Core		SDG	7, 9			

Pre-requisite courses	-	Data Book / Code book (If any)	Stream Table

Course Objectives:	
The purpose of taking this course is to:	
1	Enable the students to perform quantitative analysis of machines and processes involved in energy transformation and the relationship between work and heat.
2	Help students comprehend the laws of thermodynamics and quantify them through relevant measurements.
3	Develop a fundamental understanding of air cycles, gas turbine engines.
4	Understand and apply the thermodynamic behavior of pure substances, including phase changes, property relations, and the use of steam tables and diagrams for property determination.
5	Understand and apply thermodynamic principles through experiments on fuels, engines, refrigeration.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply the basic concepts of thermodynamics to solve problems related to closed and open systems.	Ap
CO 2	Apply the concepts of the second law, entropy, and Carnot principles to solve problems involving engine efficiency and irreversibility.	Ap
CO 3	Analyze the performance characteristics of different air standard cycles.	An
CO 4	Examine the thermodynamic properties of pure substances using steam tables, Mollier diagrams, and phase rules.	An
CO 5	Conduct experiments on various thermodynamics systems	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO1	PSO2
1	3	3	2	2	2	2	1	2	2	1	2	3	2
2	3	3	2	2	2	2	1	2	2	1	2	3	2
3	3	3	3	1	1	1	1	2	2	1	1	3	2
4	3	3	2	1	1	1	1	2	1	1	1	3	1
5	3	2	2	3	2	2	2	3	3	2	2	3	1

Course Content

FIRST LAW OF THERMODYNAMICS Concept of continuum, macroscopic approach, and thermodynamic systems – Property, state, path and process-quasi-static process - work, Zeroth law of thermodynamics – Concept of temperature and heat, internal energy, specific heat capacities, enthalpy-Introduction to Fuel Properties – Concept of ideal and real gases – First law of thermodynamics and its applications to closed and open systems –Numerical problems. **Practical Component:** • Determination of viscosity in a given fuel. · • Determination of flash and fire point in a given fuel.	**8 Hours** **8 Hours**
SECOND LAW AND ENTROPY Second law of thermodynamics – Kelvin Planck and Clausius statements of second law – Reversibility and irreversibility – Carnot theorem – Carnot cycle, Reversed Carnot cycle– Efficiency & COP – Introduction to Vapour Compression Cycle – Thermodynamic temperature scale – Clausius inequality, concept of entropy, entropy of ideal gas - principle of increase of entropy-Numerical problems. **Practical Component:** • COP test on a vapour compression refrigeration test rig.	**7 Hours** **6 Hours**
AIR STANDARD CYCLES Otto, Diesel, Dual, Air standard efficiency, mean effective pressure -Brayton cycles - Effect of Reheat, Regeneration and Intercooling- Isentropic efficiency of turbine and compressor- Introduction to Stirling cycle. Air standard efficiency – Mean effective pressure- Numerical Problems. **Practical Component:** • Valve timing and port timing diagrams in IC engines. • Performance test on diesel engine by electrical loading.	**8 Hours** **8 Hours**
PROPERTIES OF PURE SUBSTANCES Definition of pure substances – Phase Change of a pure substance- phase rule, p-T diagram for a Pure substance- p-v-T surfaces, thermodynamic properties - ideal and real gases, equations of state, compressibility chart- Determination of dryness fraction– use of Mollier diagram and Steam tables - Numerical Problem. **Practical Component:** • To study the phase change of a substance from liquid to solid by plotting the cooling curve. (virtual lab) • To determine the melting point of the given substance and to find out the transition time. (virtual lab)	**7 Hours** **8 Hours**

Theory Hours:30	Tutorial Hours:0	Practical Hours:30	Project Hours:0	Total Hours:60

Learning Resources

Textbooks:

1. Cengel, Yunus A., & Boles, Michael A., Thermodynamics: An Engineering Approach., McGraw-Hill, New York (2019).
2. Nag, P. K., Engineering Thermodynamics., McGraw-Hill, New York (2017).

References:

1. Turns, Stephen R., Thermodynamics: Concepts and Applications., Cambridge University Press, Cambridge, United Kingdom (2020).
2. Moran, M. J., Shapiro, H. N., Boettner, D. D., and Bailey, M. B., Principles of Engineering Thermodynamics, Wiley, India, (2015).
3. D. P. Mishra, Engineering Thermodynamics., Cengage. India, (2011).
4. Çengel, Yunus A., Heat and Mass Transfer: Fundamentals and Applications, McGraw-Hill, New York (2020).
5. Borgnakke, C. and Sonntag, R. E., Fundamentals of Thermodynamics, Wiley, India (2013).
6. Saravanamuttoo, H.I.H., Gas Turbine Theory, Pearson Education, London (2019).

Online Educational Resources:

1. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=709&cnt=4
2. https://www.udemy.com/course/engineering-thermodynamics/
3. https://onlinecourses.nptel.ac.in/noc22_ae17/preview
4. https://www.coursera.org/learn/thermodynamics-intro
5. https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring- 2008/index.htm

Assessment (Embedded course)

CAT, Activity and Learning Task (Open-ended questions, reflective journal), MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Dr Lakshmi VM, Scientist/Engineer 'SG', VSSC, ISRO, vm_lakshmi@vssc.gov.in	Dr. S. Periyasamy, Government College of Technology, Coimbatore.	Mr.R. Arul Prakash/AERO

Recommended by BoS on	07/05/2025		
Academic Council Approval	No.	**Date**	

24AEI202	ENGINEERING FLUID MECHANICS AND HYDRAULICS	L	T	P	J	C
		2	0	2	0	3
Professional Core		SDG	6, 7 , 9, 12 & 13			

Pre-requisite courses		Data Book / Code book (If any)	

Course Objectives:	
The purpose of taking this course is to:	
1	**Explain** the basic properties of fluids and the principles of fluid behaviour at rest.
2	**Apply** fundamental equations to solve fluid flow problems.
3	**Use** dimensional analysis and modelling techniques to study fluid systems.
4	**Understand** the working and performance of various hydraulic machines.
5	**Perform** experiments to observe fluid behaviour, verify concepts, and test equipment performance.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Explain the fundamental properties of fluids and the principles of fluid statics.	Understand
CO 2	Solve flow problems using continuity, momentum, and Bernoulli's equations.	Apply
CO 3	Apply dimensional analysis and similitude concepts using Rayleigh's method and Buckingham's π theorem	Apply
CO 4	Analyze boundary layer flow and its effect on drag force.	Analyze
CO 5	Apply principles of hydraulic machines and pumps to determine their performance.	Apply
CO 6	Conduct laboratory experiments to determine flow parameters and performance of fluid machines.	Apply

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO1	PSO2
1	3	2	1	2	1	2	3	2	2	-	2	3	1
2	3	3	1	2	1	2	3	2	2	-	2	3	2
3	3	3	2	2	2	2	3	2	2	-	2	3	2
4	3	3	2	2	2	2	3	2	2	-	2	3	2
5	3	2	3	2	2	2	3	2	2	1	2	3	2
6	3	3	3	3	3	2	3	3	3	1	3	3	3

Course Content	
FLUID STATICS Introduction to Fluid – Units and Dimensions – Mass density – Specific weight – Specific volume – Specific gravity –Specific heats – Viscosity – Compressibility – Surface tension – Capillarity – Vapour pressure and Cavitation. Pascal's Law and Hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Metacentre – Simple and differential manometers – Mechanical pressure gauges. **Practical Component:** • Determination of pressure using various manometers • Study of calibration and operation of mechanical pressure gauges	**6 Hours** **6 Hours**
FLUID DYNAMICS Lagrangian vs Eulerian descriptions, Classification of fluid flows -- Flow Visualization – Path line – Streamline – Streak line – Stream and Potential functions – Flownets. Governing equations: Continuity equation – Momentum equation – Energy equation – Euler's equation – Bernoulli's equation – Applications. **Practical Component:** • Verification of Bernoulli's theorem • Determination of the coefficient of discharge of the Venturimeter • Determination of the coefficient of discharge of the Orifice meter • Determination of the coefficient of discharge of Rotometer.	**6 Hours** **6 Hours**
DIMENSIONAL ANALYSIS AND SIMILARITY Rayleigh's method – Buckingham's π theorem – Geometric, Kinematic, and Dynamic similarity – Scale effect – Dimensionless parameters – Mach Number, Reynolds Number, Euler's Number, Weber Number, Froude's Number, and Prandtl Number – Model laws. **Practical Component:** • Determination of Darcy's friction factor. • Determination of Reynolds Number	**4 Hours** **6 Hours**
BOUNDARY LAYER FLOW Boundary layer, Boundary layer thickness: Displacement, Momentum, and Energy thickness. Drag force on a flat plate due to boundary layer –Turbulent boundary layer on a flat plate - Blasius similarity solution and the Momentum Integral Method for a flat plate. Deduction of Governing equations of the boundary layer from Navier-Stokes Equation – Separation of the boundary layer. **Practical Component:** • Measurement of the co-efficient of lift and drag in a wind tunnel to verify model laws. • Flow Visualization and Boundary Layer Separation (Using Smoke or Dye)	**7 Hours** **6 Hours**
HYDRAULIC TURBINES & PUMPS Introduction to hydraulic turbines – Classification – Pelton wheel: working, velocity triangles, efficiency – Francis turbine: working, efficiency – Draft tube – Performance characteristics. Definition and classifications- Centrifugal and Reciprocating Pumps: Working principles- Indicator diagram – Specific speed – efficiency and performance curves - Cavitation in pumps. **Practical Component:** • Performance study of the Pelton and Francis turbine • Performance study of the Centrifugal and Reciprocating	**7 Hours** **6 Hours**

Theory Hours:30	Tutorial Hours:0	Practical Hours:30	Project Hours:0	Total Hours:60

Learning Resources

Textbooks:

1. Yunus A. Çengel and John M. Cimbala, Fluid Mechanics: Fundamentals and Applications, Fifth Edition (2024 Release), McGraw-Hill Education.
2. Munson, Young, and Okiishi, Fundamentals of Fluid Mechanics,9th Edition, John Wiley & Sons Inc.
3. Frank M. White, Fluid Mechanics, Ninth Edition (2021), McGraw-Hill Education.

References:

1. Pijush K. Kundu, Ira M. Cohen, and David R. Dowling, Fluid Mechanics, Sixth Edition (2015), Academic Press.
2. R.K. Bansal, A Textbook of Fluid Mechanics and Hydraulic Machines, Tenth Edition (2018), Laxmi Publications.
3. R. S. Khurmi, A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines, Revised Edition (2016), S. Chand & Co.
4. Dr. D.S. Kumar, Fluid Mechanics and Fluid Power Engineering, Seventh Edition (2013), S.K. Kataria & Sons.
5. Modi & Seth, Hydraulics and Fluid Mechanics Including Hydraulics Machines, Twenty-First Edition (2017), Standard Book House.

Online Educational Resources:

1. http://nptel.ac.in/courses/101103004
2. https://ocw.mit.edu/courses/16-100-aerodynamics-fall-2005/
3. https://www.coursera.org/learn/fluid-mechanics
4. https://www.edx.org/course/introduction-to-fluid-mechanics
5. https://oli.cmu.edu/courses/engineering-statics-and-dynamics/

Assessment (Embedded course)

CAT, Written Assignments, Presentations, Demonstrations, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests & Viva-voce.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Dr. Kumaresh Selvakumar Research Engineer ExaSlate	Dr. Madhu Ganesh, Professor, Department of Aerospace Engineering, Karunya Institute of Technology and Sciences, Coimbatore.	Dr. M. Senthil Kumar/AERO Mr. Muthukumar S /AERO

Recommended by BoS on	07/05/2025		
Academic Council Approval	No.	**Date**	

24AET203	SOLID MECHANICS	L	T	P	J	C
		3	0	0	0	3
Professional Core		SDG	4,9,11,12			

Pre-requisite courses	Nil	Data Book / Code book (If any)	NA

Course Objectives:

The purpose of taking this course is to:

1	Understand the principles of stress, strain, and material behavior under different loading conditions.
2	Evaluate shear force and bending moment distribution in beams and apply bending theory to determine stresses.
3	Use analytical methods such as double integration, Macaulay's method, and the moment area method to calculate beam deflections.
4	Analyze torsional stresses in shafts and design helical springs for strength and stiffness.
5	Assess biaxial stress conditions, determine principal stresses, and analyze stress distributions in thin and thick-walled pressure vessels.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain stress, strain, and deformation in solids under axial and thermal loads.	U
CO 2	Analyze beams under various loads and determine shear force, bending moment, and flexural stresses.	An
CO 3	Solve beam deflection and slope using standard analytical methods.	Ap
CO 4	Determine torsional stresses and design shafts and helical springs for strength and stiffness.	Ap
CO 5	Solve the problems on biaxial stress conditions and determine stress distribution in thin and thick pressure vessels.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	1	1	-	-	-	1	-	-	2	3	1
2	3	3	2	1	-	-	2	1	-	-	1	3	1
3	3	3	2	2	-	-	2	1	-	-	1	3	1
4	3	3	2	2	-	-	2	1	-	-	2	3	1
5	3	3	-	1	-	-	-	1	-	-	1	3	1

Course Content	
FUNDAMENTALS OF STRESS AND STRAIN Introduction to Mechanics of Solids, Concept of Stress: Normal and Shear Stress, Strain and Deformation of Solids, Hooke's Law and Generalized Hooke's Law, Poisson's ratio, elastic constants; Analysis of bar of uniform and varying sections, Analysis of composite bars, Thermal Stresses.	**8 Hours**
BENDING OF BEAMS AND SHEAR FORCE Types of Beams and Loads, Shear Force and Bending Moment Diagrams - simply supported beam, cantilever beam & over hanging beams, Theory of Simple Bending, Section Modulus and Flexural Stresses, Shear Stress in Beams.	**10 Hours**
BEAM DEFLECTION Elastic curve of Neutral axis of the beam under normal loads, Evaluation of beam deflection and slope: Double integration method, Macaulay Method and Moment area method.	**9 Hours**
TORSION AND SPRINGS Torsion of Circular Shafts, Power Transmission and Torsional Rigidity, Shear Stress and Angle of Twist in Shafts, Design of Circular Shafts for Strength and Stiffness, Introduction to helical springs, Closed and Open-Coiled Springs.	**9 Hours**
BIAXIAL STRESSES AND THIN & THICK PRESSURE VESSELS Biaxial state of stresses at a point, Stresses on inclined plane, Principal planes and stresses, Mohr's circle for biaxial stresses, Stresses in Thin-Walled Pressure cylindrical vessels, Lame's Theory: Stress Distribution in Thick Cylindrical and Spherical Shells.	**9 Hours**

Theory Hours:	**45**	**Tutorial Hours:**	**0**	**Practical Hours:**	**0**	**Project Hours:**	**0**	**Total Hours:**	**45**

Learning Resources

Textbooks:

1. Beer, Ferdinand P., Johnston Jr., E. Russell, DeWolf, John T., Mazurek, David F., and Sanghi, Sanjeev Mechanics of Materials, 8th Edition (in SI Units)., Tata McGraw Hill Education (2020).
2. Rattan, S. S. Strength of materials (2nd ed., Vol. 2). McGraw Hill Education (2011).
3. Dowling, N. E., Kampe, S. L., & Kral, M. V. Mechanical behavior of materials (5th ed.). Pearson. (2019).

References:

1. Anand, Lallit. Mechanics of Solid Materials. MIT Department of Mechanical Engineering, Cambridge, MA, USA. Year not specified. MIT MechE
2. Williams, James H., and Socrate, Simona. Lecture Notes on Mechanics & Materials I. MIT Open Course Ware, Massachusetts Institute of Technology, Cambridge, MA, USA, Fall 2006.
3. Reddy, J.N. Energy and Variational Methods in Applied Mechanics, Journal of Applied Mechanics, Vol. 72, No. 3 (2005), pp. 387-397. DOI: 10.1115/1.1894391
4. Christensen, R.M. Stress Analysis of Composite Bars Under Axial Load, Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Paper No. IMECE2004-61432, Anaheim, CA, USA, Nov. 13-19, 2004. DOI: 10.1115/IMECE2004-61432.

Online Educational Resources:

1. MIT OpenCourseWare (meche.mit.edu) – Courses on Mechanics of Solids and Materials Science
2. Purdue University Engineering (engineering.purdue.edu) – Solid Mechanics I Course

3. Cornell Engineering (engineering.cornell.edu) – Solid Mechanics Research & Courses
4. https://cosmolearning.org/courses/mechanics-solids-structural-mechanics/
5. http://nptel.ac.in/courses/112107146/
6. http://www.engineeringcorecourses.com/solidmechanics1/

Assessment (Theory course)
Continuous Assessment Test I & II, Online Quiz, Assignment I & II, End Semester Examination

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Dr. R. Santhanam, Senior Scientist "F", Defence Research & Development Organisation (DRDO)	Dr. S Venkatachalam Division of Aerospace Engineering Karunya Institute of Technology and Sciences	Mr. Naveen Kumar K, Assistant Professor, Department of Aeronautical Engineering	
Recommended by BoS on	07/05/2025		
Academic Council Approval	No.	**Date**	

24AET204	PRINCIPLES OF FLIGHT	L	T	P	J	C
		3	0	0	0	3
Professional Core		SDG	9			

Pre-requisite courses		Data Book / Code book (If any)	

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the evolution of flight technology, from early balloon flight to modern aircraft designs, including the Wright Brothers' contributions and advancements in aerodynamics, materials, and propulsion.
2	Identify the different types of flight vehicles, their components, and their functions, focusing on various wing and tail configurations.
3	Explain the fundamental principles of aerodynamics, including the generation of lift, drag, and pitching moments, and their impact on aircraft performance.
4	Explain the different aircraft propulsion systems, their working principles, and evaluate their comparative performance characteristics.
5	Understand the basic concepts of aircraft structures, including various construction types and materials used in aircraft design.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Recall the history of flight, including key milestones in aircraft design and technological advancements.	R
CO 2	Identify and describe the various components of flight vehicles and their functions in the overall operation of an aircraft.	U
CO 3	Explain the basic aerodynamic principles governing lift, drag, and pitching moments, and their effects on aircraft performance.	U
CO 4	Compare different aircraft propulsion systems and their suitability for specific flight requirements.	An
CO 5	Demonstrate an understanding of basic aircraft structures and materials, identifying the advantages and limitations of different construction types.	U

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	1	-	-	-	-	-	-	1	-	-	1	-

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
2	3	2	-	-	1	1	-	-	1	-	1	3	-
3	3	2	-	-	1	1	-	-	1	-	1	3	-
4	3	2	-	-	1	1	-	-	1	-	1	3	-
5	3	2	-	-	1	1	-	-	1	-	1	3	-

Course Content

HISTORY OF FLIGHT Balloon flight, Ornithopter, Heavier-than-air Flight, Wright Brothers' airplane, Evolution of aircraft design, Developments in aerodynamics, materials, structures and propulsion over the years.	**9 Hours**
AIRCRAFT CONFIGURATIONS Atmosphere and its properties - Different types of flight vehicles - classifications- Basic Components of aircraft- principle of operation and their functions - Different types of Wing and Tail configurations - Basic instruments for Flying	**9 Hours**
INTRODUCTION TO AERODYNAMICS Newton's law of motions applied to Aeronautics- Generation of lift, drag and pitching moment, Airfoil lift and drag curve, stall, types of drag, factors affecting lift and drag, Centre of pressure and its significance - aerodynamic center, aspect ratio, Mach number and supersonic flight effects.	**9 Hours**
INTRODUCTION TO AIRCRAFT PROPULSION Aircraft power plants, classification based on the principle of operation. Piston-Propeller Turboprop, Turbojet, Turbofan, Ramjet engines– use of propeller and jets for thrust production- Comparative merits, performance characteristics	**9 Hours**
INTRODUCTION TO AIRCRAFT STRUCTURES General types of construction, Monocoque, semi-monocoque constructions, typical wing and fuselage structure. Metallic and non-metallic materials. Use of Aluminium alloy, titanium, stainless steel and composite materials.	**9 Hours**

Theory	Tutorial	Practical	Project	Total
Hours:45	**Hours:0**	**Hours:0**	**Hours:0**	**Hours:45**

Learning Resources

Textbooks:

1. Anderson, J.D., "Introduction to Flight", Seventh Edition, McGraw-Hill, 2013.
2. Kermode, A.C. "Mechanics of Flight ", Pearson Education; Eleventh edition, 2006.

References:

1. Federal Aviation Administration "The pilot's handbook of aeronautical knowledge", 2016.

2. Dava Newman “Interactive Aerospace Engineering and Design”, McGraw-Hill, 2002.
3. Richard S. Shevell, "Fundamentals of Flight", Pearson, 2017.
4. David R. Jackson, "Principles of Flight," Butterworth-Heinemann, 2005.
5. R. H. Barnard, "Principles of Flight," Longman, 1991.

Online Educational Resources:

1. https://nptel.ac.in/courses/101106061/
2. https://nptel.ac.in/courses/101106057/
3. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-100-introduction-to-aeronautical-engineering-spring-2008/
4. https://www.coursera.org/learn/aviation-101
5. https://www.edx.org/course/aerospace-engineering

Assessment (Theory course)
CAT, Activity and Learning Task (One-minute paper, reflective journal, Open-ended questions), MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Dr. Lakshman Anumolu ExaSlate	Dr. K Rajasekar Jain University	Mr.Muthukumar S/AERO Dr.M. Senthil Kumar/AERO	
Recommended by BoS on	07/05/2025		
Academic Council Approval	No.	**Date**	

24INM201	Universal Human Values II: Understanding Harmony (Common to All Branches)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	3, 4, 5, 10, 12, 13, 14, 15, 16, 17			

Pre-requisite courses	-	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Introduce the concept and significance of value education in shaping a meaningful and fulfilling life.
2	Enable students to understand the human being as a co-existence of self and body and the harmony within.
3	Develop an understanding of harmony in relationships, family, and society.
4	Help students appreciate the interconnectedness and harmony in nature and existence.
5	Instil the importance of ethical behaviour in personal, professional, and social contexts.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Understand the foundational concepts of value education and human aspirations.	U
CO 2	Analyze the human being as a holistic entity comprising self and body.	An
CO 3	Evaluate and cultivate harmonious relationships within the family and society.	E
CO 4	Interpret the interconnectedness in nature and recognize harmony in existence.	U
CO 5	Apply holistic understanding to professional ethics and sustainable living.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	-	-	-	-	-	3	3	3	3	-	3	-	-
2	-	-	-	-	-	3	3	3	3	-	3	-	-
3	-	-	-	-	-	3	3	3	3	-	3	-	-
4	-	-	-	-	-	3	3	3	3	-	3	-	-
5	-	-	-	-	-	3	3	3	3	-	3	-	-

Course Content	
INTRODUCTION TO VALUE EDUCATION Value Education- Self-exploration as the Process for Value Education- Basic Human Aspirations and their Fulfilment - Right Understanding, Relationship and Physical Facility - Happiness and Prosperity – Current Scenario - Method to Fulfil the Basic Human Aspirations.	**3 Hours**
HARMONY IN THE HUMAN BEING Human Being as Co-existence of the Self and the Body- Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Understanding Harmony in the Self - Harmony of the Self with the Body - Programs to Ensure Self-regulation and Health.	**3 Hours**
HARMONY IN THE FAMILY AND SOCIETY Harmony in the Family – The Basic Unit of Human Interaction - 'Trust' – The Foundational Value in Relationship-Respect – As the Right Evaluation - Other Values in Human-to-Human Relationship - Understanding Harmony in the Society Lecture Vision for the Universal Human Order.	**3 Hours**
HARMONY IN THE NATURE (EXISTENCE) Understanding Harmony in Nature- Interconnectedness, Self-regulation and Mutual Fulfilment among the Four Orders of Nature- Realizing Existence as Co-existence at All Levels- The Holistic Perception of Harmony in Existence.	**3 Hours**
IMPLICATIONS OF THE HOLISTIC UNDERSTANDING - A LOOK AT PROFESSIONAL ETHICS Basis for Universal Human Values-Definitiveness of (Ethical) Human Conduct - professional Ethics in the Light of Right Understanding-A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order-Holistic Technologies, Production Systems-and Management Models - Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	**3 Hours**

Theory	Tutorial	Practical	Project	Total
Hours:15	**Hours:0**	**Hours:0**	**Hours:0**	**Hours:15**

Learning Resources
Textbooks:
1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
References:
1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, Jeevan Vidya:Publishers, 1999.
Online Educational Resources:
1. https://www.uhv.org.in/

Assessment (Theory course)
Presentation, MCQ, Assignment, Case Study and E Chart.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
	Sh. Umesh Jadhav, NCCIP (National Co-oridnation Committee)-AICTE	Dr.S.Sivakumar, Associate Professor, SFS Dr.R.Prakasam, Assistant Professor, Department of Physics Mr.J.Sivaguru, Assistant Professor, Department of Mechatronics	
Recommended by BoS on	03/05/2025		
Academic Council Approval	No.	**Date**	26/06/2025

24AEP205	CAD LABORATORY	L	T	P	J	C
		0	0	2	0	1
Practical		SDG	4 & 9			

Pre-requisite courses	Engineering Graphics	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Equip students with the skills to create complex 3D models and parts using advanced CAD tools.
2	Create parametric models, where the dimensions and constraints of a design can be easily modified, and changes automatically propagate throughout the model.
3	Manage complex assemblies and co-ordinating between various design components.
4	Develop collaboration skills by working in teams to design, review, and refine products.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Use various modelling tools such as sketcher, part design, surface design, and assembly design to create accurate, functional 3D representations of products.	Ap
CO 2	Apply parametric design techniques in CAD software, allowing them to define and modify models through dimensions and constraints.	Ap
CO 3	Modify designs parametrically, making it easy to update and adapt designs to new requirements or specifications.	An
CO 4	Design, draft and evaluate complex 3D models, parts, and assemblies using CAD software.	E, C

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	-	-	3	-	-	-	2	-	-	3	-
2	3	-	3	-	3	-	-	2	-	-	-	-	3
3	-	-	3	-	3	-	-	-	3	2	-	3	-
4	-	-	-	-	-	2	-	-	3	2	-	-	3

Course Content	
Ex. 1: Introduction to CAD Modeling and Sketching	
Ex. 2: Part design of Simple Mechanical Components	

Ex. 3: Part design of Upper Housing of a Blower	
Ex. 4: Part design of a Helical Gear	
Ex. 5: Study of Assembly workbench	
Ex. 6: Assembly of Universal Coupling	
Ex. 7: Assembly of Plummer Block	
Ex. 8: Study of Surface Modeling	
Ex. 9: Surface modeling of Airfoil	
Ex. 10: Drafting of Simple Engineering Components	

Theory Hours:		**Tutorial Hours:**		**Practical Hours:**	**30**	**Project Hours:**	**Total Hours:**	**30**

Learning Resources
Textbooks:
1. Sham Tickoo "CATIA V5-6R2019 for Designers" CADCIM Technologies, Pune, India (2019). 2. J. S. Arora "CATIA V5 Surface Design" Pearson Education, New Delhi, India (2012).
References:
1. Michel P. Weiner "CATIA V5 Workbook" McGraw-Hill Education, New York, USA (2006). 2. Ravikumar "CATIA V5 Design and Modeling" Wiley, Hoboken, New Jersey, USA (2016).
Online Educational Resources:
1. https://www.3ds.com/support/training/ 2. https://grabcad.com/tutorials 3. https://www.youtube.com/results?search_query=catia+tutorials

Assessment (Practical course)
Lab Workbook, Drawing Exercises, Model Exam, End Semester, and Viva-voce.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Mr. G.Verginvino TANCAM	Dr. R. Vishnu Dept. of Mechanical Engg, CIT, Coimbatore		Mr. Arun Kumar R, Aeronautical Engineering, KCT
Recommended by BoS on	07/05/2025		
Academic Council Approval		**Date**	

Semester-4

24HSP006	MASTERING GROUP DISCUSSION AND PRESENTATION SKILLS	L	T	P	J	C
		0	0	2	0	1
Practical		SDG	4 & 8			

Pre-requisite courses	Nil	Data Book / Codes / Standards (If any)	

Course Objectives:	The purpose of taking this course is to:
1	To equip learners with techniques for organizing and presenting ideas effectively, ensuring logical flow and engaging delivery through appropriate visual and verbal strategies.
2	To enhance students' ability to evaluate diverse viewpoints and articulate reasoned arguments, fostering meaningful participation in collaborative discussions.
3	To strengthen students' ability to adapt their speaking style and content to different audiences and contexts, utilizing digital tools for enhanced presentation effectiveness.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Create and deliver structured presentations with a clear introduction, body, and conclusion, utilizing effective visual tools and appropriate pacing to enhance clarity and impact.	C
CO 2	Analyse issues from multiple perspectives, articulate ideas effectively within group discussions	An
CO 3	Deliver confident presentations and speeches in professional and social settings, leveraging digital tools and technologies to enhance quality and effectiveness.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1		2			1	2		3	3		3		
2		2			1	2		3	3		3		
3		2			1	2		3	3		3		

Course Content

MODULE 1	6 Hours
Introduction to Group Discussions - Key skills for effective participation - Phases in a GD - Conversational Phrases in GD.	

Group Dynamics - Understanding group roles and dynamics - Conflict resolution and management in groups - Techniques for fostering collaboration. **Presentations** - Introduction to Visual Aids and Technology in Presentations. **Delivery Techniques** - Voice modulation and speech clarity - Body language and gestures – audience analysis. **Handling Q&A Sessions** - Preparing for audience questions - Techniques for handling difficult questions - Mock Presentation with Q&A sessions.	
MODULE 2 **Factual Group Discussions**: Focus on sharing and verifying accurate information on a given topic. Participants base their contributions on verifiable data and concrete evidence. **Opinion-based / Argumentative Group Discussion**: Encourages participants to express and defend their point of view on a topic. Evaluate different perspectives and build critical thinking skills.	**6 Hours**
MODULE 3 **Case Study Group Discussion**: Involves analyzing the complexities, identifying key issues, and developing insights or solutions based on the group's collective knowledge. **Abstract Discussion**: Deals with intangible concepts, ideas, or themes without concrete reference points. Encourages creative thinking and theoretical exploration.	**6 Hours**
MODULE 4 **Impromptu Presentations**: Participants speak on a given topic with little to no preparation. Helps develop quick thinking and effective communication skills. **Informative Presentation**: Aims to educate the audience on a specific topic by providing clear, factual information. The focus is on clarity, accuracy, and comprehensiveness. **Demonstrative Presentation**: Interactive sessions where participants engage in hands-on activities to learn practical skills. Often includes exercises, demonstrations, and collaborative tasks.	**6 Hours**
MODULE 5 **Training and Technical Presentation**: Designed to teach specific technical skills or procedures. Includes detailed instructions, demonstrations, and may involve technical jargon. **Academic Presentation**: Involves presenting research findings or theoretical concepts in an academic setting. Emphasizes clarity, evidence-based arguments, and adherence to scholarly standards. **Pitch Presentation:** A concise, persuasive presentation aimed at securing support, investment, or approval. Focuses on the value proposition, potential benefits, and unique selling points. **Persuasive Presentation**: Seeks to convince the audience to adopt a particular viewpoint or take a specific action. Utilizes logical arguments, emotional appeals, and credible evidence. **Multimedia Presentations**: Uses visual and auditory media to convey information and present arguments. Enhances engagement and aids in illustrating complex concepts.	**6 Hours**

Theory Hours:	**-**	**Tutorial Hours:**	**-**	**Practical Hours:**	**2**	**Project Hours:**	**-**	**Total Hours:**	**30**

Learning Resources*
Reference books/ Web Links
1. Powell, M. (2010). Dynamic presentations student's book with audio CDs (2). Cambridge University Press. 2. Reynolds, G. (2011). Presentation Zen: Simple ideas on presentation design and delivery. New Riders. 3. Galanes, G. J., Adams, K., & Brilhart, J. K. (2020). Effective group discussion: Theory and practice (15th ed.). McGraw-Hill Education. 4. Adams, K., & Galanes, G. (2018). Communicating in groups: Applications and skills, a practical guide (18th ed.). McGraw-Hill Education. 5. Ivy, D. K., & Backlund, P. (2018). Speak with confidence: A practical guide. Pearson. 6. Reynolds, G. (2019). Presentation Zen: Simple ideas on presentation design and delivery. New Riders.
Online Resources
1. https://www.coursera.org/learn/verbal-communications-and-presentation-skills 2. https://www.coursera.org/learn/present-with-purpose 3. https://www.coursera.org/learn/teamwork-skills-effective-communication

Assessment	
Formative	Summative
-----	1. Participation in group discussions (40%) 2. Individual presentations (40%) 3. Quizzes and written assignments (20%)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
Mr. Bhuvana Sundar Soorappaiah Program Manager Bosch, Coimbatore	Dr Kishore Selva Babu Head and Associate Professor Department of English and Cultural Studies Christ University Bangalore-560029	Dr. J Srikala- AP III Dr. C Tissaa Tony - AP III Dr. S G Mohanraj – AP III Dr. S Sreejan – AP III Dr. R Hema – AP II Dr. A S Mythili - AP II

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	**25.04.2025**

24MAI241	NUMERICAL METHODS AND PROBABILITY (Common to AE, AU, CE, ME, MR)	L	T	P	J	C
		3	0	2	0	4
BS		SDG	4, 8, 9			

Pre-requisite courses	-	Data Book / Codes books (If any)	Normal table

Course Objectives:

The purpose of this course is to:

1	Solve algebraic and transcendental equations where analytical solutions are impractical or impossible.
2	Develop the ability to solve engineering problems and other real-world applications using interpolation and integration methods for both data analysis and numerical solutions.
3	Develop problem-solving skills by using these numerical methods to model and solve real-world engineering and scientific problems involving first-order differential equations.
4	Critically analyze the performance of different numerical methods in terms of accuracy, stability, and computational efficiency for solving partial differential equations in practical engineering applications.
5	Apply probability theory to model and solve real-world problems involving uncertainty, risk analysis, and decision-making in engineering, business, and science.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply numerical methods such as Newton–Raphson and Gauss–Jordan techniques to solve algebraic, transcendental, and linear systems of equations arising in engineering applications.	Ap
CO 2	Construct interpolation polynomials and use them for numerical differentiation and integration employing Trapezoidal and Simpson's rules to approximate functions and definite integrals.	Ap
CO 3	Implement numerical techniques including Taylor series, Euler, Improved Euler, Runge–Kutta, and Milne's predictor–corrector methods for solving ordinary differential equations (ODEs).	Ap
CO 4	Solve two-dimensional Laplace's equations using finite difference techniques and visualize potential distributions on rectangular domains relevant to engineering and electrostatics problems.	Ap
CO 5	Analyze and model real-world problems involving uncertainty using fundamental probability concepts.	An
CO 6	Examine the Normal distribution and its properties, and apply it to model and solve engineering and scientific problems involving random variations.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)
	1	2	3	4	5	6	7	8	9	10	11	

Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	-	-	1	-	-	-	-	-	1	-	-
2	3	3	-	-	2	-	-	-	-	-	1	-	-
3	3	2	-	-	2	-	-	-	-	-	2	-	-
4	3	3	-	-	3	-	-	-	-	-	2	-	-
5	3	3	-	-	3	-	-	-	-	-	2	-	-
6	3	2	-	-	3	-	-	-	-	-	2	-	-

Course Content

NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS Fixed point Iteration method, Newton's method –Solution of linear system by Gauss Jordan method - Iterative method: Gauss Seidel method – Inverse of a matrix by Gauss Jordan method-Jacobi method for finding eigenvalues. **Practical Component** • Gauss Jordan method. • Newton Raphson method.	**9 Hours** **6 Hours**
INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION Newton's forward, backward and divided difference interpolation, Cubic spline interpolation – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 and 3/8 rules. **Practical Component** • Newton's divided difference interpolation • Numerical integration by Simpsons rule	**9 Hours** **6 Hours**
NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS Taylor's series method – Euler and Improved Euler methods, fourth order Runge-Kutta method for solving first order equations – Multistep method: Milne's predictor and corrector method, Adams Bashforth method **Practical Component** • Numerical solution of ODE by Euler's method. • Numerical solution of ODE by Milne's method.	**9 Hours** **6 Hours**
SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS Solution of one-dimensional heat equation using Bender Schmidt and Crank Nicholson difference schemes –Solution of one-dimensional wave equation by explicit scheme. Finite difference techniques for the solution of two-dimensional Laplace's equation on rectangular domain. **Practical Component** • Solution of one-dimensional heat equation using Bender Schmidt method.	**9 Hours** **6 Hours**

• Solution of one-dimensional wave equation by explicit scheme	
PROBABILITY AND RANDOM VARIABLES Axioms of probability - Conditional probability – Total probability – Bayes' theorem – Random variable – Distribution function – properties – Probability mass function-Probability density function –Normal distributions – Properties. **Practical Component** • Introduction to R Programming • Normal distribution.	**9 Hours** **6 Hours**

Theory Hours: 45	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 75

Learning Resources

Textbooks

1. Steven C. Chapra and Raymond P. Canale., Numerical Methods for Engineers with Programming and Software Applications., McGraw-Hill ,7th Edition (2021).
2. Johnson R.A., Miller I and Freund J., Miller and Freund's Probability and Statistics for Engineers., PearsonEducation, Asia 8th Edition (2015).

Reference books

1. Numerical Methods for Scientific and Engineering Computation by M.K. Jain, S.R.K.Iyengar and R.K. Jain, New Age International Publishers 2019.
2. Gupta S.C and Kapoor V.K, "Fundamentals of Mathematical Statistics", 11th extensively revised edition, Sultan Chand & Sons, 2020.
3. Conte S.D and Carl de Boor., Elementary Numerical Analysis - An Algorithmic Approach., McGraw-Hill (2018)
4. John H. Mathews and Kurtis D. Fink., Numerical Methods using Matlab, Prentice Hall of India,4th Edition (2021).

Online Resources (Web Links)

1. https://nptel.ac.in/courses/111106101
2. https//nptel.ac.in/courses/111105041

Assessment

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
1. Mr. Ramesh V.S., STEPS Knowledge Services Private Limited, Coimbatore.	1. Dr. M. Sivakumar Assistant Professor Sr. Grade Vellore Institute of Technology, Vellore 2. Dr. Ramesh Babu Assistant Professor (SG) Amrita University Coimbatore, Tamil Nadu.	1. Dr. S.Meena Priyadarshini Assistant Professor II Department of Mathematics,KCT 2. Ms.S.Sivasakthi Assistant Professor (SRG) Department of Mathematics, KCT

Recommended by BoS on	28.11.2025		
Academic Council Approval	No:	**Date**	

24AEI206	AERODYNAMICS I	L	T	P	J	C
		2	0	2	0	3
Professional Core		SDG	4, 9 & 13			

Pre-requisite courses	24AEI202	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Apply fundamental aerodynamic equations to calculate flow properties, pressure coefficients, and measure airspeed using experimental techniques.
2	Determine aerodynamic forces and pressure distributions on idealized two-dimensional bodies by applying the principle of potential flow superposition and the Kutta-Joukowski theorem.
3	Analyze the aerodynamic performance of airfoils by applying Thin Airfoil Theory to calculate lift and moment coefficients and identify key aerodynamic reference centers.
4	Evaluate the three-dimensional effects of finite wings by using Prandtl's Lifting Line Theory to predict lift distribution, induced drag, and wing efficiency.
5	Examine propeller performance characteristics and efficiency using froude momentum and blade element theories for fixed and variable pitch propellers.
6	Develop hands-on skills through experimental techniques, including pressure distribution measurement, force analysis on airfoils and wings, and aerodynamic performance evaluation of propellers.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Calculate aerodynamic flow properties and pressure coefficients using the governing fluid dynamic equations	Ap
CO 2	Apply the principle of superposition of elementary potential flows to determine the aerodynamic forces on idealized bodies	Ap
CO 3	Apply Thin Airfoil Theory to calculate the aerodynamic coefficients and characteristic centers of airfoils	Ap
CO 4	Apply Prandtl's Lifting Line Theory to determine the aerodynamic characteristics of finite wings.	Ap
CO 5	Analyze the forces, efficiency, and performance characteristics of propellers using momentum and blade element theories.	An
CO 6	Conduct experimental analysis of aerodynamic characteristics for airfoils, wings, and propellers.	An

Course Outcomes (COs)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO1	PSO2
1	3	2	1	2	1	-	-	1	1	-	1	3	1
2	3	3	1	2	1	-	-	1	1	-	1	3	1
3	3	3	2	2	2	-	-	1	1	-	1	3	2
4	3	2	2	2	2	-	-	1	1	-	1	3	2
5	3	2	2	3	2	-	-	1	1	-	1	3	2
6	3	3	2	3	3	-	-	3	3	3	-	3	3

Course Content

INTRODUCTION TO AERODYNAMICS Aerodynamic forces and moments – Pressure distribution on an airfoil – Continuity, momentum equation – Euler's equation – Bernoulli's Equation – Pitot tube: Measurement of airspeed. Pressure Coefficient - Circulation and Vorticity - Streamline, stream function, irrotational flow, potential function, Equipotential lines **Practical Component:** • Measurement of airspeed using a Pitot tube • Verification of Bernoulli's equation	**5 Hours** **4 Hours**
TWO DIMENSIONAL POTENTIAL FLOWS Elementary flows – Uniform, Source, Sink, Doublet and Vortex flow, Combination of a uniform flow with a source and sink, non-lifting flow over a circular cylinder, Lifting flow over a cylinder, Kutta Joukowski theorem and Generation of lift, Flow over a flat plate, D'Alembert Paradox, Magnus effect. **Practical Component:** • Pressure distribution over smooth cylinder • Pressure distribution over rough cylinder	**7 Hours** **6 Hours**
AIRFOIL THEORY Airfoil Nomenclature – Airfoil characteristics – Kelvin's circulation theorem – Thin airfoil theory and its applications – Kutta condition - Aerodynamic Center – Center of pressure. **Practical Component:** • Pressure distribution over symmetrical airfoil • Pressure distribution over cambered airfoil. • Determination of Aerodynamic coefficients of airfoils using computational analysis tools	**7 Hours** **8 Hours**
Wing Theory Vortex filament, bound vortex and trailing vortex, Horse shoe vortex, Biot and Savart law – Downwash and induced drag – Helmholtz theorems, Prandtl's lifting line theory - Applications of Prandtl's lifting line theory.	**7 Hours**

Practical Component: • Force measurement on a wing with symmetircal airfoil • Force measurement on a wing with cambered airfoil • Evaluation of aerodynamic coefficients using XFLR5 (VLM) and MATLAB	**8 Hours**
PROPELLER THEORY Froude momentum and Blade element theories – Propeller coefficients – Performance of fixed and variable pitch propeller – propeller efficiency. **Practical Component:** • Performance analysis of propeller	**4 Hours** **4 Hours**

Theory	Tutorial	Practical	Project	Total
Hours:30	**Hours:0**	**Hours:30**	**Hours:0**	**Hours:60**

Learning Resources

Textbooks:

1. John D. Anderson, **"Fundamentals of Aerodynamics"**, McGraw-Hill Education, United States, 2023.
2. E.L. Houghton, P.W. Carpenter, Steven Collicott, and Daniel Valentine, **"Aerodynamics for Engineering Students"**, Butterworth-Heinemann, United Kingdom, 2021.

References:

1. L.J. Clancy, "Aerodynamics", Pitman Publishing, United Kingdom, 1975.
2. Ethirajan Rathakrishnan, "Theoretical Aerodynamics", Wiley, India, 2021.
3. J.J. Bertin and M.L. Smith, "Aerodynamics for Engineers", Pearson, United States, 2021.
4. A.M. Kuethe and J.D. Schetzer, "Foundations of Aerodynamics: Bases of Aerodynamic Design", Wiley, United States, 1997.
5. Milne-Thomson L.M., "Theoretical Aerodynamics", Dover Publications, United States, 1973.

Online Educational Resources:

1. https://nptel.ac.in/courses/101106042
2. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-01-16-02-unified-engineering-i-ii-iii-iv-fall-2005/
3. https://www.grc.nasa.gov/www/k-12/airplane/bga.html
4. https://aerospaceweb.org/design/ucav/aerodynamics.shtml
5. https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak

Assessment

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Dr. Lakshman Anumolu ExaSlate	Dr. K Rajasekar Jain University	Mr.Muthukumar S /AERO Dr.M. Senthil Kumar/AERO
Recommended by BoS on	06/12/2025	
Academic Council Approval	No.	**Date**

24AEI207	AIRCRAFT STRUCTURES I	L	T	P	J	C
		2	0	2	0	3
Professional Core		SDG	4, 9, 11, 12			

Pre-requisite courses	24AET203	Data Book / Code book (If any)	NA

Course Objectives:

The purpose of taking this course is to:

1	Develop a fundamental understanding of statically determinate and indeterminate structures and their behavior under different loading conditions.
2	Equip students with analytical skills for solving structural problems using energy methods, strain energy principles, and Castigliano's theorem.
3	Introduce the concepts of column stability and buckling analysis using Euler's and Rankine's theories.
4	Provide knowledge of failure criteria and fracture mechanics, including stress intensity factors and fatigue crack propagation.
5	Integrate theoretical concepts with practical applications through hands-on experiments and computational analysis.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze statically determinate structures, including plane and space trusses, using appropriate methods.	An
CO 2	Analyze statically indeterminate structures using advanced techniques such as Clapeyron's Three Moment Equation and the Moment Distribution Method.	An
CO 3	Analyze column stability problems and predict buckling loads using Euler's and Rankine's equations for aerospace structures.	Ap
CO 4	Identify the stability of columns under different loading conditions using Euler's and Rankine's theories.	Ap
CO 5	Understand failure theories and fracture mechanics principles, including stress intensity factors and fatigue analysis.	U
CO 6	Demonstrate the experiments with UTM and determinate beam structures to determinate the predominant parameters.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	1	-	-	-	-	-	-	-	2	3	1

2	3	3	2	2	-	-	1	1	-	-	2	2	1
3	3	3	2	2	-	-	1	1	-	-	2	3	1
4	3	3	1	1	-	-	1	1	-	-	2	2	1
5	3	2	1	2	-	-	-	-	-	-	2	3	1
6	3	2	2	1	2	2	2	3	3	1	2	3	1

Course Content

STATICALLY DETERMINATE STRUCTURES Analysis of plane truss – Method of joints, zero-force members, determinacy checks, method of sections, common truss configurations, real-world truss behaviour. 3D (Space) Truss – Coordinate transformation, stability in 3D, force resolution in space frames, applications in aerospace structures **Practical Component:** • Determination beam support reaction. • Verification of Maxwell's Reciprocal theorem.	**6 Hours** **6 Hours**
STATICALLY INDETERMINATE STRUCTURES Clapeyron's Three Moment Equation – Continuous beam analysis, settlement of supports, variable flexural rigidity. Moment Distribution Method – Slope-deflection background, analysis of airframe frames, fuselage bulkhead flexibility. **Practical Component:** • Determination of Young's Modulus using deflection of Cantilever beam. • Verification of Clapeyron's Three-Moment Equation for a Two-Span Continuous Beam	**6 Hours** **6 Hours**
ENERGY METHODS Strain Energy due to axial, bending and torsional loads. Castigliano's theorem for displacements and moments – Deflection analysis of wing spars, rotor blades and truss-type aircraft structures. Unit load method – Virtual work principle, calculation of slopes and deflections, application to beams, trusses and frames. **Practical Component:** • Verification of Castigliano's theorem in a simply supported beam. • Hardness Test • Charpy Impact tests.	**6 Hours** **6 Hours**
COLUMNS Elastic and Inelastic Buckling: Euler's Column theory – Derivation and critical load prediction. Rankine's formula – Combined elastic and inelastic behaviour, empirical constants. Column with initial curvature, Eccentric loading, Beam column. **Practical Component:** • Validation of Euler's and Rankine's theories for critical buckling load.	**6 Hours** **4 Hours**
FAILURE CRITERIA AND FRACTURE MECHANICS Failure Theories: Maximum Stress, Maximum Strain, Maximum Shear Stress, Distortion Energy Theory, Application to ductile and brittle materials, yield surface interpretation. multi-axial stress evaluation in wings, fuselage, and engine pylon structures. Fracture Mechanics: fatigue and crack propagation. **Practical Component:** • Torsion Test. • Testing failure theories using a universal testing machine (UTM). • Determination of stress-strain behaviour and fracture strength of steel using UTM.	**6 Hours** **8 Hours**

Theory Hours: 30	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 60

Learning Resources

Textbooks:

1. Timoshenko, S. P., & Gere, J. M. Theory of Elastic Stability. McGraw-Hill Education (2017).
2. Srinath, L. N. Advanced Mechanics of Solids. Tata McGraw-Hill Education, 3rd Edition (2008).
3. Gere, J. M., & Goodno, B. J. Mechanics of Materials (9th ed.). Cengage Learning (2020).
4. Hibbeler, R. C. Structural Analysis (11th ed.). Pearson (2022).

References:

1. Megson, T. H. G. Aircraft Structures for Engineering Students (6th ed.). Butterworth-Heinemann (2019).
2. Hertzberg, Richard W., Vinci, Richard P., and Hertzberg, Jason L. Deformation and Fracture Mechanics of Engineering Materials, Wiley, New York, NY (2012).
3. Bazant, Zdeněk P., and Cedolin, Luigi. "Stability of Structures: Elastic, Inelastic, Fracture, and Damage Theories." Journal of Engineering Mechanics, Vol. 121 No. 12 (1995): pp. 1393-1402, DOI: 10.1061/(ASCE)0733-9399.
4. Zingoni, Alphose. "Advances in the Stability Analysis of Statically Indeterminate Structures." Proceedings of the 5th International Conference on Structural Engineering, Paper #102, Cape Town, South Africa, March 10-12, 2015.
5. Bruhn, Ernest. "Analysis and Design of Flight Vehicle Structures." Technical Report No. 23-567, Purdue University, Indiana, USA (1973).

Online Educational Resources:

1. https://ocw.mit.edu/courses/2-080j-structural-mechanics-fall-2013/
2. https://www.edx.org/learn/engineering/massachusetts-institute-of-technology-elements-of-structures
3. http://nptel.ac.in/courses/112106141/
4. https://www.edx.org/course/introduction-to-aerospace-structures-and-materials
5. https://cosmolearning.org/courses/introduction-aerospace-structures/

Assessment

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
Dr. R. Santhanam, Senior Scientist "F", Defence Research & Development Organisation (DRDO)	Dr. S Venkatachalam Division of Aerospace Engineering Karunya Institute of Technology and Sciences	Mr. Naveen Kumar K, Assistant Professor, Department of Aeronautical Engineering
Recommended by BoS on	06/12/2025	
Academic Council Approval	No.	**Date**

24AEI208	AIRCRAFT PROPULSION	L	T	P	J	C
		2	0	2	0	3
Professional Core		SDG	7 & 9			

Pre-requisite courses	24AEI201	Data Book / Code book (If any)	-

Course Objectives:	
The purpose of taking this course is to:	
1	Explain the fundamentals, performance parameters, and modern advancements in piston engines and gas turbine engines.
2	Describe inlet, fan, and nozzle aerodynamic behaviour and their influence on engine operability and thrust generation.
3	Interpret the operating principles, energy transfer mechanisms, and stability considerations of axial and centrifugal compressors.
4	Discuss combustion processes, emission formation, and sustainable propulsion technologies including hydrogen combustion and SAF.
5	Explain turbine aerothermodynamics, cooling techniques, and emerging future propulsion concepts for next-generation aircraft.
6	Perform experiments to interpret thrust, flow, combustion, and heat-transfer characteristics relevant to air-breathing propulsion systems.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Summarize the working principles, thrust equation, and performance parameters of piston and gas turbine engines including UHBR and GTF technologies.	Un
CO 2	Analyze inlet, and nozzle aerodynamic behaviour, losses, pressure recovery, and thrust production.	An
CO 3	Explain energy transfer, stage loading, degree of reaction, and stability limits of axial and centrifugal compressors.	Ap
CO 4	Interpret combustion processes, emission formation, low-emission combustor technologies, hydrogen combustion and SAF-based sustainable propulsion.	Ap
CO 5	Analyze turbine aerodynamics, blade cooling techniques, and emerging hybrid-electric, open-rotor, and fuel-cell propulsion systems.	An
CO 6	Evaluate the performance and thermal behaviour of air-breathing propulsion components through experimental analysis.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Teamwork	Communication	Project Management and Finance	Life-Long Learning	PSO1	PSO2
1	3	2	1	1	1	-	-	-	-	-	2	3	2
2	3	3	2	2	3	-	-	1	-	-	2	3	2
3	3	2	2	1	2	-	-	-	-	-	2	3	2
4	2	2	1	-	1	3	-	-	-	-	3	2	2
5	3	2	2	1	2	-	-	1	-	-	3	3	2
6	3	3	2	3	3	-	-	3	2	2	3	3	3

Course Content

AIR-BREATHING PROPULSION FUNDAMENTALS Overview of piston and gas turbine engines-working principles and engine component functions. Thrust equation and factors influencing thrust -Key performance parameters including SFC and efficiencies. Comparison of turbojet, turbofan, turboprop, and turboshaft engines - Introduction to modern ultra-high bypass ratio (UHBR) and geared turbofan (GTF) technologies.	**6 Hours**
Practical Component: • Measurement of Thrust and Efficiency of a Propeller • Component Study and Operating Cycle of a Reciprocating (Piston) Engine	**6 Hours**
INLET AND NOZZLE Subsonic and supersonic inlet - ram recovery characteristics - Inlet losses and starting issues. Nozzle types including convergent and convergent–divergent nozzles - nozzle performance parameters, and variable-area nozzles. Fundamentals of thrust reversal and intake/exhaust design considerations in modern aircraft engines, Introduction to noise reduction and control methods.	**5 Hours**
Practical Component: • Determination of Pressure Recovery in a Two-Dimensional Diffuser • Study of Thrust Characteristics of a Nozzle • Analysis of Velocity Profiles in Free Jet and Wall Jet Flows	**6 Hours**
COMPRESSOR AERODYNAMICS AND PERFORMANCE Principles of centrifugal and axial compressors, Euler's turbomachinery equation, and energy transfer. Velocity triangles, stage loading, and degree of reaction. Compressor characteristics including stall, surge, and methods to improve stall margin using variable IGVs and bleed systems. Introduction to transonic compressor technology.	**6 Hours**
Practical Component: • Study of Major Components and Flow Path of a Jet Engine	**6 Hours**

COMBUSTION AND SUSTAINABLE PROPULSION Types of aircraft combustors and their operating processes- flame stabilization and combustor cooling techniques. Formation of emissions (NOx, CO, UHC) and basic ICAO emission standards. Overview of low-emission combustor technologies -lean burn and RQL (Rich-burn, Quick-mix, Lean-burn) designs. Introduction to sustainable propulsion concepts - hydrogen combustion fundamentals - compatibility with Sustainable Aviation Fuels (SAF). **Practical Component:** • Measurement of flame speed using different air fuel ratios • Demonstration of the combustion process in Ramjet Engine	**6 Hours** **6 Hours**
TURBINES AND FUTURE PROPULSION SYSTEMS Axial turbine stage fundamental - velocity triangle- turbine work output, and stage efficiency. Introduction to heat transfer - Basics of turbine blade cooling techniques - internal cooling and film cooling. Turbine compressor matching and operability considerations. Introduction to next-generation propulsion systems. **Practical Component:** • Demonstration of free and forced convection	**7 Hours** **6 Hours**

Theory Hours:	**30**	**Tutorial Hours:**	**0**	**Practical Hours**	**30**	**Project Hours:**	**0**	**Total Hours:**	**60**

Learning Resources

Textbooks:

1. Philip Hill and Carl Peterson, 'Mechanics and Thermodynamics of Propulsion', Pearson Education, United Kingdom, 2009.
2. Saravanamuttoo, H.I.H., Paul Straznicky, Henry Cohen, and Gordon Rogers, 'Gas Turbine Theory', United Kingdom, Pearson Education, 2019.

References:

1. Ganesan. V., 'Gas Turbines', McGraw-Hill Education, McGraw Hill Education, New York City,2017.
2. Jack D. Mattingly, 'Elements of Propulsion: Gas Turbines and Rockets', American Institute of Aeronautics & Astronautics, United States, 2017.
3. Saeed Farokhi, 'Aircraft Propulsion', Wiley, India, 2014.
4. Ahmed F. El-Sayed, 'Aircraft Propulsion and Gas Turbine Engines', CRC Press, India,2017.
5. C. Jaganathan and S.K Jain, "Jet Engines", Yes Dee,India, 2016.

Online Educational Resources:

1. https://nptel.ac.in/courses/101101002/
2. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-50-introductionto-propulsion-systems-spring-2012/
3. https://www.grc.nasa.gov/www/k-12/UEET/StudentSite/engines.html.
4. https://www.rolls-royce.com/products-and-services/civil-aerospace.aspx.
5. https://www.geaviation.com/commercial/engines

Assessment

SA I and SA II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE), Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**		**Internal Expert(s)**
Mr.Thiyagarajan K Manager, Engine Manufacturing sector, Tata Advance System, Hyderabad.	Dr. A.P. Haran, Professor & Dean of Mechanical Sciences, PARK College of Engineering & Technology, Coimbatore.		Mr.R.Arul Prakash/AERO Dr.M. Senthil Kumar/AERO
Recommended by BoS on	06/12/2025		
Academic Council Approval	No.	**Date**	

24AET209	AIRCRAFT MECHANISMS AND MACHINE DYNAMICS	L	T	P	J	C
		3	0	0	0	3
Professional Core		SDG	4, 9 & 12			

Pre-requisite courses	Engineering Mechanics	Data Book / Code book (If any)	NA

Course Objectives:

The purpose of taking this course is to:

1	Understand the kinematic structure and analysis of mechanisms used in machines, engines, and flight systems.
2	Recognize different cam types and follower motions and to develop cam profiles for specified motion transmission.
3	Solve problems related to friction in machine elements relevant to aerospace applications.
4	Apply the law of gearing and gear train principles to compute velocity ratios and study interference in gears.
5	Describe and apply balancing techniques for rotating and reciprocating masses, critical in aero-engines and propellers.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Identify types of mechanisms and differentiate the motion of four-bar linkages, slider-crank, and other inversions for aerospace applications.	An
CO 2	Classify cam types and follower motions, and construct cam profiles (SHM, cycloidal, uniform velocity) for motion transmission.	An
CO 3	Apply principles of friction in machine elements and determine forces in clutches, brakes, and bearings used in aerospace systems.	Ap
CO 4	Apply gear terminology and the law of gearing to analyse gear trains and calculate velocity ratios.	An
CO 5	Interpret principles of static and dynamic balancing and predict reciprocating mass balancing and gyroscopic effects in rotating components.	E

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	3	2	2	3	2	-	3	3	-	2	3	2
2	3	3	3	2	2	-	-	3	3	-	2	3	2
3	3	2	2	2	2	2	2	3	3	-	2	3	2
4	3	3	3	2	2	2	2	3	3	-	2	3	3
5	3	3	2	3	2	3	3	3	3	-	2	3	3

Course Content	
MECHANISMS Introduction to Mechanisms: Definitions: link, pair, chain, kinematic structure -Types of pairs (lower and higher pairs) -Types of motion: translation, rotation, oscillation - Gruebler's criterion (mobility) - Constrained motion, degrees of freedom. Basic Mechanisms: Four-bar linkage - Grashof conditions - Slider-crank mechanism and its inversions. Kinematic Analysis: Graphical methods (velocity and acceleration polygons) - Relative velocity method- Instantaneous centres (centroid method) - Klein's construction - Coriolis acceleration component.	**12 Hours**
CAMS & FOLLOWERS Cams and Followers: Types of cams (disc, cylindrical, translating) and followers (roller, knife-edge, flat). Displacement (motion) curves: uniform velocity, simple harmonic motion (SHM), uniform acceleration and deceleration and cycloidal motion. Layout and construction of cam profiles - Pressure angle, undercutting, and design issues – Cam & Follower assemblies for precise actuation of aircraft controls - valve actuators in IC Engines.	**8 Hours**
FRICTION Fundamentals of Friction: Static vs kinetic friction, rolling friction - Laws of dry friction -Viscous (fluid) friction. Surface Contacts & Lubrication: Screw and nut friction (self-locking, efficiency) - Pivot and collar friction - Types of Thrust Bearings Used in Aircraft. Friction Devices: Clutches and Brakes: Friction in Power Transmission Devices: Belt drives (flat belt, V-belt).	**10 Hours**
GEARS AND GEAR TRAINS Gears: Law of gearing (involute profile) - Gear terminology (pitch circle, base circle, addendum, dedendum, tooth thickness, etc.) Interference and undercutting; minimum number of teeth. Types of Gears: spur, helical, bevel, worm & worm wheel, rack & pinion - Gear materials. Gear Trains: Types: simple, compound, reverted, epicyclic (planetary) - Velocity ratio calculation: analytical and tabular methods.	**7 Hours**
BALANCING Static and Dynamic Balancing: Concept of balancing, reason for unbalance - Static balancing of rotating masses - Dynamic balancing (single and multiple plane). Introduction to Vibration - Definition of vibration, Free and forced vibration - Relation between imbalance and vibration. Reciprocating Mass Balancing: Primary and secondary balancing in reciprocating engines Gyroscopic Effects: Principle of gyroscopic couple - Effect of gyroscopic moments in aircraft (during turning, pitching) - Gyroscopic effects in propellers, rotors - Implications for stability and control.	**8 Hours**

Theory Hours: 45	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours: 45

Learning Resources

Textbooks:

1. Shigley, Joseph E., Uicker, John J., and Pennock, Gordon R., Theory of Machines and Mechanisms, Oxford University Press, New York (2017).
2. Norton, R.L., Design of Machinery, 6th Edition, McGraw-Hill, 2020
3. Ratan, S. S., Theory of Machines, Tata McGraw-Hill, New Delhi (2019).

References:

1. Uicker, John J., Pennock, Gordon R., and Shigley, Joseph E., Theory of Machines and Mechanisms, Oxford University Press, New York (2017).
2. Riley, William F., and Sturges, Leroy D., Engineering Mechanics: Dynamics (often used for Mechanics of Machines topics), McGraw-Hill, New York (2002).
3. Sclater, Neil, Mechanisms & Mechanical Devices Sourcebook, McGraw-Hill, New York (2020).

Online Educational Resources:

1. Kinematics of Mechanisms and Machines: https://nptel.ac.in/courses/112105268
2. Kinematics of Machines: https://nptel.ac.in/courses/112104121
3. Dynamics of Machines: https://www.youtube.com/playlist?list=PL46AAEDA6ABAFCA78
4. Mechanisms: https://ocw.metu.edu.tr/mod/resource/view.php?id=2094&forceview=1

Assessment

SA I and SA II, MCQ, Assignments (FA) – Written Assignments, Presentations & Demonstrations (Using working models & Software tools) & Lab Visits, End Semester Examination

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
-	Dr.R.Vishnu Dept. of Mechanical Engg., CIT, Coimbatore	Mr R. Arun Kumar

Recommended by BoS on	06/12/2025		
Academic Council Approval		**Date**	

24AET210	AIRCRAFT SYSTEMS AND INSTRUMENTS	L	T	P	J	C
		3	0	0	0	3
Professional Core		SDG	7 & 9			

Pre-requisite courses	24AET204	Data Book / Code book (If any)	NA

Course Objectives:	
The purpose of taking this course is to:	
1	Provide an understanding of the fundamental aircraft systems and their integration in flight operations.
2	Introduce students to different types of aircraft powerplants and their operational principles.
3	Understand the classification of flight instruments and their role in navigation and control.
4	Familiarize students with modern aircraft safety measures through simulation and case studies.
5	Analyse human factors affecting cockpit design and pilot workload management.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain the working principles of various aircraft systems, including flight control, hydraulic, and electrical systems.	U
CO 2	Interpret and analyze data from flight instruments, including pitot-static systems, gyroscopic instruments, and electronic flight displays.	An
CO 3	Demonstrate knowledge of modern avionics, navigation aids and aircraft communication systems used in flight operations.	Ap
CO 4	Understand the role of Flight Data Recorders (FDR), Cockpit Voice Recorders (CVR), and emergency systems in enhancing aircraft safety and accident investigation.	U
CO 5	Describe the inspection procedure and troubleshooting on aircraft.	R

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2	2	2	1	3	1	2	3	2	2	3	1
2	3	2	1	2	1	3	1	2	2	2	2	3	1
3	3	2	2	2	1	3	2	2	2	2	2	3	1
4	3	2	1	2	1	3	2	2	2	2	2	3	1
5	3	2	2	2	1	3	1	2	2	2	2	3	1

Course Content

AIRCRAFT SYSTEMS AND FLIGHT CONTROL TECHNOLOGIES Overview of Aircraft Systems and Subsystems, Classification of Flight Systems, Fluid Power Systems in Aircraft, Electrical Power generation and distribution system, Aircraft Ice Protection and Prevention Systems, Advanced Flight control systems – FBW-Autopilot, Morphing wings.	**9 Hours**
AIRCRAFT ENGINE SYSTEMS AND PERFORMANCE Overview of Aircraft Powerplants, Types of Aircraft Engines, Fuel Management and Distribution Systems in Piston and Jet engine, Engine Lubrication Systems, FADEC Architecture and Operation, Aircraft Engine Health Monitoring	**9 Hours**
AIRCRAFT INSTRUMENTATION FUNDAMENTALS Classification of Flight Instruments, Pitot-Static System and Related Instruments (Airspeed Indicator, Altimeter, VSI), Gyroscopic Instruments (Attitude Indicator, Heading Indicator, Turn Coordinator), Electronic Flight Instrumentation System (EFIS), Navigation Aids, Aircraft Communication Systems.	**9 Hours**
SAFETY AND DATA RECORDING SYSTEMS Flight Data Recorder (FDR) and Cockpit Voice Recorder (CVR), Aircraft Health Monitoring Systems (AHMS), Fire Detection and Suppression, Failure Warning and Safety Systems, AI-Based Fault Detection, Digital Twin Technology, Big Data in Aviation Safety.	**9 Hours**
COCKPIT LAYOUT AND HUMAN-MACHINE INTERFACE Human Factors Engineering, Cockpit Layout and Ergonomics, Display Systems, Flight Management System (FMS), Glass Cockpit Technology and Adaptive display system, Voice-Controlled Systems, Augmented Reality (AR) and Virtual Reality (VR) in Cockpit Displays.	**9 Hours**

Theory Hours: 45	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total Hours: 45**

Learning Resources

Textbooks:

1. E. H. J. Pallett, 'Aircraft Instruments – Principles and Applications', Second Edition, Longman House, 1981.
2. E. H. J. Pallett and S. Coyle, 'Automatic Flight Control', Fourth Edition, Blackwell Science Ltd, 1993.
3. Irwin Treager, 'Aircraft Gas Turbine Engine Technology', Third Edition, McGraw Hill, 1997.
4. James Powell, 'Aircraft Radio Systems', Shroff Publishers, 2006.
5. Ian Moir and Allan Seabridge, 'Aircraft Systems – Mechanical, electrical and avionics subsystems integration', Second Edition, Professional Engineering Publishing Limited, 2001.
6. Ian Moir, Allan Seabridge and Malcolm Jukes, 'Civil Avionics Systems', Second Edition, Wiley, 2013.
7. 'General Hand Book of Airframe and Powerplant Mechanics', U.S. Dept. of Transportation, Federal Aviation Administration, English Book Store, New Delhi, 1995.

References:

1. https://www.princeton.edu/~stengel/MAE331Lecture10.pdf
2. http://okigihan.blogspot.com/2017/04/aircraft-hydraulic-system.html
3. http://okigihan.blogspot.com/2017/06/aircraft-pneumatic-systems.html
4. home.iitk.ac.in/~mohite/Basic_construction.pdf
5. https://science.ksc.nasa.gov
6. Pilot's Handbook of Aeronautical Knowledge: https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/

7. MIT Open Courseware lectures notes on Aircraft Systems Engineering: https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-885j-aircraft-systems-engineering-fall-2004/lecture-notes/
8. NPTEL Online course materials on Aircraft Maintenance: https://nptel.ac.in/courses/101104071/

Online Educational Resources:

1. https://ocw.mit.edu/courses/aeronautics-and-astronautics/
2. https://www.coursera.org/
3. https://www.edx.org/course/introduction-to-aeronautical-engineering
4. https://www.humanfactors.com
5. https://www.nasa.gov
6. https://www.eurocontrol.int
7. https://www.ergonomics.org.uk
8. https://www.skybrary.aero
9. https://www.ntsb.gov
10. https://www.icao.int
11. https://aviation-safety.net

OPEN COURSEWARE & FREE STUDY MATERIAL

- MIT OpenCourseWare (Flight Controls): https://ocw.mit.edu
- NASA Technical Reports Server: https://ntrs.nasa.gov
- FAA Handbooks: https://www.faa.gov
- EASA Publications: https://www.easa.europa.eu

Assessment (Embedded course)
SA I and SA II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Thaariq Ahmad Rafiq, Next Leap Aeronautics Private Limited, Bangalore	Daniel Davison, University of Waterloo **ddavison@uwaterloo.ca** (519) 888-4567 ext. 35338	Dr J Darshan Kumar Dr S Senthil Kumar	
Recommended by BoS on	06/12/2025		
Academic Council Approval		**Date**	

24INM102	INDIAN KNOWLEDGE SYSTEMS IN SCIENCE AND ENGINEERING (Common to All branches)	L	T	P	J	C
		1	0	0	0	1
HS		SDG	5, 16			

Pre-requisite courses	-	Data Book / Codes / Standards (If any)	-

Course Objectives:	The purpose of taking this course is to:
1	Explore the Role of Traditional Knowledge in Basic Scientific Concepts.
2	Know the science behind the establishment of traditional architecture.
3	Revive ancient Indian aerospace, metallurgy and navigation technologies.
4	Revitalize ancient textile traditions through sustainable practices, promoting eco- friendly materials.
5	Explore and integrate ancient Indian medical systems like Ayurveda, Siddha & Rasa Shastra

Course Outcomes	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO 1	Understand Indigenous Knowledge Systems (IKS) in Science and Technology	U
CO 2	Apply Traditional Design Principles in Civil Engineering	Ap
CO 3	Explore Ancient Aerospace Technologies for Aeronautical Engineering	E
CO 4	Know the sustainable traditional textile practices for eco-friendly atmosphere	R
CO 5	Gain knowledge of Ancient Medical Practices for Biotechnologists	U

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2	2	2	2	1	2	3	1	2	1	3		
2	2	2	2	2	1	2	2	1	2	1	3		
3	2	2	2	2	1	2	2	1	2	1	3		
4	2	2	2	2	1	2	2	1	2	1	3		
5	2	2	2	2	1	2	2	1	2	1	3		

COURSE CONTENT

IKS IN BASIC SCIENCES Study of ancient Indian concepts such as atomism (paramāṇu)- the five elements (Panchabhūta)- Exploration of alchemical practices, metallurgy-development of zero, decimal systems, algebra, and trigonometry - works by scholars such as Brahmagupta and Aryabhata - Detailing planetary motions and timekeeping systems.	**3 hours**
IKS IN CIVIL ENGINEERING Evolution from rock-cut caves to grand temples like Madurai Meenakshi and Brihadeeswarar - Vastu Shastra- The Concept of "Mandala- Courtyard Design- Sacred	**3 hours**

Geometry- Panchabhuta - Chhatri- dome-shaped canopy- Prana Vayu- Shilpa Shastra- Sthapatya Veda- Kaalchakra-Brahmasthan.	
IKS IN MECHANICAL ENGINEERING Exploration of ancient metallurgical techniques-including ore extraction-alloying, furnace design-Vimana (Flying Machines) - Shakti (Energy Source) -Aerospace materials- Vimana Shapes -Ancient Navigation- Vedic Astronomy- Flight Principles in Nature- Matrika Systems-Indian shipbuilding techniques and navigation methods.	**3 hours**
IKS IN TEXTILE TECHNOLOGY Introduction to Ancient Indian Textiles- Cultural and Historical Context -Traditional Dyeing Techniques-Weaving Techniques and Patterns-Khadi - Natural Fibres and Materials- Cotton, Silk, Wool and Jute-Sustainable Practices and Eco-Friendly Technologies-Organic Cotton Farming-Recycling and Repurposing.	**3 hours**
IKS IN MEDICINE Ayurveda- Siddha Medicine- Rasa Shastra- Herbal Medicine- Nadi Pariksha- Chikitsa- Yoga and Pranayama- Surgical Techniques - Charaka Samhita - Sushruta Samhita—Panchagavya usage-Medicinal Plants and Herbal Remedies-Agricultural Practices and Crop Diversity-Sacred and Ritual Plants.	**3 hours**

Theory Hours: 15	**Tutorial Hours:**	**Practical Hours:**	**Project Hours:**	**Total Hours:15**

Learning Resources

Textbooks

1. Indian Knowledge Systems: A Sustainable Approach: The Science of Self-Healing" by Vasant Lad, Excel India Publisher, 2024.
2. Indigenous Knowledge Systems: Towards a Holistic Inclusive Conservation, Satarupa Dutta Majumder, Manohar Publishers & Distributors, 2019.

References

1. Indian Knowledge System: Integrating Heritage with Engineering, Gagan Bansal, Deep Science Publishing, 2025

Online Resources

www.deepscienceresearch.com/dsr/catalog/book/70

Assessment (Theory Course)

Presentation, MCQ, Assignment, Case Study and E Chart.

Course Curated By

Expert(s) from Industry	Expert(s) from Higher Education Institutions	Internal Expert(s)
-	Dr K Sangeetha, Professor and Head-Textile Department, IKS-Nodal officer, Bharathiyar University, Coimbatore-46.	Dr.R.Prakasam, AssistantProfessor, Department of Physics. Capt-A.R.Arul, Assistant Professor, Department of Physics

Approved by: BoS Chairman	With Signature and date
BoS Approval date:	**25-04-2025**