KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.E MECHANICAL ENGINEERING

REGULATION 2024

I to IV Semesters

Mechanical Engineering Department

INSTITUTE VISION

- The vision of the college is to become a technical university of International Standards through continuous improvement.

INSTITUTE MISSION

- Kumaraguru College of Technology (KCT) is committed to providing quality Education and Training in Engineering and Technology to prepare students for life and work equipping them to contribute to the technological, economic and social development of India. The College pursues excellence in providing training to develop a sense of professional responsibility, social and cultural awareness and set students on the path to leadership.

DEPARTMENT VISION

- To emerge as a centre, that imparts quality higher education through the programme in the field of Mechanical Engineering and to meet the changing needs of the society.

DEPARTMENT MISSION

- The department involves in sustained curricular and co-curricular activities with competent faculty through teaching and research that generates technically capable Mechanical Engineering professionals to serve the society with delight and gratification.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives of Mechanical Engineering Undergraduate Program are to prepare the students:

I. Graduates will take up careers in manufacturing and design related sectors.

II. Graduates will be involved in the execution of mechanical engineering projects.

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III. Graduates will take up educational programmes in mastering Mechanical Engineering Science and Management.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The Program Specific Objectives of Environmental Engineering Postgraduate Program are toprepare the graduates:

PSO 1: Apply the fundamentals of science and mathematics to solve complex problems in the field of design and thermal sciences.

PSO 2: Apply the concepts of production planning and industrial engineering techniques in the field of manufacturing engineering.

PROGRAM OUTCOMES (POs)

Graduates of the Environmental Engineering Postgraduate 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. (WK1 to WK4)

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. (WK5)

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. (WK8).

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. (WK2 and WK6)

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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. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

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. (WK8)

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KUMARAGURU COLLEGE OF TECHNOLOGY

Mechanical Engineering
REGULATION 2024
B.E., Mechanical Engineering - Curriculum

Semester I

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST101	Heritage of Tamil	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	24ADP001	Basics of AI	Practical	ES	0	0	2	0	1
5	24MEI101	Engineering Graphics	Embedded	ES	2	0	2	0	3
6	24MEI102	Manufacturing Technology	Embedded	ES	3	0	2	0	4
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	24INO1--	FCLF General stack - 1	Practical	OE	0	0	2	0	1
10	24INP101	Design Thinking	Practical	ES	0	0	2	0	1
								Total Credits	**21**
								Total Contact Hours/week	**30**

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 Transform	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	24CSI101	Logical Thinking and Problem solving	Embedded	BS	3	0	2	0	4
7	24INP103	Innovation Practicum – 2	Practical	ES	0	0	2	0	1
8	24HSP112	Holistic wellness – 2	Practical	HS	0	0	2	0	1
9	24INO1--	FCLF General stack - 2	Practical	OE	0	0	2	0	1
								Total Credits	**20**
								Total Contact Hours/week	**26**

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Semester III									
S. No.	**Course code**	**Course Title**	**Course Category**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24HSP005	Mastering Conversations for Enhanced Interactions	Practical	HS	0	0	2	0	**1**
2	24MAT231	Partial Differential Equations and Transforms Techniques	Theory	BS	3	1	0	0	**4**
3	24INP201	Innovation Practicum - 3	Practical	ES	0	0	2	0	**1**
4	24MET201	Engineering Thermodynamics	Theory	PC	3	0	0	0	**3**
5	24MET202	Kinematics of Machinery	Theory	PC	3	0	0	0	**3**
6	24MEI203	Applied Machining & Manufacturing Techniques	Embedded	PC	3	0	2	0	**4**
7	24MEI205	Fluid Mechanics and Machinery	Embedded	PC	3	0	2	0	**4**
8	24INM201	Universal Human Values –II : Understanding Harmony	Theory	HS	1	0	0	0	**1**
9	24MEJ204	Internship	Internship	PC	0	0	0	0	**1**
10	24INO___	FCLF - General Stack	Practical	OE	0	0	2	0	**1**
								Total Credits	**23**
								Total Contact hours / Week	**27**

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Semester IV									
S.No	**Course code**	**Course Title**	**Course Category**	**CT**	**L**	**T**	**P**	**J**	**C**
1	24HSP006	Mastering Group Discussion and Presentation Skills	Practical	HS	0	0	2	0	**1**
2	24INM202	Environmental Science and Sustainability	Theory	MC	2	0	0	0	**2**
3	24INP202	Innovation Practicum - 4	Practical	ES	0	0	2	0	**1**
4	24MAI241	Numerical Methods and Probability	Embedded	BS	3	0	2	0	**4**
5	24MEI207	Strength of Materials	Embedded	PC	3	0	2	0	**4**
6	24MEI208	Thermal Engineering - I	Embedded	PC	3	0	2	0	**4**
7	24EEI209	Electrical Drives and Control	Embedded	ES	3	0	2	0	**4**
8	24INO___	FCLF - Technical Stack	Practical	OE	0	0	2	0	**1**
10	24MEP207	Digital Engineering Drafting & Modelling	Practical	PC	0	0	4	0	**2**
11	24INM102	Indian Knowledge System in Science and Engineering	Theory	HS	1	0	0	0	**1**
								Total Credits	**24**
								Total Contact hours / Week	**33**

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Semester - I

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	PSO-3
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 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	PSO-3
1	2	2		1	1									
2	1	2		1	1									
3	1	1		1	1									
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, Valles Marineras 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.	1. Dr. N.Anitha, 2. Ms. S. Sivasakthi, 3. Dr. S.Selvanayaki, Department of Mathematics

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	PSO-3
1	3	2			1						2			
2	3	2			1									
3	3	2			1									
4	3	2		2	1						2			
5	3	2			1						2			

6	3	2			1									

Course Content

PROPERTIES OF MATTER 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. **Practical Component** 1. Non-uniform bending – Determination of Young's modulus 2. Compound pendulum – Determination of acceleration due to gravity	**9 Hours** **6 Hours**
QUANTUM PHYSICS 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. **Practical Component** 1. Determination of Planck's constant – Electroluminescence method.	**9 Hours** **6 Hours**
LASERS 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** 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	**9 Hours** **6 Hours**
NDT AND SURFACE COATINGS NDT: 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** 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	**9 Hours** **6 Hours**
GREEN ENERGY 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	**9 Hours** **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

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	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	PSO-3
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 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.	**8 Hours**
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

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	PSO-3
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:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:
30	**0**	**30**	**0**	**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

24MEI102	MANUFACTURING TECHNOLOGY (Common to AU, ME)	L	T	P	J	C
		3	0	2	0	4
ES		SDG	9, 12			

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

Course Objectives:	
The purpose of taking this course is to:	
1	gain in-depth knowledge of various manufacturing processes including casting, welding, forming, powder metallurgy, and additive manufacturing.
2	develop the ability to identify, troubleshoot, and resolve defects in casting, welding, forming, and powder metallurgy processes.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	apply fundamental knowledge of casting processes for quality castings	Ap
CO 2	analyse different welding techniques and their applications to select appropriate methods for joining various materials.	An
CO 3	analyse the principles of forming processes to design sheet metal products.	An
CO 4	demonstrate the ability to apply powder metallurgy techniques to refine metal powders.	Ap
CO 5	explore the principles and applications of additive manufacturing to understand its impact on modern manufacturing practices.	U
CO 6	execute experiments involving casting, welding, forming, powder metallurgy, and additive manufacturing to fabricate components, refine metal powders, assess their quality, and interpret the results for process improvement.	C

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

Course Content	
Casting Processes	

Overview of casting processes - significance in manufacturing - Types of casting processes: sand casting, investment casting, die casting - Applications and limitations - Mold materials and preparation - Pattern making and types of patterns - Core making and core materials - Minimizing defects: porosity, shrinkage, inclusions - Riser and gating system - Inspection methods: visual, radiographic, ultrasonic testing - Casting defects and their causes – Advance casting techniques - Permanent mold casting and centrifugal casting - Continuous casting - Case studies of innovative casting techniques. **Practical Component** **Sand Moulding Process:** To understand the sand moulding process and produce a mould for a component.	**9 Hours** **6 Hours**
Welding Techniques Basic principles of welding - Types of welding processes: MIG, TIG, arc welding - Applications and limitations - Equipment and consumables - Welding parameters and techniques - Safety measures and equipment handling – Advanced welding techniques - Resistance welding, laser welding, and electron beam welding - Advantages and applications - Common welding defects and their remedies - Inspection methods: visual, radiographic, ultrasonic - Standards in welding. **Practical Component** **Metal Arc Welding:** To perform metal arc welding, gas welding	**9 Hours** **6 Hours**
Forming Processes Overview of metal forming processes – Classification - bulk forming, sheet forming - Applications and benefits of forming processes - Sheet Metal Forming - Bending, shearing, and blanking processes - Deep drawing and its applications - Roll forming and spinning – Metal Forming - Formability and material properties – Forging, Rolling, Hydroforming, explosive forming, and superplastic forming - Applications and benefits - Case studies of sheet metal products - Common defects in forming processes - Techniques for minimizing defects - Inspection and quality control methods. **Practical Component** **Sheet Metal Forming:** To perform smithy and sheet metal forming operations.	**9 Hours** **6 Hours**
Powder Metallurgy Overview and significance of powder metallurgy – Advantages and limitations compared to traditional methods – Applications in various industries – Methods of powder production: atomization, reduction, electrolysis – Properties of metal powders – Compaction techniques: uniaxial pressing, isostatic pressing – Sintering – atmospheres and equipment – Applications in automotive, aerospace, and electronics – Case studies of powder metallurgy products – Common defects in powder metallurgy – Inspection and testing methods. **Practical Component** **Powder Metallurgy:** To refine a metal powder.	**9 Hours** **6 Hours**
Additive Manufacturing Overview of additive manufacturing (AM) technologies - Comparison with traditional manufacturing - Benefits and challenges of AM- Types of Additive Manufacturing Processes - Fused deposition modeling (FDM) - Stereolithography (SLA) - Selective laser sintering (SLS) and direct metal laser sintering (DMLS) - Materials for Additive Manufacturing - Polymer, metal, and ceramic materials - Material properties - Applications in aerospace, automotive, medical, and consumer products - Case studies of AM solutions. **Practical Component** **Additive Manufacturing (3D Printing):** To explore additive manufacturing techniques like STL or FDM by producing a 3D printed component.	**9 Hours** **6 Hours**

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

Learning Resources

Textbooks

1. Hajra Choudhury, "Elements of Workshop Technology", Media Promotors Pvt. Ltd., Mumbai, 2001.
2. Rao, P. N., "Manufacturing Technology 4th Edition, (Vol. 1&2)", Tata McGraw Hill 2017.
3. P. C. Sharma, "Production Technology", S. Chand, New Delhi, 2007.
4. C. Hellier, Handbook of Non-Destructive Evaluation, McGraw-Hill Professional, 1st edition, 2001.
5. Jain R K., "Production Technology: Manufacturing Processes, Technology and Automation" Khanna Publication, 2012.

Reference books

1. Groover, M. P., Fundamentals of Modern Manufacturing: Materials, Processes, and Systems. John Wiley & Sons, 2016
2. Kalpakjian, S., & Schmid, S. R., Manufacturing Engineering and Technology. Pearson, 2013.
3. Degarmo, E. P., Black, J. T., & Kohser, R. A., Materials and Processes in Manufacturing. John Wiley & Sons, 2017.
4. Davies, A. C., The Science and Practice of Welding: Volume 1: Welding Science and Technology. Cambridge University Press, 2012.
5. Chua, C. K., Leong, K. F., & Lim, C. S., Rapid Prototyping: Principles and Applications. World Scientific, 2010.

Online Resources (Web Links)

1. https://www.edx.org/learn/manufacturing/massachusetts-institute-of-technology-fundamentals-of-manufacturing-processes
2. https://archive.nptel.ac.in/courses/112/107/112107145/
3. https://onlinecourses.nptel.ac.in/noc24_me48/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 Institution	Internal Expert
Mr. M. Thiagarajan, Manager, CAM Programming and Optimization, Eppinger Tooling Asia Private Limited, Coimbatore.	Dr. P. Dhanabal, Assistant Professor (Selection Grade), Department of Mechanical Engineering, PSG College of Technology, Coimbatore – 641 004.	Dr. B. N. Sreeharan, Assistant Professor – III, Department of Mechanical Engineering

Recommended by BoS on	17.08.2024		
Academic Council Approval	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	PSO-3
1	2		1											
2	2				1									
3		2	2	1										

Course Content

Engineering Fundamentals and Innovation 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.	**3 Hours**
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 Department)	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	PSO-3
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. • 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.	**14 Hours**
MENTAL AND EMOTIONAL WELLNESS: • Stress management techniques. • The role of Yoga, mindfulness and meditation in mental health. • Emotional intelligence and its impact on relationships.	**6 Hours**

• Hands-on activity: Practicing Yoga, mindfulness and emotional regulation exercises.	
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 Department)	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	PSO-3
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 - II

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. know agriculture and irrigation technology. Understanding Scientific Tamil and Computer Tamil.	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	PSO-3
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 -	**3 Hours**

Knowledge of Sea - Fisheries - Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	
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	PSO-3
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	PSO-3
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			
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	PSO-3
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 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, 45thEdition, 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	PSO-3
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 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	**9 Hours** **6 Hours**
ADVANCED ENGINEERING MATERIALS	**9 Hours**

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	**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	PSO-3
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,	Dr S Parimala Murugaveni Associate Professor, Department of Mechanical Engineering,	Dr. N. Sangeetha, Associate Professor, Department of Mechanical Engineering

Design Engineer Lead |Mechanical Product Design Engineer-III at SLB, Singapore.	Government College of Technology, Coimbatore.		
Recommended by BoS on	17.08.2024		
Academic Council Approval	No: 27	**Date**	24.08.2024

24CSI101	LOGICAL THINKING AND PROBLEM SOLVING (Common to all Programmes)	L	T	P	J	C
		3	0	2	0	4
ES		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	**6 Hours**

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	 **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 (Common to All branches)	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	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	PSO-3
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 Pi, exploring their capabilities and applications, Designing PCBs using KiCad and EasyEDA, Understanding PCB fabrication processes	**6 Hours**
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	**6 Hours**

languages (Python, JavaScript), Testing frameworks (Selenium), No-code platforms (Bubble, Adalo, Wix, AppGyver), Building functional prototypes without extensive coding	
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 Department)	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	PSO-3
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. • Cognitive-behavioural strategies for managing stress and anxiety. • Hands-on activity: Developing and practicing a resilience toolkit.	**6 Hours**
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:	**6 Hours**

• 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.	
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
8. ., WS Press, Newtown, PA(2023).
9. Murphy, Joseph., The Power of Your Subconscious Mind [Original Edition (Complete)], Prentice-Hall, Englewood Cliffs (1963).
10. 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			
Academic Council Approval	No: 27	**Date**	24.08.2024

Semester - III

Course Code: **24HSP005**	24HSP005-Mastering Conversations	**L**	**T**	**P**	**J**	**C**
		0	**0**	**2**	**0**	**1**
Course Category: Practical		**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	K3
CO 2	Analyze and converse critically on complex subjects, demonstrating the ability to approach and deal with various social contexts effectively	K4
CO 3	Exhibit skills in role-playing and enacting given situations to navigate diverse social interactions and career-related contexts.	K6

Course Outcomes should be clear, measurable, aligned with broader educational objectives, and focused on developing essential engineering skills while preparing students for future challenges in the field

COs: Embedded (3 to 4 credits): –6,, Theory only- 5, Micro-credentials - 3, lab only – 3, project – 4

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	PSO-3
1						3			3	2	3			

2									1	2				
3									3	2				

Course Content(Add or delete the modules as per the requirement)	
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*
Textbooks
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 from 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
https://www.niu.edu/citl/resources/guides/instructional-guide https://positivepsychology.com/role-playing-scripts/

Assessment	
Formative	Summative
Assignments / Mini project), Quiz, Lab	Quizzes and written assignments, Participation in group activities and End Semester Examination (ESE)

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	Faculty members of the Department of Languages and Communication

Approved by: BoS Chairman	
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 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	PSO-3
1	3	2												
2	3	2												
3	3	2												
4	3	1		2										
5	3	1		2										
6	3	1		2										

Course Content

PARTIAL DIFFERENTIAL EQUATIONS — **9 + 3 Hours**

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.	
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
4.

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)
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	1. Ms. S. Sivasakthi 2. Dr. S. Meenapriyadarshini 3. Ms. A. Shanmughavadivu

	Coimbatore, Tamil Nadu.		
Recommended by BoS on	25.4.2025		
Academic Council Approval		**Date**	

30 Hours	24INP201 Innovation Practicum - 3	0L: 0T: 0P: 1J	1 Credit

Course Overview:

This course offers an in-depth exploration of the innovation process, with a strong emphasis on customer discovery, problem validation, challenge curation, and solution concept generation. Participants will learn how to identify and frame critical problems through customer-centric research, validate the underlying challenges, and curate meaningful innovation opportunities. The course guides them in developing and refining solution concepts that address real-world needs, ensuring both feasibility and viability. Through a combination of theoretical insights and practical exercises, participants will gain a thorough understanding of the innovation process and acquire the skills needed to transform their ideas into impactful solutions.

Course Objectives:

- Develop a deep understanding of the innovation process and apply customer-centric thinking to innovation
- Evaluate the feasibility and viability of innovation ideas.
- Optimise innovation projects for efficiency and effectiveness and communicate the ideas effectively.

Course Outcomes:

- Analyse the various stages of innovation and their interdependencies
- Create innovative solutions that address specific customer needs
- Evaluate the potential impact and risks of different innovation concepts and present them clearly and persuasively.

CO-PO-PSO Mapping

COs	Programme Outcomes (POs)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2											1	
CO2			2											
CO3			2											

S-Strong (3) **M-Medium (2)** **L-Low (1)**

Module 1: Idea Worth Prototyping

Discuss potential risks and challenges associated with innovative ideas, Learn to refine and validate the initial concept, Develop a plan outlining key milestones and timelines for advancing from idea to prototype.

Module 2: Framing the Challenge

Define the specific problem or opportunity that the innovation aims to address, understand customer needs and preferences, Identify the gaps in the market and potential obstacles to adoption, assess the potential market size, competition, and feasibility.

Module 3: Crafting High-Value Solutions

Generate Minimum Usable Prototype (MUP) concepts that address the identified challenge that provide high value, evaluate the potential of each solution concept based on criteria like feasibility, viability, and desirability.

Module 4: Optimization and Planning

Create Bill of Quantities (BOQ) and Bill of Materials (BOM) to estimate costs and resources, Develop a comprehensive innovation proposal outlining the innovation concept, goals, and benefits, Implement Lean principles to improve efficiency and reduce waste in the innovation process, Reflect on the activities to identify areas for improvement and learning.

Module 5: Project Presentation

Develop and deliver a compelling presentation of your minimum usable prototype (MUP) and innovation solution to effectively communicate its value and impact to a broader audience. Create a visually engaging presentation that clearly outlines the problem, the proposed solution, and the value of your minimum usable prototype. Utilise tools such as slides, infographics, and videos to enhance the visual appeal. Craft a compelling story around your innovation. Highlight the journey from problem identification to solution development, emphasising key insights and milestones.

References:

1. https://formlabs.com/blog/ultimate-guide-to-prototyping-tools-for-hardware-and-product-design/
2. https://docs.kicad-pcb.org/
3. https://www.tinkercad.com/learn/circuits
4. https://docs.github.com/en/free-pro- team@latest/actions/guides
5. Everything you need about value proposition: https://blog.forgeforward.in/everything-you-need-to-know-about-value-proposition-7247493c940c
6. Test your Value Proposition: http://businessmodelalchemist.com/2012/09/test-your-value-proposition-supercharge-lean-startup-and-custdev-principles.html
7. Valuation Risk versus Validation Risk in Product Innovations: https://blog.forgeforward.in/valuation-risk-versus-validation-risk-in-product-innovations-49f253ca8624
8. User Guide for Product Innovation Rubric: https://blog.forgeforward.in/user-guide-for-product-innovation-rubric-857181b253dd

9. Innovation Risk Diagnostic — Product Innovation Rubric: https://blog.forgeforward.in/product-innovation-rubric-adf5ebdfd356
10. Evaluating Product Innovations — proof, potential, & progress:https://blog.forgeforward.in/evaluating-product-innovations-e8178e58b86e

24MET201	ENGINEERING THERMODYNAMICS	L	T	P	J	C
		3	1	0	0	4
PC		SDG				

Pre-requisite courses	Nil	Data Book / Codes / Standards (If any)	Steam Tables, Mollier diagram, Gas Tables and Compressibility chart..

Course Objectives:	
The purpose of taking this course is to:	
1	Elucidate basic concepts and thermodynamic properties.
2	Apply the laws of thermodynamics for closed and open systems.
3	Instruct the method of applying energy, entropy, and exergy balance to systems.
4	Educate the properties of ideal gases, real gases, and pure substances.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply the first law of thermodynamics to closed and open systems to arrive solutions	Ap
CO2	Check the feasibility of a thermodynamic system and evaluate its performance by applying the second law of thermodynamics	C
CO3	Apply entropy and exergy balance to closed and open systems for the performance evaluation.	Ap
CO4	Calculate the thermodynamic properties of pure substances, ideal and real gases.	An
CO5	Express the derived properties in terms of measurable properties.	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	PSO-3
1	3	3	1	3		2						1		
2	3	3	1	2		3						1		
3	3	3	3	3		3						1		
4	3	3	3	3		2						1		
5	3	3	3	2		3						1		
6	3	3	1	3		3						1		

Course Content	
BASIC CONCEPTS AND FIRST LAW	12 Hours

System, properties, zeroth law of thermodynamics and application, thermodynamic state and equilibrium, process and cycle, work, heat and other forms of energy; First law of thermodynamics, application to open and closed systems, general energy equation and applications.	
SECOND LAW Kelvin-Planck and Clausius statements, heat engines and heat pump, reversibility, Carnot cycle, Carnot theorem, thermodynamic temperature scale; Third law of thermodynamics.	**12 Hours**
ENTROPY AND EXERGY BALANCE **Clausius** theorem, property of entropy, Clausius inequality, entropy and its applications, microscopic interpretation of entropy, maximum work obtainable from finite heat reservoirs, entropy generation in open and closed systems, isentropic work in a steady flow open system. Available and Unavailable energy, energy destruction, second law or exergetic efficiency, exergy transfer by heat, Work and mass, exergy balance applied to closed and open systems**.**	**12 Hours**
PROPERTIES OF PURE SUBSTANCES Formation of steam at constant pressure, types of steam, steam tables and uses, external work done during evaporation, internal energy of Steam, dryness fraction of steam, entropy of steam – Mollier diagram steam power cycles- simple Rankine cycle,	**12 Hours**
IDEAL AND REAL GASES AND THERMODYNAMIC RELATIONS Properties ideal and real gases, equation state, Vander Wall's equation of state, compressibility factor, compressibility chart- Dalton's law of partial pressure. Exact differentials, T-D relations, Maxwell's relations, Clausius Clapeyron equations, Joule-Thomson coefficient**.**	**12 Hours**

Theory Hours: 45	Tutorial Hours: 15	Practical Hours: 0	Project Hours: 0	Total Hours: 60

Learning Resources

Textbooks

1. Nag, P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 2008.
2. Cengel Y., "Thermodynamics an Engineering Approach", Tata McGraw-Hill, New Delhi, 2008.
3. Sonntag R. E., Borgnakke C. and Van Wylen, G., "Fundamentals of Thermodynamics", 7/e, John Wiley and Sons, 2008.
4. Holman.J.P. "Thermodynamics", Tata MC Graw Hill, 2006
5. Michael J. Moran and Howard N. Shapiro., "Fundamentals of Engineering Thermodynamics", 9/e, John Wiley and Sons, Inc., 2018.

Reference books

1. Arora, C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2004.
2. Rogers and Mayhew, "Engineering Thermodynamics", Work and Heat Transfer, Pearson education, 1992.

Online Resources (Weblinks)

1. http:// mit open courseware
2. http:// www.iit.delhi.ac.in

Assessment	
Formative	Summative
Assignments / Mini project, Quiz, Lab	CAT- I, CAT – II and End Semester Examination (ESE)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
	Dr. V. Prabhuraja Professor, Department of Mechanical Engineering PSG College of Technology, Coimbatore	Mr.S.Sivakumar Assistant Professor-II Department of Mechanical Engineering Kumaraguru College of Technology, Coimbatore

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

24MET202	Kinematics of Machinery	L	T	P	J	C
		3	0	0	0	3
Professional Core		SDG	9 &4			

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

Course Objectives:	
The purpose of taking this course is to:	
1	To introduce the basic concepts of kinematic links, pairs, chains, mechanisms, and machines, and to establish criteria for their classification and mobility.
2	To enable students to perform position, velocity, and acceleration analysis of plane mechanisms using graphical and analytical methods.
3	To impart knowledge on cam mechanisms, enabling the construction of cam profiles for various follower motions and understanding cam dynamics.
4	To familiarize students with the fundamental principles of gear tooth design and various gear trains, including epicyclic gear trains
5	To provide hands-on exposure to the motion analysis of mechanisms through simulation tools.

Note: Course Objectives: - should cover Knowledge to be Acquired, Skills to be gained, and Competency to be Developed. Number of Course objectives must range from 3 to 5

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 kinematic elements and mechanisms and apply laws governing mobility and motion.	K3
CO 2	Analyze the motion of planar mechanisms using graphical methods for position, velocity, and acceleration.	K4
CO 3	Develop cam profiles based on desired follower motion and analyze the dynamic performance of cams.	K4
CO 4	Explain gear terminology and analyze different gear trains including epicyclic gear trains.	K4
CO 5	Apply simulation tools to visualize and study motion in planar mechanisms.	K3

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

Course Content

Module 1: Review of kinematics of planar rigid bodies Kinematic link, kinematic pair, kinematic chain, mechanism and machines. Degrees of freedom – mobility – Kutzbach criterion – Grashoff's law. Kinematic inversions – four bar chain and slider crank – mechanical advantage – transmission angle. Mechanisms for robotic gripper.	**9 Hours**
Module 2 : KINEMATICS OF PLANE MECHANISMS Analysis of slider crank and four bar mechanisms – Graphical method for position, velocity and acceleration. Instantaneous center, Kennedy's theorem-velocity analysis – Corioli's component of acceleration – Introduction to synthesis of mechanism- Two position synthesis- 4-bar linkage.	**9 Hours**
Module 3: KINEMATICS OF CAM Classifications - Displacement diagrams - Uniform velocity, simple harmonic, uniform acceleration and retardation and cycloidal motions – Graphical layout of plate cam profiles - Derivatives of follower motion – High speed cams – Cams with specified contours - unbalance and wind up - Pressure angle and undercutting – spring surge, jump speed - Analysis of cam.	**9 Hours**
Module 4: GEARS & GEAR TRAINS Introduction – fundamental law of gearing-involute tooth form-pressure angle – changing center distance-interference and under cutting- contact ratio - types of gears-simple gear trains - compound gear trains - epicyclic gear Trains.	**9 Hours**
Module 5 : Motion study using simulation (only for Assignment practice) Motion study of simple mechanisms using simulation software	**9 Hours**

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

Learning Resources

Textbooks:

1. Rattan, S.S.,"Theory of Machines", Tata McGraw-Hill Publishing Company Ltd.,New Delhi,2009

References:

1. Uicker, J.J., Pennock, G.R and Shigley, J.E., "Theory of Machines and Mechanisms", Oxford University Press,New Delhi, 2009.
2. Thomas Bevan, "Theory of Machines",CBS Publishers and Distributors, 2005.
3. Ghosh, A., and Mallick, A.K., "Theory of Mechanisms and Machines", Affiliated EastWestPvt. Ltd., New Delhi, 2006.
4. Rao, J.S., and Dukkipati, R.V, "Mechanism and Machine Theory", New Age International (P) Ltd Publishers. New Delhi, 2007.
5. Norton L Robert, "Kinematics and Dynamics of Machinery",Tata McGraw Hill, Higher Education, 2008.
6. Khurmi, R.S., and Gupta, J.K., "Theory of Machines", S.Chand& Company, 2009

Online Educational Resources:

- https://nptel.ac.in/courses/112104121/
- https://nptel.ac.in/courses/112104121/4
- https://nptel.ac.in/courses/112104121/7
- https://www.edx.org/course/mechanics-kinematics-and-dynamics-3
- https://www.coursera.org/courses?query=kinematics
- https://cosmolearning.org/courses/kinematics-of-machines/video-lectures/

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

*Activity and Learning Task(s): assessed through Active Learning Strategies (ALS) Eg: One-minute paper, exit tickets/exit slips, Think-pair-share, Socratic seminar, reflective journal, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Concept map, Homework tasks. Delete Assessment tables that do not apply to this course.

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
[Mr. Gautham Siddharth, Mechanical Design Lead at Titan Engineering C Automation Limited, Hosur]	[Dr.P.Dhanapal, ME, PhD PSG College of Technology, Coimbatore]	[Dr.N.Sangeetha) Dr.T.Karuppusamy]
Recommended by BoS on		
Academic Council Approval	No. 28	**Date**

24MEI203	Applied Machining & Manufacturing Techniques	L	T	P	J	C
		3	0	1	0	4
EMBEDDED		SDG	9, 12			

Pre-requisite courses	24MEI102	Data Book / Code book (If any)	Nil

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the fundamentals of metal cutting and tool mechanics.
2	Learn the operations and features of conventional machining tools.
3	Explore advanced machining processes.
4	Develop basic programming and machining skills for CNC machining.
5	Familiarize with unconventional machining techniques and applications.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Explain the mechanics of chip formation, cutting tool nomenclature, and tool wear mechanisms	Understand
CO 2	Analyze the operations and specifications of conventional machining tools like lathes, shaping, and drilling machines	Analyze
CO 3	Apply the knowledge to perform machining processes such as turning, threading, milling, grinding, and gear manufacturing	Apply
CO 4	Create part programs for CNC machining processes using manual and computer-aided methods	Create
CO 5	Evaluate the constructional features, working principles, and operational procedures of CNC and unconventional machining tools	Evaluate
CO 6	Demonstrate the ability to use unconventional machining methods like EDM for complex manufacturing tasks	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	PSO-1	PSO-2	PSO-3
1	2	2										1		
2		2	2											
3					2							1		
4					2								1	
5			2	2										
6				2									1	

Course Content

THEORY OF METAL CUTTING Mechanics of chip formation, single point cutting tool, nomenclature, orthogonal and oblique metal cutting, Types of chips, thermal aspects, cutting tool materials, tool wear, tool life, economics of cutting, cutting forces analysis in machining, Merchant's Circle Diagram, **Practical Component:** • Study of nomenclature of single point cutting tool	**__ 9 hours** **1 hour**
SPECIAL PURPOSE MACHINES - I Lathe, Shaping, Planning, Drilling machines - constructional features, working principles, specification, operations, tool holding, work holding devices **Practical Component:** • Step turning, Taper Turning, Knurling • Internal and External Threading, Drilling and Boring • Dovetail Machining • Drilling and Reaming of Holes	**9 hours** **8 Hours**
SPECIAL PURPOSE MACHINES - II Milling, Gear Manufacturing, grinding (Surface, Cylindrical), Broaching Machines - constructional features, working principles, specification, operations, tool holding, work holding devices **Practical Component:** • Spur Gear Machining • Surface and cylindrical grinding	**9 Hours** **6 Hours**
CNC MACHINES Computer Numerical Control (CNC) machine tools, types, constructional details, special features, Turning Centre, machining centre, manual part programming, computer aided part programming **Practical Component:** • Manual part programming in CNC Turning and Machining Center • Computer Aided part programming in CNC Turning and Machining Center • Step turning, Taper turning • Contour milling	**9 Hours** **12 Hours**
UNCONVENTIONAL MACHINING Abrasive Jet Machining, Electrical Discharge Machining, Electrochemical Machining, Ultrasonic Machining, Laser Beam Machining, Electron Beam machining. **Practical Component:** • Machining in EDM	**9 Hours** **3 Hours**

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

Learning Resources

Textbooks:

1. Hajra Choudhury S. K., Hajra Choudhury A. K., Roy N. – 'Elements of Workshop Technology' Media Promotors & Publishers Pvt. Ltd. – 2010 – Vol.II: Machine Tools, 13e
2. W. A. Knight and G. Boothroyd, Fundamentals of Metal Machining and Machine Tools, CRC Press, 2006.

3. M. P. Groover, Fundamentals of Modern Manufacturing, Materials, Processes and Systems, Second Edition, Wiley India, Reprint 2007.

References:

1. M. C. Shaw, Metal Cutting Principles, Second Edition, Oxford University Press, 2005.
2. P. K. Mishra, Nonconventional Machining, Narosa Publishing House, 2007
3. Serope Kalpakjian and Steven R. Schmid – ''Manufacturing Engineering and Technology' – Prentice Hall – 2013 – 7th Edition
4. 'H.M.T. Production Technology: Handbook` – Tata McGraw-Hill Publishing Company Limited – 1990
5. Roy. A. Lindberg, "Process and Materials of Manufacture", Fourth Edition, PHI/Pearson Education 2006.

Online Educational Resources:

1. https://www.coursera.org/learn/manufacturing-processes
2. https://www.coursera.org/learn/cnc-programming
3. https://archive.nptel.ac.in/courses/112/105/112105126/

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

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

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce, etc…

Course Curated by

Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**
Mr. M. Thiagarajan, Manager, CAM Programming and Optimization, Eppinger Tooling Asia Private Limited, Coimbatore.	Dr. P. Dhanabal, Assistant Professor (Selection Grade), Department of Mechanical Engineering, PSG College of Technology, Coimbatore – 641 004.	Dr. B. N. Sreeharan, Assistant Professor – III, Department of Mechanical Engineering, Kumaraguru College of Technology, Coimbatore – 641 049.
Recommended by BoS on	XX/YY/2024	
Academic Council Approval	No.	**Date** XX/YY/2024

24MEI205	Fluid Mechanics and Machinery	L	T	P	J	C
		3	0	2	0	4
Professional Core		SDG	4, 6, 7, 9 13			

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

Course Objectives:

The purpose of taking this course is to:

1	To study the fluid properties, calculate discharge using venturi meter/orifice meter and calculate meta centre
2	To solve problems using Euler's, Bernoulli's equation and to understand steps involved in solving fluid dynamics problems using Computational fluid dynamics tool.
3	To calculate the power requirement for hydraulic pumps or power generated for hydraulic turbines by considering flow through pipes with major and minor losses.

Note: Course Objectives: - should cover Knowledge to be Acquired, Skills to be gained, and Competency to be Developed. Number of Course objectives must range from 3 to 5

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	State and explain various fluid properties	U, Ap
CO 2	Apply the knowledge of fluid statics for solving the problems in buoyancy and manometers.	Ap, An
CO 3	Solve problems in mass, momentum and energy balance equations in fluid dynamics.	Ap. An
CO 4	Determine the flow rate through Venturi-meter and orifice meter.	Ap, An
CO 5	Analyze the performance of turbines	Ap, An
CO 6	Analyze the performance of pumps	Ap, An

Note: Course Outcomes should be clear, measurable, aligned with broader educational objectives, and focused on developing essential engineering skills while preparing students for future challenges in the field

No. of COs: Embedded (3 to 4 credits): 6; Theory only 5; Micro-credentials – 3; lab only – 3; project – 4

RBT levels: Write the abbreviated levels - R, U, Ap, An, E, C (Remember, Understand, Apply, Analysis, Evaluate, Create)

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

Course Content

FLUID PROPERTIES AND FLUID STATICS	10 Hours

Definitions of fluid - Properties of fluids – (Definition only)-Mass density – Specific weight – Specific volume – Specific gravity – Viscosity – Compressibility – Surface tension – Capillarity –Vapor pressure. Fluid Statics: Hydrostatic equation –Forces on plane and curved surfaces- Buoyancy – Metacentre – Simple and differential manometers.	
FLUID KINEMATICS AND FLUID DYNAMICS **Fluid Kinematics:** Velocity and Acceleration, Local and convective acceleration, material derivative. Path line – Stream line – Streak line – Stream and Potential functions – Flownets. **Fluid Dynamics:** Eulerian and Lagrangian fluid flow analysis – Governing equations- 3-D Continuity equation (Differential Cartesian form only), energy equation (1-D form- statement only), momentum equation (1-D form-statement only), Navier-stokes equation (Differential form with terms- No derivation). Non-viscous flows (Euler's equation) – Frictionless flows (Bernoulli's equation). Introduction to CFD and steps involved in solving fluid dynamics problems using Ansys fluent CFD tool.	**10 Hours**
FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS Laminar and turbulent flows through pipe – Hagen-Poiseuille equation– Darcy-Weisbach equation – Major and Minor losses (Application only), pipes in series and parallel, Dimensional Analysis- Buckingham's π theorem. Discharge and velocity measurements- venturi meter and Pitot tube. **Practical Component:** • Determination of the Coefficient of discharge of a given Orifice meter. • Determination of the Coefficient of discharge of a given Venturi meter.	**10 Hours** **8 Hours**
HYDRAULIC TURBINES Force exerted on unsymmetrical moving curved plate with jet striking tangentially at one of the tip. –Classification of hydraulic turbines, Design of Pelton, Francis, and Kaplan turbines with Velocity triangle, work done, Specific speed – efficiencies and Performance curve for turbines. **Practical Component:** • Performance characteristics of Pelton turbine. • Performance characteristics of Francis/Kaplan turbine.	**8 Hours** **12 Hours**
HYDRAULIC PUMPS Definition and classifications- Centrifugal and Reciprocating Pumps: Working principles- Ideal Indicator diagram – Specific speed – efficiency and performance curves - Cavitation in pumps. **Practical Component:** • Characteristic curves of Centrifugal pump • Characteristic curves of Reciprocating pump	**7 Hours** **10 Hours**

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

Learning Resources

Textbooks:

1. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd, New Delhi (2006).
2. K.L. Kumar, "Engineering Fluid Mechanics", Eurasia publishing house, New Delhi,(2001).

References:

1. P.N. Modi & S.M. Seth, "Hydraulics and fluid mechanics including hydraulic machines", Standard book house, New Delhi, (2005).
2. V.L. Streeter – "Fluid mechanics", McGraw-Hill, New York, (2002).
3. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, Chennai, (2003).
4. Versteeg, H.K, and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The Finite Volume Method", Pearsons, United Kingdom, (2007).

Online Educational Resources:
1. http://nptel.ac.in/courses/105101082/ 2. http://bookboon.com/en/engineering-fluid-mechanics-ebook 3. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv078 4. http://www.srividyaengg.ac.in/elearn1/coursematerial/Mech/114343. pdf 5. http://www.engineeringtoolbox.com/fluid-mechanics-t_21.html 6. https://www.youtube.com/watch?v=OGIkuJoQzok 7. https://www.youtube.com/watch?v=VZXVdPoy3zs 8. https://www.youtube.com/watch?v=3gxNrc_EEN8 9. https://www.youtube.com/watch?v=BaEHVpKc-1Q

Assessment (Embedded course)
CAT, MCQ, Written Assignments on solving problems, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce, etc…

*Activity and Learning Task(s): assessed through Active Learning Strategies (ALS) Eg: One-minute paper, exit tickets/exit slips, Think-pair-share, Socratic seminar, reflective journal, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Concept map, Homework tasks. Delete Assessment tables that do not apply to this course.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Mr. Balamurugan M Application Engineer-API Pumps Department : Techno-Commercial Operations M/s. Flowserve India Controls Pvt. Ltd., Coimbatore.	Dr. Anirudha Ambekar Assistant Professor Department of Mechanical Engineering IIT Goa.	Mr. Jeeva B Assistant Professor Department of Mechanical Engineering, Kumaraguru College of Technology, Coimbatore.	
Recommended by BoS on			
Academic Council Approval		**Date**	

Semester - IV

30 Hours	Innovation Practicum - IV	0L: 0T: 0P: 1J	1 Credit

Course Overview:

This course immerses participants in a comprehensive product design and development experience through a dynamic hackathon model. Covering essential topics such as the Forge Innovation Handbook, advanced programming techniques, intellectual property, and the creation of a Minimum Usable Prototype (MUP), the course combines master classes, hands-on workshops, and intensive hacking sessions. Participants will acquire practical skills and knowledge applicable to their projects. The course culminates in a pitch competition and MUP demonstration, where students will present their innovations, showcase their prototypes, and articulate their value propositions, allowing them to demonstrate their creativity and entrepreneurial skills.

Course Objectives:

- Learn and apply the Forge Innovation Handbook (FIH) to problem-solving.
- Develop a minimum usable prototype (MUP) through iterative design, development, and testing.
- Effectively demonstrate the developed MUP.

Course Outcomes:

- Proficiency in using the FIH to identify and solve problems.
- Experience in designing, building, and demonstrating a MUP.
- Improved ability to communicate and present project outcomes effectively.

CO-PO-PSO Mapping

COs	Programme Outcomes (POs)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	2									
CO2			3	2			2		2				2	
CO3									2	3		2		2

S-Strong (3) **M-Medium (2)** **L-Low (1)**

Module 1: Innovation Fundamentals

Master Class #1: Explore the core concepts of product design and development.

Master Class #2: Introduction to the Forge Innovation Handbook (FIH) and its applications.

Workshop #1: Utilize the FIH Canvas to identify challenges, validate problems, understand user needs, and define pain points, gains, and value propositions.

Module 2: Advanced Prototyping Techniques

Master Class #3: Rapid Prototyping Techniques - 1.

Master Class #4: Rapid Prototyping Techniques - 2.

Hack Time #1: Engage in hands-on experimentation to test core assumptions, refine the Proof of Concept (PoC). Incorporate rapid prototyping techniques and iterate on the design to enhance functionality.

Module 3: Intellectual Property and Proof of Concept

Master Class #5: Gain insights into intellectual property (IP) and prior art search.

Hack Time #2: Develop and refine a working prototype. Build a Minimum Usable Prototype (MUP) based on feedback and iteration.

Module 4: Build the Minimum Usable Prototype (MUP)

Hack Time #3: Enhance the prototype through iterative improvements. Utilise feedback from mentoring sessions to make targeted adjustments and refinements, optimising the prototype's functionality and design based on practical insights.

Hack Time #4: Develop the Minimum Usable Prototype (MUP). Build the final version of the MUP incorporating all iterative refinements. Ensure that it meets the defined criteria and is ready for comprehensive testing and presentation.

Module 5: Perfect Pitch and Product Showcase

Hack Time #5: Conduct a final demonstration and technical testing of the prototype. Create a compelling pitch to articulate the value proposition and potential impact of the innovation, aimed at securing support or funding.

Pitch Presentation and MUP Demonstration: Students showcase their completed prototype through a comprehensive demonstration, highlighting its key features and functionalities to Industry experts, incubators and investors. They deliver a compelling pitch that clearly communicates the innovation's impact, market potential, and benefits. This presentation aims to effectively convey the value of the prototype, engage potential stakeholders, and secure support or funding opportunities.

Text Books

1. Rapid Prototyping And Engineering Applications: A Toolbox For Prototype Development - Frank W.Liou, 2007
2. Rapid Prototyping Technology: Selection And Application - COOPER K. G, 2001

References:

1. Jazz Factory - All about Presentations and http://blog.jazzfactory.in/
2. Pretotyping Methodology - https://www.pretotyping.org/methodology.html
3. How to give a killer presentation - https://hbr.org/2013/06/how-to-give-a-killer-presentation
4. Evaluating Product Innovations — proof, potential, & progress:https://blog.forgeforward.in/evaluating-product-innovations-e8178e58b86e

24MEI208	Thermal Engineering	L	T	P	J	C
		3	0	2	0	4
Professional Core		SDG	SDG No's. 04,07,09,12			

Pre-requisite courses	Course code(s)	Data Book / Code book (If any)	NA

Course Objectives:	
The purpose of taking this course is to:	
1	Understand the thermodynamic cycles used in internal combustion engines and analyze their performance characteristics.
2	Learn the construction, operation, and comparison of different types of internal combustion engines and their auxiliary systems.
3	Evaluate the performance of IC engines using various testing methods and parameters.
4	Gain knowledge of the functioning, classification, and performance evaluation of different types of boilers.
5	Analyze the working principles and performance of different types of air compressors and understand multi-stage compression.

Note: Course Objectives: - should cover Knowledge to be Acquired, Skills to be gained, and Competency to be Developed. Number of Course objectives must range from 3 to 5

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Analyze and compare the performance of air standard cycles and internal combustion engines using P-V and T-S diagrams.	AP
CO 2	Illustrate the construction and working of engine auxiliary systems such as carburetors, ignition systems, and supercharging.	An
CO 3	Conduct and interpret engine performance tests and evaluate efficiency parameters using test methods.	AP
CO 4	Explain and assess the performance of various types of boilers and their draught systems.	AP
CO 5	Analyze the working and performance of single-stage and multi-stage air compressors, including efficiency and energy savings.	AP

Note: Course Outcomes should be clear, measurable, aligned with broader educational objectives, and focused on developing essential engineering skills while preparing students for future challenges in the field

No. of COs: Embedded (3 to 4 credits): 6; Theory only 5; Micro-credentials – 3; lab only – 3; project – 4

RBT levels: Write the abbreviated levels - R, U, Ap, An, E, C (Remember, Understand, Apply, Analysis, Evaluate, Create)

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	PSO-3
1	3	3	2	2	0	0	0	0	0	0	1	3		

2	3	2	2	0	2	0	0	0	0	0	1	2		
3	3	3	2	3	2	0	0	1	2	1	1	3		
4	3	2	1	2	0	1	0	0	0	0	1	2		
5	3	3	2	2	0	0	0	0	0	0	1	3		

Course Content

AIR STANDARD CYCLES AND IC ENGINES: Air standard assumptions, Carnot, Otto, Diesel and Dual cycles, comparison of Otto, Diesel, and Dual cycles; Classification and comparison of engines, working principle of Wankel engine, four stroke and two stroke engines, petrol and diesel engines with P-V and T-S diagrams, valve and port timing diagrams **Practical Component:** 1. Valve Timing Diagrams 2. Port Timing Diagrams	**15 Hours**
ENGINE AUXILIARY SYSTEMS: Working principles and types of carburetors, ignition systems, fuel pumps and injectors, MPFI, CRDI, lubricating and cooling systems; Super and turbocharging. **Practical Component:** 3. Determination of Viscosity of given oil. 4. Determination of Flash Point and Fire Point.	**15 Hours**
PERFORMANCE OF IC ENGINES: Engine testing: Constant speed and variable speed tests, indicated power, brake power, frictional power - Willan 's line and Morse test, volumetric efficiency, heat balance test. **Practical Component:** 5. Performance Test on Multi Cylinder Diesel Engine by Hydraulic loading. 6. Heat Balance Test on Diesel Engine by Electrical loading. 7. Morse Test on Multi cylinder Petrol Engine. 8. Performance and emission Test on single cylinder petrol engine. 9. Determination of Frictional Power by retardation test.	**24 Hours**
BOILERS: Requirements of boiler; Types: Water tube, fire tube, fluidized bed boilers; Boiler draught; Boiler performance: Direct and indirect heat balance.	**09 Hours**
COMPRESSORS: Classification, working principle of reciprocating compressors, equations for shaft work and efficiencies, effect of clearance on volumetric efficiency, multi-stage compression, inter-cooler and optimum intermediate pressure in a two stage compressor; Rotary compressor: Roots-type blower, sliding vane and screw compressors - working principle and performance. **Practical Component:** 10. Performance test on reciprocating air compressor.	**12 Hours**

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

Learning Resources

Textbooks:

1. John B. Heywood, "Internal Combustion Engine Fundamentals", 2nd Edition, McGraw-Hill Education, USA, 2018.
2. Ganesan V, "Internal Combustion Engine", 4thEdition, McGraw Hill Publishers, India, 2012.

References:

1. Allan T Kirkpatrick, Colin R Ferguson , "Internal Combustion Engines: Applied Thermosciences", 3rd Edition, Wiley,India, 2015.

2. Kothandaraman C P, DomkundwarS , "Thermodynamics and Thermal Engineering", 3rd Edition, Dhanpat Rai and Sons, India, 2013.

3. Rudramoorthy R , "Thermal Engineering", 3rd edition, Tata McGraw Hill Publishers Co. Ltd, India, 2017.

4. Willard W Pulkrabek, "Engineering Fundamentals of the Internal Combustion Engine", 2ndEdition, Pearson Education,USA, 2003.

Online Educational Resources:

https://archive.nptel.ac.in/courses/112/103/112103316/
https://www.youtube.com/playlist?list=PLwdnzlV3ogoWV-_n1YItO933MxgPXfEiM
https://onlinecourses.nptel.ac.in/noc23_me31/preview

Assessment (Theory course)

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

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce, etc…

*Activity and Learning Task(s): assessed through Active Learning Strategies (ALS) Eg: One-minute paper, exit tickets/exit slips, Think-pair-share, Socratic seminar, reflective journal, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Concept map, Homework tasks. Delete Assessment tables that do not apply to this course.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
[Name, Organization]	[Name, Institution]	[Name, Department]	
Recommended by BoS on	XX/YY/2024		
Academic Council Approval	No.	**Date**	XX/YY/2024

24MEI207	STRENGTH OF MATERIALS/Applied Mechanics of Materials	L	T	P	J	C
		3	0	2	0	4
Professional Core		**SDG**	**4,9**			

Pre-requisite courses: **Engineering Mechanics**	**24MEI207**	**Data Book / Code book (If any)**	

Course Objectives:	
The purpose of taking this course is to:	
1	**CO1:** To provide students with the ability to **apply** fundamental concepts of stress and strain in analyzing axial stress and strain in materials under varying cross-sections and determine their effects on structural components.
2	**CO2:** To develop the students' skills in **analyzing** shear force and bending moment diagrams for statically determinate beams, and enable them to evaluate bending and shear stresses under different loading conditions.
3	**CO3:** To enable students to **apply** various methods of calculating slope and deflection in beams and understand their significance in ensuring structural integrity in mechanical designs.
4	**CO4:** To equip students with the knowledge to **evaluate** the buckling behavior of columns under different boundary conditions and determine strain energy in materials subjected to gradual, sudden, and impact loading conditions.
5	**CO5:** To develop the students' hands-on experimental skills by **applying** methods to measure stress-strain relationships using tension tests and analyzing the results to assess material properties for practical applications.
6	**CO6:** To provide students with practical experience in **evaluating** beam deflections using modern experimental techniques, such as laser displacement sensors, and comparing the results with theoretical predictions to validate the accuracy of beam design.

Course Outcomes		
After successful completion of this course, the students shall be able to		**Revised Bloom's Taxonomy Levels (RBT)**
CO 1	Apply the concepts of stress and strain to analyze axial stress and strain in materials under uniform and varying cross-sections, and calculate their effects on structural components.	Apply
CO 2	Analyze the shear force and bending moment diagrams for statically determinate beams, and evaluate the bending and shear stresses under various loading conditions.	Analyze
CO 3	Apply the methods of slope and deflection to determine deflection in beams, and analyze the importance of deflection control in design.	Apply
CO 4	Evaluate the buckling behavior of columns using Euler's and Rankine's formulas, and analyze strain energy stored in materials under various loading conditions.	Evaluate
CO 5	Apply experimental methods to measure stress-strain relationships in mild steel using a tension test, and analyze the data to assess material properties.	Apply
CO 6	Evaluate beam deflections experimentally using laser displacement sensors and extensometers, and compare the results with theoretical predictions.	Evaluate
CO	**Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)**	

	1	2	3	4	5	6	7	8	9	10	11	Program Specific Outcomes (PSO)		
	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	PSO-3
1	2	2	1	0	1	0	0	0	0	0	0	2	0	
2	1	2	3	0	1	0	0	0	0	0	0	2	0	
3	1	1	2	0	1	0	0	0	0	0	0	2	0	
4	2	2	2	0	1	0	0	0	0	0	0	2	0	
5	1	1	1	3	1	0	0	0	0	0	0	2	0	
6	1	1	1	3	1	0	0	0	0	0	0	2	0	

Course Content

Module 1: Simple Stresses and Strains **Stress and Strain:** Definition of stress and strain. Types of stresses (normal and shear) and strains (normal and lateral). **Stress-Strain Diagrams:** Understanding the stress-strain curve for ductile and brittle materials. Yield point, ultimate tensile strength, and fracture point. Use of stress-strain data to design components for safety-critical applications like aircraft wings, automotive frames, and bridges (**Study Only)** **Factor of Safety:** Determining the factor of safety for various material conditions and loading scenarios. **Stresses and Strains in Stepped Bars and Uniformly Varying Sections:** Axial stress and strain in stepped bars under uniform and varying cross-sections. **Stresses in Composite Bars due to Axial Loads and Temperature:** Stresses in bars made of different materials subjected to axial loading and temperature variations. **Relationships among Elastic Constants:** Relationship between Young's modulus, Poisson's ratio, and shear modulus. **Practical Component:** • Tension Test on a Mild Steel Rod (Experimental validation of stress-strain relationship). • Integration of Digital Image Correlation (DIC) for precise measurement of strain distribution during the test. (**Study Only)**	9 Hours 4 Hours
Module 2: Shear and Bending in Beams **Shear Force and Bending Moment Diagrams:** Analysis of shear force and bending moment for statically determinate beams. Drawing shear force and bending moment diagrams. **Theory of Simple Bending:** Assumptions in bending theory. Bending stress distribution along the length and in beam sections. **Shear Stresses in Beams:** Calculation of shear stress in solid and hollow beams.	9 Hours 4 Hours

Practical Component: • Shear Test on a Mild Steel Rod (Experimental shear stress analysis).	
Module 3: Deflection of Beams **Slope and Deflection in Determinate Beams:** Concepts of slope and deflection in beams. Theoretical methods for calculating deflection. **Methods of Calculating Deflection:** o Double integration method. o Macaulay's method. o Moment area method**.** Importance of deflection control in the design of cantilevers in mechanical systems (e.g., cranes, bridges)- (**Study Only)** **Practical Component:** • Deflection Test on Beams (Experimental validation of beam deflection). • Use of laser displacement sensors and extensometers in lab experiments. (**Study Only)** • Real-time deflection measurement using non-contact techniques (e.g., Laser Doppler Vibrometry). (**Study Only)**	7 Hours 4 Hours
Module 4: Buckling of Columns and Strain Energy (7 Hours) **Buckling of Columns:** End conditions and their impact on buckling behavior.Euler's formula for buckling. Rankine's formula for column strength. **Strain Energy:** Energy stored in materials under gradual, sudden, and impact loading. Calculations of strain energy in different loading conditions • Case study on the optimization of materials to absorb strain energy, such as in automotive crash simulations. (**Study Only)** • Modern methods in assessing strain energy during high-impact loading conditions (e.g., impact testing for crashworthiness) (**Study Only)** **Practical Component:** • Hardness Test on Metals (Brinell and Rockwell hardness tests). • Impact Test (Charpy/Izod impact test for toughness measurement).	6 Hours 8 Hours
Module 5: Torsion **Torsion of Shafts:** Torsion in circular and hollow shafts. Elastic theory of torsion. Stresses and deflections in solid and hollow shafts. Stepped shafts and shafts in series and parallel. **Springs:** Analysis of closed and open coiled helical springs. Stress and deflection in helical springs. • Analysis of torsional stresses in drive shafts, aircraft fuselages, and propeller shafts. (**Study Only)** • Advanced materials used to handle torsional loads such as titanium alloys and carbon fiber composites(**Study Only)** **Practical Component:** • Torsion Test on Mild Steel Rod (Experimental torsion behaviour).	7 Hours 10 Hours

• Implementation of rotary test rigs equipped with torque sensors and DIC for measuring angular displacement and strain on the test specimens. (**Study Only)** • Compression and Tensile Test on Helical Springs (Behaviour of springs under axial compression). • Use of automated systems to measure compression, deflection, and spring modulus for design applications. (**Study Only).** • Integration of extensometers for precise measurement of strain in helical springs during tensile loading. (**Study Only).**	
Module 6: Complex Stresses **State of Stress at a Point:**Understanding the normal and shear stresses acting on a material poin**t.** **Principal Stresses and Strains in Two Dimensions:**Calculating principal stresses and strains using analytical methods.Mohr's Circle for stress and strain analysis. **Concepts in 3D Stress Analysis (Basics from FEA – Study Only):**Introduction to 3D stress and strain analysis.FEA methods for analyzing complex stress systems. Case studies of real-world applications (e.g., pressure vessels, structural components, etc.). Analyzing FEA results for practical design scenarios (**Study Only)** **Hoop and Longitudinal Stresses in Thin Cylinders and Shells:**Stresses due to internal pressure in cylindrical and spherical shells. **Practical Component:** • Strain Energy Test • Measurement using advanced load cells, strain gauges, and Digital Image Correlation(DIC) for real-time monitoring of strain energy in different materials under varying loading conditions. (**Study Only)** • Modelling a simple structure (plate/frame) in FEA software. Simulation of forces and boundary conditions. Validation of FEA results using experimental data from strain gauges. (**Study Only)**	7 Hours

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

Learning Resources

Textbooks:

1. Bansal, R.K., Strength of Materials, Laxmi Publications, New Delhi (2018).
2. Ramamrutham, S., Strength of Materials, Dhanpat Rai Publishing, New Delhi (2021).
3. Punmia, B.C., Strength of Materials and Mechanics of Solids, Laxmi Publications (2017).
4. Timoshenko, S.P., Strength of Materials, CBS Publishers, New Delhi (2015).

5. Egor P. Popov, Engineering Mechanics of Solids, Pearson Education, India (2012).

References:

1. Beer, F.P., and Johnston, E.R., Mechanics of Materials, McGraw Hill Education, New Delhi (2017).
2. Gere, J.M., Mechanics of Materials, Cengage Learning (2016).
3. Hibbeler, R.C., Mechanics of Materials, Pearson Education, New Delhi (2018).
4. Sadhu Singh, Strength of Materials, Khanna Publishers, New Delhi (2013).
5. Srinath, L.S., Strength of Materials, Macmillan India Ltd., New Delhi (2010).

Online Educational Resources:

1. NPTEL: Strength of Materials by Prof. S.K. Bhattacharya, IIT Kharagpur
2. SWAYAM – Strength of Materials
3. Khan Academy – Mechanics of Materials
4. Coursera – Mechanics of Materials I: Fundamentals of Stress & Strain
5. MIT OpenCourseWare – Mechanics of Deformable Solids

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

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

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce, etc…

*Activity and Learning Task(s): assessed through Active Learning Strategies (ALS) Eg: One-minute paper, exit tickets/exit slips, Think-pair-share, Socratic seminar, reflective journal, Low-stakes quizzes, Diagnostic questions, Open-ended questions, Concept map, Homework tasks. Delete Assessment tables that do not apply to this course.

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
Mr. Vetrivel R Executive – NS Instruments India Pvt Ltd		**Dr.S.Sivakumar,AP-III** **Dr.Krishnamoorthi K,AP-III**	
Recommended by BoS on			
Academic Council Approval		**Date**	

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

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

Course Objectives:

The purpose of taking this course is to:

1	to 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	critically analyse the performance of different numerical methods in terms of accuracy, stability, and computational efficiency for solving PDEs in practical engineering applications.
4	apply probability theory to model and solve real-world problems involving uncertainty, risk analysis, and decision-making in engineering, business, and science.
5	to study and apply standard probability distributions, with emphasis on the Poisson and Normal distributions, including their properties, applications, and parameter interpretation.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	develop algorithmic and computational skills to implement these numerical techniques using programming or mathematical tools.	Ap
CO 2	analyse and compare the accuracy and efficiency of various interpolation and integration techniques in solving real-world numerical problems.	An
CO 3	implement numerical schemes and compute approximate solutions for both heat and wave equations using finite difference methods.	Ap
CO 4	implement and simulate the solution of 2D Laplace and Poisson equations using numerical algorithms on rectangular domains.	Ap
CO 5	analyse and model real-world problems involving uncertainty using fundamental probability concepts.	An
CO 6	interpret and use distribution-related concepts in statistical modelling and data analysis.	An

	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	PSO-3
1	2										1			
2	2										1			

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

Course Content

NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS Linear interpolation method-Newton's method –Solution of linear system in engineering field by Gaussian elimination, Gauss Jordan method - Iterative method: Gauss Seidel method – Inverse of a matrix by Gauss Jordan method. **Practical Component** • Gauss Elimination & Inverse by Gauss Jordan method • Newton Raphson method.	**9 Hours** **6 Hours**
INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION Newton's forward, backward and divided difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's rules(single integration) **Practical Component** • Newtons divided difference interpolation • Numerical integration by Simpsons rule	**9 Hours** **6 Hours**
SOLUTION OF BOUNDARY VALUE PROBLEMS Solution of one dimensional heat equation using Bender Schmidt difference scheme –Solution of one dimensional wave equation by explicit scheme. Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain. **Practical Component** • Solution of one dimensional heat equation using Bender Schmidt method Solution of one dimensional wave equation by explicit scheme	**9 Hours** **6 Hours**
PROBABILITY THEORY Axioms of probability - Conditional probability – Total probability – Bayes' theorem • Introduction to R Programming • Probability and Bayes' Theorem **in** R programming,	**9 Hours** **6 Hours**
RANDOM VARIABLES Random variable – Distribution function – properties – Probability mass function-Probability density function –Poisson and Normal distributions – Properties. **Practical Component** • . Application of Poisson distribution • Application of 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. **Numerical Analysis**
   https://nptel.ac.in/courses/111106101
2. **Probability and Statistics**
   https//nptel.ac.in/courses/111105041

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 Institution**	**Internal Expert(s)**
1. Dr. R VASU Business Excellence and Management Systems Consultant Specialisation in Process Excellence, Six Sigma Quality, Health Safety & Environment Systems Vice President (Retired) Brakes India.	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

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

24INM202	ENVIRONMENTAL SCIENCE AND SUSTAINABILITY (Common to All Branches)	L	T	P	J	C
		1	0	2	0	2
HS		SDG	6, 13, 15			

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

Course Objectives:

The purpose of taking this course is to:

1	To introduce the importance, types, and conservation strategies of natural resources, with a focus on sustainable practices in water and food management.
2	To understand the structure and function of ecosystems and biodiversity, and explore the need for conservation through the study of hotspots and global environmental concerns.
3	To examine the causes and effects of environmental degradation, including pollution and waste management, and to promote mitigation strategies for sustainable development.
4	To provide knowledge of the legal and institutional frameworks for environmental protection in India and globally, including critical environmental acts and enforcement challenges.
5	To explore conventional and alternative energy resources, and to assess methods for energy conservation and carbon footprint reduction through audits and sustainability measures.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply the concept of natural resource conservation to demonstrate sustainable practices	Ap
CO2	Analyse the structure, function, and adaptive capacity of ecosystems to categorize threats and conservation strategies for biodiversity.	An
CO3	Analyse various forms of environmental degradation and propose management and preventive solutions.	An
CO4	Apply national environmental laws and frameworks in the personal and professional contexts	Ap
CO5	Design strategies using renewable energy principles to develop sustainable energy utilization plans through audits and footprint analysis to transfer a healthy environment for future generations.	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	PSO-3
1	2	–	–	–	–	2	3	–	1	–	–	2	–	–
2	2	2	–	–	–	2	3	1	–	–	–	2	2	–
3	2	3	–	2	–	3	3	1	–	–	–	2	3	–

4	–	2	–	–	–	3	3	3	1	2	2	–	2	–
5	2	2	3	2	2	3	3	–	1	2	2	2	2	3

Course Content	
NATURAL RESOURCES **Introduction to Natural resources :** Types, significance, and conservation strategies **Water resources:** Utilization, management practices, and conservation strategies - rainwater harvesting methods.– Water distribution system audit **Food resources:** Challenges of food security in India - impact of modern agriculture, and environmental concerns related to fertilizers and pesticides. **Practical Component:** • Parameter Testing : Water / Effluent / Soil/Fertiliser • Simulation Experiments • Online Course	**3 Hours** **10 Hours**
ECOSYSTEM AND BIODIVERSITY **Ecosystem:** Structure and function of an ecosystem - ecosystem resilience and adaptive capacity **Biodiversity:** Values of biodiversity - Hot Spot of biodiversity (in the Himalayas, the Western Ghats, the Indo-Burma region, and the Gulf of Mannar) - Threats to biodiversity. **Conservation Strategies:** Emerging Issues in Biodiversity Conservation - Citizen science - In-situ and Ex-situ conservation of biodiversity. **Practical Component:** • Documentation of biodiversity in the campus	**3 Hours** **6 Hours**
ENVIRONMENTAL DEGRADATION AND MANAGEMENT **Pollution**: Causes, effects and control measures of Air pollution, Water pollution - Role of an individual in prevention of pollution **Waste management**: Circular Economy vs. Linear Economy - Disposal of solid wastes - Treatment of Liquid wastes **Disaster Management**: Mitigation strategies and Readiness **Practical Component:** • Waste Management and Resource recovery in Campus • Documentation of Environmental Data Resources and Monitoring Tools.	**3 Hours** **6 Hours**
LEGAL FRAMEWORK FOR ENVIRONMENTAL PROTECTION IN INDIA **Global and National Initiatives**: United Nations Sustainable Development Goals - Coastal Regulation Zone - Environmental impact assessment **Environmental Legislation in India**: Key Legal and Regulatory Terminology in India – Valuation of Ecosystem Services and integration of Acts in the workplace - Plastic Waste Management Rules - E-Waste Management Rules - Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act **Implementation Challenges**: Issues involved in enforcement of environmental legislation **Practical Component:** • Online Course	**3 Hours** **2 Hours**

ENERGY MANAGEMENT **Energy Resources:** Energy Demand and Urban energy Challenges - Necessity of alternate energy methods - Renewable and Non- renewable energy resources - Carbon footprint and carbon credit – Sustainable energy utilization – Case study **Energy Audits** – Purpose, methodology, and common instruments used **Practical Component**: • Documentation of Energy usage through Carbon foot print calculation - Personal aswell as Institutional	**3 Hours** **6 Hours**

Theory Hours: 15	Tutorial Hours: 0	Practical Hours: 30	Project Hours: 0	Total Hours: 45

Learning Resources

References:

1. Bharucha, E. (2021). Textbook of environmental studies for undergraduate courses (3rd ed.). Orient BlackSwan / Universities Press - Hyderabad, India.
2. Miller, G. T., & Spoolman, S. E. (2014). Environmental science (14th ed.). Cengage India
3. Anubha Kaushik & C.P. Kaushik (2024). Perspectives in Environmental Studies (8th ed.). New Age International Publishers, New Delhi.
4. Masters, G. M., & Ela, W. P. (2013). Introduction to environmental engineering and science (3rd ed.). Pearson Education, New Delhi.
5. Leelakrishnan, P. (2018). Environmental law in India (3rd ed.). LexisNexis Butterworths, New Delhi.
6. Botkin, D. B., & Keller, E. A. (2014). Environmental science: Earth as a living planet (9th ed.). Wiley, Hoboken, NJ.
7. Armstrong, J. (2023). The future of energy: The 2023 guide to the energy transition. Independently published.
8. Easton, T. (Ed.). (2017). Taking sides: Clashing views on environmental issues (17th ed.). McGraw-Hill Education, New York, NY.
9. Ishwaran, N. (2022). Ecosystem services and economic valuation. New Delhi: TERI Press.

Online Resources (Weblinks)

https://www.youtube.com/watch?v=j4Z6WmTnhRQ How to Conduct a Water Audit in Institutions

- https://www.youtube.com/watch?v=_OKYio2Yk9U India's Food Security Challenge
- https://www.youtube.com/watch?v=IjNT9Z2OLf4 India’s Biodiversity Hotspots
- https://www.youtube.com/watch?v=_c_sJIEJY4M What is Citizen Science?
- https://www.youtube.com/watch?v=1HZR3GyzFZc What is a Circular Economy
- https://www.youtube.com/watch?v=6_tLYyR_3Vo Environmental Law and Acts in India
- https://www.youtube.com/watch?v=kGcrYkHwE80 Introduction to SDGs
- https://www.youtube.com/watch?v=V__eNSHdChA Conducting an Energy Audit
- https://www.youtube.com/watch?v=dUqTt5Qrxn8 - What is Your Carbon Footprint?

Assessment (Embedded course)

CAT, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)
Lab Workbook, Report Submission

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. Mathivanan Packiarajan University of Michigan Ann Arbor, MI USA Dr. Venkatakrishnan Professor, School of Chemical Sciences Indian Institute of Technology (Mandi) Himachal Pradesh India		Faculty Of Chemistry Department of Chemistry
Recommended by BoS on			
Academic Council Approval	No.	**Date**	

BoS Chair

24MEP207	Digital Engineering Drafting and Modeling	L	T	P	J	C
		0	0	4	0	2
Professional Core		SDG	4,7,9,12,13			

Pre-requisite courses	24MET203	Data Book / Code book (If any)	--

Course Objectives:	
The purpose of taking this course is to:	
1	To introduce students to fundamental 2D drafting and 3D modeling techniques using industry-standard CAD software for mechanical components.
2	To develop the ability to create and assemble detailed machine parts and visualize complex mechanical systems in digital environments.
3	To train students in preparing professional-quality 2D drawings and 3D models with appropriate dimensions, tolerances, and surface finish indications.
4	To enable students to interpret and analyze industrial drawings and apply Geometric Dimensioning and Tolerancing (GD&T) principles in mechanical design.
5	To foster the skills to integrate drafting and modeling techniques creatively for producing complete and precise engineering documentation suitable for manufacturing.

Course Outcomes		
After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO 1	Apply 3D modeling techniques to visualize and develop machine components using CAD tools..	Apply
CO 2	Analyze assembly modeling and drafting practices to create detailed industrial drawings with GD&T and surface roughness indications.	Analyze
CO 3	Evaluate different CAD and drafting methods to recommend the most suitable techniques for creating accurate machine drawings	Evaluate
CO 4	Create part and assembly models to develop professional-level 2D and 3D engineering drawings.	Create
CO 5	Analyze industrial drawings with GD&T standards to interpret manufacturing requirements and suggest improvement	Analyze

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	PSO-3
1	2	2	0	1	0	2	0	0	1	1	0	0	0	0
2	0	3	0	0	0	2	1	0	0	1	0	0	0	0
3	0	0	2	2	0	0	0	0	0	2	0	0	0	0
4	0	0	0	3	0	0	0	0	0	0	2	0	0	0
5	1	2	0	0	0	2	0	2	1	1	0	2	0	0

Course Content

MODULE I: 3D Visualization of Machine Components – Part Modelling Introduction to CAD packages and demonstration of part modelling, simple examples to familiarize cad packages. Sketcher constraints, basic 3D commands to be used for modelling machine components. Visualization of machine components - CAD modelling of shaft, bearings, fasteners, gears, keys, rivets and springs, – user defined, customization using toolbox	**12 hours**
MODULE II: 3D Visualization of Machine Components –Assembly Modelling Visualization of machine components - Assembly modelling of – rod joints: cotter and knuckle joints, , tail stock., screw Jack, stop valve, machine vice, Plummer block [for class work only – keys and shaft coupling: flanged coupling – shaft bearing. Assembly modelling and detailing of – IC engine connecting rod,].	**12 hours**
MODULE III: Fundamentals of 2D Drafting Introduction to drafting package – basic commands and development of 2d simple drawings – drawing, editing, dimensioning, layering concepts, hatching, detailing etc. Fundamentals of Machine Drawing – Conventional representation of: Sectional views, Riveted joints, Welded joints, Keys, Bolts & Nuts and Foundation bolts	**12 hours**
MODULE IV: 2D Assembly Drawings of Machine Components Preparation of Detailed Assembly Drawings (2D) of – rod joints: cotter and knuckle joints, tail stock, screw Jack, stop valve, machine vice, Plummer block [for class work only – keys and shaft coupling: flanged coupling – shaft bearing. Assembly Drawing (2D) with Bill of Materials of – IC engine connecting rod].	**12 hours**
MODULE V: Industrial Drawing Case Studies with Geometric Dimensioning & Tolerancing and Roughness Indications Basic Principles of Geometric Dimensioning and Tolerancing. Surface roughness – Indication of surface roughness on drawings. Reading and Interpretation of industrial drawings – Case study and Presentation	**12 hours**

Theory Hours:	**Tutorial Hours:**	**Practical Hours:**	**3**	**Project Hours:**	**Total Hours:60**

Learning Resources
Textbooks:
1. N.D. Bhatt, Machine Drawing, Charotar Publishing house, Anand, New Delhi, 28th edition, 1994. 2. Gopalakrishna K.R., Machine Drawing, 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013
References:
1. Bertoline, Wiebe, Miller, Nasma., -Technical Graphics Communication, IR WIN Graphic Series, 2008. 2. S. Bogolyubov. A. Voinov., -Engineering Drawing, Van Nostrand Reinhold Company, 2001. 3. D. E. Hewitt., -Engineering Drawing and Design for Mechanical Technicians, The Macmillan Press Ltd, London, 2006. 4. William P. Spence, Engineering Graphics, Printice Hall Inc, Engle Wood Cliff 5. Brain Griffiths., Engineering Drawing for Manufacture, Kogan Page Science, USA, 2003Last name, 6. K.L. Narayana, P. Kannaiah, K. Venkat Reddy, Machine Drawing, New Age International (P) Ltd.,2nd edition 7. P S Gill, Machine Drawing, Kataria& Sons.
Online Educational Resources:
1. https://youtube.com/playlist?list=PLp6ek2hDcoNCjoRLQ4rjpCozisCACBxKA- Engineering Graphics and Design, Naresh V Datla and Sunil R kale, Department of Mechanical Engineering, IIT Delhi.

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

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

Assessment (Practical course)
Lab Workbook, Experimental Cycle tests, viva-voce, etc…

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert(s)**	
[Name, Organization]	[Name, Institution]	Dr Arun K K,AP-III Dr.S.Sivakumar,AP-III	
Recommended by BoS on	XX/YY/2024		
Academic Council Approval	No.	**Date**	XX/YY/2024