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DEPARTMENT OF AERONAUTICAL ENGINEERING

B.E. AERONAUTICAL ENGINEERING

REGULATION 2024

CURRICULUM AND SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

DEPARTMENT OF AERONAUTICAL ENGINEERING

MAHENDRA ENGINEERING COLLEGE

(AUTONOMOUS)

MALLASAMUDRAM WEST, TAMILNADU-637503

DEPARTMENT OF AERONAUTICAL ENGINEERING

Regulation-2024- Curriculum (CBCS)							
I Semester							
Sl. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**
THEORY							
1	24MA12101	Engineering Mathematics-I	BS	3	1	0	4
2	24CY12001	Engineering Chemistry	BS	3	0	0	3
3	24HS11001	Communicative English	HS	3	0	0	3
4	24GE13101	Engineering Drawing	ES	2	0	2	3
5	24HS11002	Heritage of Tamils	HS	1	0	0	1
	-	Induction Program	MC	-	-	-	-
PRACTICAL							
6	24CY22001	Chemistry Laboratory	BS	0	0	3	1.5
7	24HS21001	Personality Development Practice Laboratory	EEC	0	0	2	1
8	24GE23101	Computer Aided Drafting and Modelling Laboratory	ES	0	0	3	1.5
			TOTAL	**12**	**1**	**10**	**18**

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MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus					**Regulations 2024**	
Department	**MATHEMATICS**	**Programme Code**				
SEMESTER – I						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24MA12101	**ENGINEERING MATHEMATICS-I (Common to all Branches)**	3	1	0	4	**100**
Objectives	To enable the students to: • Learn the types of matrices and linear algebra in a comprehensive manner. • Familiarize with functions of several variables and its applications toengineering. • Define the geometric aspects of curvature, radius of curvature, evolutes and envelopesas application of differential calculus. • Explain various techniques of integration. • Learn double and triple integrals and give their representation as area and volume.					
Outcomes	At the end of the course the students will be able to: • Determine the rank of a matrix, eigenvalues, eigenvectors and inverse of a givenmatrix and diagonalize symmetric matrix by orthogonal transformations, solve system of linear equations. • Determine maxima and minima of functions of several variables. • Apply the concepts of differential calculus in physical problems. • Apply different methods of integration in solving practical problems. • Compute the area and volume by using multiple integrals.					
UNIT – I	**MATRICES**					**9+3**

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Matrix and its types – Rank of matrix –Solving system of linear equations - Characteristic equation – Eigen values and Eigenvectors of the matrix - Cayley-Hamilton Theorem, Diagonalization of real and symmetric matrices by Orthogonal transformation – Reduce the quadratic form to canonical form.		
UNIT – II	**DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES**	**9+3**
Differentiation of implicit functions – Partial derivatives – Total derivative – Euler's theorem – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables– Lagrange's method of undetermined multipliers.		
UNIT – III	**APPLICATIONS OF DIFFERENTIAL CALCULUS**	**9+3**
Curvature in Cartesian co-ordinates– Centre and radius of curvature – Circle of curvature – Evolutes –Envelopes – Evolute as envelope of normals and their properties.		
UNIT – IV	**INTEGRAL CALCULUS**	**9+3**
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals – Applications to Engineering problems.		
UNIT – V	**MULTIPLE INTEGRALS**	**9+3**
Double integrals in Cartesian co-ordinates – Change of order of integration – Area as double integral – Triple integral in Cartesian co-ordinates – Volume as triple integral – Change of variables in double integrals. Applications to Engineering problems.		
	Total	**(L:45+T:15):60 Periods**

TEXT BOOK:	
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017.
2	James Stewart, Calculus with Early Transcendental function, Cengage, 2013.
REFERENCES:	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2016.
2	Ray Wylie, Louis C. Barrett, Advanced Engineering Mathematics, McGraw-Hill, 2013.

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SEMESTER – I (For Non Circuit Branches & ECE) & SEMESTER – II (For Circuit Branches & Except ECE)						
COURSE CODE	**COURSE NAME**	**HOURS/WEEK**			**CREDIT**	**MAXIMUM MARKS**
24CY12001	**ENGINEERING CHEMISTRY**	**L**	**T**	**P**	**C**	**100**
		3	0	0	3	
Objectives	To make the students familiar with: 1. The treatment of water used for domestic and industrial purpose. 2. Various types of polymers in our day today life. 3. The basic principle and preparation methods of Nanomaterials. 4. The Construction and applications of different types of batteries. 5. The preparation, properties and combustion method of fuels.					
Outcomes	At the end of the course the student will be able to 1. Explain the various water quality parameters and their treatments for domestic and industrial applications. 2. Classify the reaction mechanism, synthesis and application of polymers. 3. Develop the essential concepts of nanoscience and nanotechnology in designing the nanomaterial for Engineering. 4. Compare the working principles of batteries and super capacitors. 5. Illustrate the suitable fuels for engineering processes and applications.					
UNIT-I	**WATER TECHNOLOGY**					9 Hrs
Types of water - Alkalinity, types and determination - Hardness, types and Estimation by EDTA method. Domestic water treatment – disinfection methods (Chlorination, ozonation, UV treatment) – Boiler feed water – requirements – Decreased efficiency of using hard water in boilers – external conditioning – demineralization process, Electro dialysis process, reverse osmosis - Internal conditioning (phosphate, calgon and carbonate conditioning methods) – Conservation of Water using 3R method– WHO and BIS guidelines for drinking water.						
UNIT-II	**POLYMER CHEMISTRY**					9 Hrs

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Introduction - Classification of polymers – Natural and synthetic - Thermoplastic and Thermosetting - Functionality – Degree of polymerization - Types and mechanism of polymerization: Addition (Free Radical); condensation and copolymerization - Preparation, properties & applications of selected commodity and engineering polymers (Polyester, Polystyrene, PVC, Nylon, Teflon, Bakelite and Epoxy resin).		
UNIT-III	**NANOCHEMISTRY**	9 Hrs
Basic - Distinction between molecules, nanoparticles and bulk materials - size-dependent properties (optical, electrical, mechanical and magnetic) - Types of nanomaterials: Definition, properties and uses of –nanoparticles , nanocluster, nanorod, nanotube and nanowire - Synthesis of nanomaterials: laser ablation, Sol gel, Synthesis of Carbon nano tubes by CVD Method- SWCNT and MWCNT- Applications (Medicine, Agriculture and Electronics).		
UNIT-IV	**ENERGY STORAGE DEVICE**	9 Hrs
Types of batteries - Primary battery - dry cell - Secondary battery - Construction and application of lead acid battery and Lithium ion batteries – Battery used in EV application – Nuclear energy – Fission and Fusion reactions – Light water nuclear reactor for power generation (block diagram only) - Fuel cell (H_2-O_2) - Super Capacitors.		
UNIT-V	**FUELS AND COMBUSTION**	9 Hrs
Introduction - classification of fuels - Coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - Petroleum - manufacture of synthetic petrol (Bergius process) - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - flue gas analysis (ORSAT Method).		
	TOTAL	**45 Hrs**

TEXT BOOK :

1.	Jain P.C. and Monica Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2022.
2.	Kannan P., Ravikrishnan A., “Engineering Chemistry”, Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2021.
3.	Dara S.S, Umare S.S, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi 2019.

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4.	Lindsay S.M., "Introduction to Nanoscience" Oxford University, 2009.
REFERENCES	
1.	Dr.C.K.Charles and Dr.G.Ramachandran, "Applied Chemistry", CARS Publishers,Chennai,2015
2.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2012.
3.	Linden's "Handbook of Batteries", Thomas B. Reddy, Fourth Edition McGraw-Hill, New York, 2011.
4.	Shikha Agarwal,"Engineering Chemistry-Fundamental and Application",Cambridge University press,Delhi,Second Edition,2019.

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MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus						
Department	**Mechanical Engineering**	**Programme Code**			**5082**	
I Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24GE13101	**ENGINEERING GRAPHICS** (Common to Non circuit Branches)	3	0	0	3	**100**
Objective(s)	• Increase ability to communicate with people through drawing skills as per the BIS standard. • Learn to sketch and take field dimensions. • Learn to take data and transform it into graphic drawings. • Learn basic engineering drawing formats.					
UNIT-I	**Plane Curves and Free Hand Sketching**					**9**
Importance of drawing in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Basic Geometrical constructions, Curves used in engineering practices: Conics –Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid –construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects.						
UNIT-II	**Projection of Points, Lines and Plane Surfaces**					**9**
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes -Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.						
UNIT-III	**Projection of Solids**					**9**

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Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.		
UNIT-IV	**Projection of Sectioned Solids and Development of Surfaces**	**9**
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.		
UNIT-V	**Isometric and Perspective Projections**	**9**
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.		
	Total hours to be taught	**45**
Outcome(s)	• Students' ability to indicate proper dimensions on drawings will improve • Students' ability to perform basic sketching techniques will improve. • Students will become familiar with office practice and standards. • Students will be able to improve their visualization skills so that they can apply these skills in developing new products.	

TEXT BOOK :	
1	S.Gowri &K.Jayapoovan, "Engineering Graphics" 6th Edition, Vikas Publication New Delhi
2	N S Parthasarathy and Vela Murali, "Engineering Drawing" Oxford University Press 2015.
3	K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 2011.
REFERENCES:	
1	M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education 2005.
2	K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications 1998.
3	Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4	Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited 2008.

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Semester - I
(Common to all B.E./B.Tech. Programmes)

Course Code	Course Name	Periods/Week			Credit	Maximum Marks
		L	T	P	C	
24HS11002	தமிழர் மரபு	1	0	0	1	100

அலகு 1	மொழிமற்றும் இலக்கியம்	3

இந்தியமொழிக் குடும்பங்கள்–திராவிடமொழிகள்–தமிழ்ஒருசெம்மொழி–தமிழ்செவ்வியக்கங்கள்–சங்கஇலக்கியத்தின் சமயச் சார்பற்றதன்மை–சங்கஇலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில்மேலாண்மைக் கருத்துக்கள்–தமிழ்க் காப்பியங்கள், தமிழகத்தில்சமணபௌத்தசமயங்களின் தாக்கம் –பக்திஇலக்கியம், ஆழ்வார்கள்மற்றும் நாயன்மார்கள்– சிற்றிலக்கியங்கள்–தமிழில்நவீனஇலக்கியத்தின் வளர்ச்சி –தமிழ்இலக்கிய வளர்ச்சியில்பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு 2	மரபு–பாறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை–சிற்பக் கலை	3

நடுகல்முதல்நவீனசிற்பங்கள்வரை–ஐம்பொன் சிலைகள்–பழங்குடியினர் மற்றும் அவர்கள்தயாரிக்கும் கைவினைப் பொருட்கள்,பொம்மைகள்–தேர் செய்யும் கலை–சுடுமண் சிற்பங்கள்–நாட்டுப்புறத் தெய்வங்கள்–குமரிமுனையில்திருவள்ளுவர் சிலை–இசைக் கருவிகள்–மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூகபொருளாதாரவாழ்வில்கோவில்களின் பங்கு.

அலகு 3	நாட்டுப்புறக் கலைகள்மற்றும் வீரவிளையாட்டுகள்	3

தெருக்கூத்துகரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4	தமிழர்களின் திணைக் கோட்பாடுகள்	3

தமிழகத்தின் தாவரங்களும் விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்கஇலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள்–தமிழர்கள்போற்றிய அறக்கோட்பாடு–சங்ககாலத்தில்தமிழகத்தில்எழுத்தறிவும் கல்வியும் – சங்ககாலநகரங்களும் துறைமுகங்களும் – சங்ககாலத்தில்ஏற்றுமதிமற்றும் இறக்குமதி–கடல்கடந்தநாடுகளில்சோழர்களின் வெற்றி.

அலகு 5	இந்தியதேசியஇயக்கம் மற்றும் இந்தியபண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3

இந்தியவிடுதலைப்போரில்தமிழர்களின் பங்கு–இந்தியாவின் பிறப்பகுதிகளில்தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதைஇயக்கம் – இந்தியமருத்துவத்தில்,சித்தமருத்துவத்தின் பங்கு–கல்வெட்டுகள்,கையெழுத்துப்படிகள்–தமிழ்ப் புத்தகங்களின் அச்சுவரலாறு.

TOTAL – 15 PERIODS

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Semester - I

(Common to all B.E./B.Tech. Programmes)

Course code	Course Name	Periods/week			Credit	Maximum marks
		L	T	P	C	
24HS11002	HERITAGE OF TAMILS	1	0	0	1	100

UNIT-I	**LANGUAGE AND LITERATURE**	3

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

UNIT-II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	3

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.

UNIT-III	**FOLK AND MARTIAL ARTS**	3

Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT-IV	**THINAI CONCEPT OF TAMILS**	3

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.

UNIT-V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	3

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.

TOTAL HOURS	**15**

DEPARTMENT OF AERONAUTICAL ENGINEERING

	TOTAL – 15 PERIODS
TEXT BOOK ANDREFERENCE BOOKS	
1.	தமிழகவரலாறு–மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடுதமிழ்நாடுபாடநூல்மற்றும் கல்வியியல்பணிகள்கழகம்)
2.	கணினித் தமிழ்–முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
3.	கீழடி–வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4.	பொருநை–ஆற்றங்கரைநாகரிகம் (தொல்லியல்துறைவெளியீடு)
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.Subaramanian, 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 Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book 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) – Reference Book.

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MAHENDRA ENGINEERING COLLEGE (Autonomous)-Syllabus						R 2024
DEPARTMENT:	**SCIENCE & HUMANITIES**		**Programme Code & Name**			**CY & CHEMISTRY**
SEMESTER – I (For Non Circuit Branches & ECE) & SEMESTER – II (For Circuit Branches (Except ECE))						
COURSE CODE	**COURSE NAME**	**HOURS/WEEK**			**CREDIT**	**MAXIMUM MARKS**
24CY22001	**CHEMISTRY LABORATORY (Any eight experiments to be conducted)**	**L**	**T**	**P**	**C**	**100**
		0	0	3	1.5	
Objectives	▪ To inculcate experimental skills to test basic understanding of water quality parameters, such as, alkalinity, hardness, DO and chloride. ▪ To induce the students to familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions. ▪ To design and plan the experimental procedure and to record and process the results.					
Outcomes	On completion of this course, students will have the knowledge in ▪ Explain the essential principles and their analysis of water quality parameters, like hardness, alkalinity, DO, and chloride. ▪ Experiment with different types of instruments for analysis of materials using small quantities involved for quick and accurate results. ▪ Analyze the normality of different types of materials such as PVA and Ferrous ion.					
1.	Determination of Total, Temporary & Permanent hardness of water using EDTA method.					
2.	Determination of the Alkalinity level of a water sample.					
3.	Determination of Chloride content of water sample by Argentometry.					
4.	Determination of DO content of water sample using Winkler's method.					
5.	Determination of molecular weight of polyvinyl alcohol using Viscometry.					
6.	Estimation of Iron content of the given solution using Potentiometry.					
7.	Determination of strength of given hydrochloric acid using pH meter.					
8.	Conductometric titration of strong acid vs strong base.					
9.	Determination of strength of acids in a mixture using Conductometry.					
10.	Estimation of sulphate in a solution using Conductometry (precipitation).					
TEXT BOOK						
1.	Chemistry lab Manual, Department of Chemistry, Mahendra Engineering College, Mallasamudram, 2022.					
2.	Chemistry lab Manual, Department of Chemistry, Mahendra Engineering College, Mallasamudram, 2020.					
REFERENCES						
1.	Applied chemistry theory and practice by O. P. Vermani and A. K. Narula, second edition.					
2.	J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).					
3.	Kolthoff I.M. and Sandell E.B. et al. Quantitative chemical analysis, Mcmillan, Madras 1980					

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Syllabus - Regulation 2024						
Department	**English**					
Semester I – Non-Circuit Branches **Semester II – Circuit Branches** **(Common to all B.E./ B.Tech. Programmes)**						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24HS21001	**Personality Development Practice**	0	0	2	1	**100**
Objectives	• To develop listening and speaking skills of students for a variety of purposes like making presentations, attending interviews and participating in discussions • To enhance the non-verbal and social interaction skills of students for becoming effective communicators • To enable learners to hone their linguistic (LSRW) skills with the help of Technology					
Outcomes	**At the end of the course, the students will be able to** • Understand the language proficiency and its techniques • Prepare the resume with organized details • Develop soft skills to excel in their career					

LIST OF EXERCISES

1.	Importance of Communication Skills
2.	Building Vocabulary (Basic level)
3.	Stage Dynamics (Group PPT Presentation)
4.	Predicting the Content of a Given Article (Newspaper, Magazine, etc.,)
5.	Common Errors in English
6.	Interview Skills

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7.	Presentation skills
8.	Group Discussion
9.	Soft Skills (Self-Confidence, Team Work, Time Management, Adaptability, Openness to Criticism)
10.	Creative Writing – Any Essay type (Descriptive, Narrative etc.)
	Total Hrs : 15

REFERENCE BOOKS:

1. Joshi, Manmohan, ***Soft Skills***, 1st Edition. Bookboon, 2017
2. Raman, Meenakshi & Sangeeta Sharma. ***Technical Communication: Principles and Practice***, Ed.III, Oxford University Press, New Delhi. 2015

Online Websites:

https:// www.ted.com/talks
https://quizziz.com
www.pdfdrive.com
https://www.calameo.com/read/00072308558ed20d410e7/

Activity:
Worksheets for relevant topics

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DEPARTMENT OF AERONAUTICAL ENGINEERING

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Mechanical Engineering**			**Programme Code**		**1081**
I Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
24GE23101	**COMPUTER AIDED DESIGN AND DRAFTING LABORATORY**	L	T	P	C	**100**
		0	0	3	1.5	
Objective(s)	• Develop skill to use software to create 2D and 3D models. • Understanding the basic principles in drafting techniques • To get the knowledge and practicing the advanced drafting software.					

LIST OF EXPERIMENTS

1. INTRODUCTION to CAD
2. AutoCAD – Basics
   - Starting with AutoCAD
   - Layout and sketching
   - Drawing environment
   - Elements of drawing
   - Draw commands
   - 3D Functions
3. 2D – FIGURES for practice using Design Software
4. ISOMETRIC DRAWING for practice using Design Software
5. 3-D Solid Figures Using Design Software
   - Learning Different Operations like Threading, Sweep, Swept blend. Modeling

LIST OF EQUIPMENTS (for a batch of 30 students)

1. Better hardware, with suitable graphics facility - 30 No.
2. Licensed software for Drafting and Modeling. - 30 Licenses
3. Laser Printer or Plotter to print / plot drawings - 1 No

TOTAL HOURS: 45

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Outcome(s)	• Ability to use the software packers for drafting and modeling • Ability to create 2D and 3D models of Engineering Components • Ability to understand the dimensioning and different fits and tolerance techniques.

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Regulation-2024- Curriculum (CBCS)							
II Semester							
Sl. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**
THEORY							
1	24MA12201	Engineering Mathematics-II	BS	3	1	0	4
2	24PY12001	Engineering Physics	BS	3	0	0	3
3	24CS13001	Problem Solving Techniques using C	ES	3	0	0	3
4	24EE13001	Basics of Electrical & Electronics Engineering	ES	3	0	0	3
5	24GE13201	Engineering Mechanics	ES	3	0	0	3
6	24HS11003	Tamils and Technology	HS	1	0	0	1
PRACTICAL							
7	24PY22001	Physics Laboratory	BS	0	0	3	1.5
8	24CS23001	Problem Solving Techniques Using C Lab	ES	0	0	2	1
9	24GE23001	Engineering Practices Laboratory	ES	0	0	3	1.5
			TOTAL	**16**	**1**	**8**	**21**

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MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus						**Regulations 2024**
Department	**MATHEMATICS**	**Programme Code**				
SEMESTER – II						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
24MA12201	**ENGINEERING MATHEMATICS - II (Common to all Branches)**	**L**	**T**	**P**	**C**	**100**
		3	**1**	**0**	**4**	
Objectives	To enable the students to: • Define vector function, operators and working procedure to evaluate line, surface and volume integrals. • Explain different types of higher order ordinary differential equations with variable coefficients and various methods to solve the equations. • Learn Laplace transform, inverse Laplace transform and its properties to solve differential equations. • Know about functions of complex variables, properties and problems involving conformal mapping. • Learn about Taylor's and Laurent's series expansion of complex functions and the process of evaluating complex integrals.					
Outcomes	At the end of the course the students will be able to • Solve problems related to vector differentiation, line, surface and volume integrals and theorems involving them. • Solve higher order differential equations with variable coefficients. • Describe Laplace transform and its properties inverse Laplace transform and the solution of linear differential equation using Laplace transform techniques. • Solve Analytic functions, harmonic functions, conformal mapping and its applications. • Expand the functions as Taylor's and Laurent's series and evaluate the complex integrals..					
UNIT-I	**VECTOR CALCULUS**					**9+3**

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Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs).Verification and application in evaluating line, surface and volume integrals.		
UNIT -II	**ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS**	**9+3**
Second and Higher order linear differential equations with constant coefficients– Method of variation of parameters – Cauchy Euler equation, Legendre's type differential equations – System of simultaneous linear differential equations with constant coefficients.		
UNIT-III	**LAPLACE TRANSFORM**	**9+3**
Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem, solving Initial value problems by Laplace Transform method.		
UNIT-IV	**ANALYTIC FUNCTIONS**	**9+3**
Functions of a complex variable, Cauchy-Riemann equations – Analytic functions – Harmonic andorthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: w= z+c, cz, 1/z, and Bilinear transformation.		
UNIT -V	**COMPLEX INTEGRATION**	**9+3**
Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula(without proof) – Taylor and Laurent expansions –Types of Singularities-Singular points – Residues – Residue theorem(without proof) – Application of residue theorem to evaluate real integrals – Contour integration.		
	Total	**(L:45+T:15): 60 Periods**

TEXT BOOK :	
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017.
2	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018.
REFERENCES:	
1	Michael D. Greenberg, Advanced Engineering Mathematics, Pearson 2013.
2	Lokenath Debnath and Dambaru Bhatta,"Integral Transforms and Their Applications, CRC Press 2015.
3	Dennis G. Zill and Warren S. Wright "Advanced Engineering Mathematics", Jones and Bartlett2014.

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MAHENDRA ENGINEERING COLLEGE (Autonomous)-Syllabus							**R 2024**
DEPARTMENT:	SCIENCE & HUMANITIES			Programme Code & Name			ENGINEERING PHYSICS
SEMESTER-II							
COURSE CODE	**COURSE NAME**	**HOURS/WEEK**				**CREDIT**	**MAXIMUM MARKS**
24PY12001	**ENGINEERING PHYSICS (FOR ALL BRANCHES)**	**L**	**T**	**P**		**C**	**100**
		3	0	0		3	
Objective(s)	➢ To provide fundamental knowledge about lasers, Ultrasonic's, Properties of Matter, Quantum Physics and different kinds of Engineering Materials. ➢ To correlate the principles with application oriented Engineering studies.						
Out come(s)	After completing the course the students ➢ Understand the basics of Laser, Fiber Optics and its types with its applications in various fields. ➢ Gain knowledge about Ultrasonic's their applications in various engineering fields. ➢ Have the necessary understanding on Properties of materials and their uses. ➢ Get Knowledge on basics concepts of Quantum Physics with their Applications. ➢ Understand the properties of SMA, metallic glasses, bio materials and their applications.						
UNIT I	**LASER AND FIBER OPTICS**						9 (Hrs)
Introduction – Principle of spontaneous emission, stimulated absorption and emission – Einstein's coefficient (derivation) – Types of lasers - CO_2, Nd: YAG – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index and mode) – losses associated with optical fibers - fiber optic sensors: pressure and displacement.							
UNIT II	**ULTRASONICS**						(9 Hrs)
Introduction – Production – magnetostriction effect - magnetostriction generator – piezoelectric and inverse piezoelectric effect- piezoelectric generator – properties – Cavitations - Velocity measurement – acoustic grating – SONAR - Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays-Industrial Applications							

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and medical applications-medical endoscope.		
UNIT-III	**PROPERTIES OF MATTER**	(9 Hrs)
Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.		
UNIT-IV	**QUANTUM PHYSICS**	(9 Hrs)
Black body radiation – Planck's theory (derivation) –wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box– scanning tunneling microscope- electron tunneling microscope.		
UNIT-V	**ADVANCED ENGINEERING MATERIALS**	(9 Hrs)
Smart materials: Shape-memory alloys: Martensite, Austenite, Two way shape memory, characteristics and applications –Metallic glasses – Origin – Preparation – Structure, mechanical and electrical properties. **Biomaterials:** First, second and third generation biomaterials – Classification – Metals and alloys – Polymers – Hydrogels – Applications in medicine: Skin and Blood interfacing implants.		
Total hours to be taught		(45 Hrs)

Text book :

1.	Dr. G. Senthil kumar - Engineering Physics-VRB Publication & Co, Chennai- Latest edition 2022.
2.	Dr. P.K. Palanisamy , "Engineering Physics", Sci tech Publications, Chennai, 2022.
3.	Biomaterial Science and Engineering- JB Park- Plenum Press, NewYork(2014).
4.	M N Avadhanulu, A Textbook of Engineering Physics (2008), S. Chand Publishing, New Delhi.
5.	Bhattacharya, D.K. & Poonam, T. —Engineering Physics. Oxford University Press, 2015.

REFERENCES:

1.	Pillai S O, "Engineering Physics" (2014), New Age International Publishers, New Delhi.
2.	Karl F Renk, Basics of Laser Physics (2017)-Springer International Publishing, Switzerland.
3.	Introduction to Quantum Mechanics- J Griffiths-2nd edition(2016).
4.	Halliday.D, Resnick.R. & Walker.J, Principles of Physics (2020), Wiley.
5.	Serway, R.A. & Jewett, J.W. —Physics for Scientists and Engineers. Cengage Learning,

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	2010.
6.	William T. Silfvast, Laser Fundamentals (2014), Cambridge University Press.

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MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Computer Science and Engineering**		**Programme Code**		**1041**	
II Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24CS13001	**PROBLEM SOLVING TECHNIQUES USING C**	3	0	0	3	**100**
Objective(s)	The student should be made to: • Understand the basics of computer and algorithm • Learn the basic concepts of C Programming. • Know the arrays and functions in C • Be familiar with pointers and structures in C • Learn the file handling techniques and preprocessors in C					
Outcome(s)	Upon completion of this course , students will be able to • Illustrate algorithms for real time problems through various problem solving techniques • Explain the syntax of C Programming • Summarize the concept of arrays and functions in C • Apply the concepts of pointers and structure • Develop the concepts of files and preprocessors in C					
UNIT-I	**PROBLEM SOLVING ASPECTS**					**9**
Computers: Hardware – Software – Processor – Memory – I/O devices – Interface – Programming Languages Problem Solving Aspects: Algorithms Pseudo code, Flowchart-Steps in Problem Solving – simple strategies for developing algorithms (iteration, recursion) – Steps for Creating and Running programs -Illustrative problems: Exchanging The Values – Find minimum in a list - Factorial Computation - Fibonacci Sequence						
UNIT-II	**C PROGRAMMING BASICS**					**9**
Introduction to C programming – Header files – Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions-, Expression Evaluation, Type conversion Statements – operators – Input and Output operations – Decision Making and Branching – Looping statements- Programming Examples						

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UNIT-III	**ARRAYS AND FUNCTION**	**9**
Arrays: Introduction – One-Dimensional Arrays – Two and multi-Dimensional Arrays - Strings: Operations of Strings. Function – definition of function – Declaration of function – Function prototype – Types of functions- user defined functions – Pass by value – Pass by reference – Recursion - Programming Examples		
UNIT-IV	**POINTERS AND STRUCTURES**	**9**
Pointers - Definition – Initialization - Pointer variables, Pointer arithmetic, Pointers to Pointers, Pointers with Arrays, Pointers with Functions- Introduction to Structure – structure definition – Structure declaration – Structure within a structure-Structures fusion with Arrays- Unions – Storage classes		
UNIT-V	**FILE PROCESSING**	**9**
Files: File modes – File functions – Types of file processing: Sequential access, Random access – Text and binary files - Command line arguments – C Preprocessor directives: Macros – Definition – Types of Macros - Creating and implementing user defined header files		
	Total hours	**45**

TEXT BOOK :

1	Anita Goeland Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India)Pvt. Ltd. Pearson Education, 2016.

REFERENCES:

1	Dromey R.G, "How to Solve it by Computer" Prentice Hall of India, Delhi., 2010.
2	E Balagurusamy, "Computer Programming", First Edition, Tata McGraw Hill Education (India) Private Ltd, New Delhi., 2013.
3	Pradip Dey, Manas Ghosh, " Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press.,2013.
4	M.Rajaram and P.Uma Maheshwari " Computer Programming with C", Pearson Education., 2013.
5	NPTEL course, Problem Solving Through Programming in C, https://nptel.ac.in/courses/106105171
6	NPTEL course, Introduction to Programming in C, https://nptel.ac.in/courses/106104128

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MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Regulations 2024						
Department	**Electrical and Electronics Engineering**				**Programme Code**	**1051**
II Semester						
Course Code	**Course name**	**Hours/week**			**Credit**	**Maximum Marks**
		L	**T**	**P**	**C**	
24EE13001	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**	**3**	**0**	**0**	**3**	**100**
Objective(s)	• To study the basic concepts of electrical circuits and measuring instruments • To understand the operation of magnetic circuits and electrical machines • To study the concepts of semiconductor devices • To acquire knowledge on the concepts of integrated circuits • To impart knowledge on the basic concepts of communication systems					
Outcome(s)	At the end of the course, students will be able to: 1. Summarize the concepts of electrical circuits and measuring instruments 2. Illustrate the constructional features and working principle of Electrical machines 3. Explain the operation of semiconductor devices 4. Interpret the concepts of integrated circuits 5. Discuss the basic concepts of Communications systems					
UNIT I	**ELECTRICAL CIRCUITS AND MEASUREMENTS**					**(9)**
-Ohm's Law – Kirchhoff's Law- Voltage and Current Sources - Basics of Resistance, Inductance, and Capacitance- Series and Parallel circuits- Average value and RMS value – Power and Power Factor- Classification of Instruments – Moving coil and Moving Iron Instruments – Energy Meter-Residential wiring - Earthing.						
UNIT II	**ELECTRICAL MACHINES**					**(9)**
Introduction to Magnetic circuits, Faraday's law, Lenz's Law, Fleming's Left-Hand and Right-Hand Rule- Construction and Working Principle: DC Machines -Single phase Transformer – Three phase Squirrel Cage Induction motor- Single phase Induction motor (Qualitative treatment only).						
UNIT III	**SEMICONDUCTOR DEVICES**					**(9)**
PN Junction Diode –Characteristics – Half wave and Full wave Rectifiers –Zener diode- Characteristics-Voltage Regulator-Bipolar Junction Transistor, FET, JFET-Characteristics.						
UNIT IV	**DIGITAL ICs and MICROCONTROLLER**					**(9)**

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Boolean Algebra - Logic gates - Demorgan's Theorem - Combinational circuits: Adder, Subtractor, Multiplexer, Demultiplexer - Pin Details and Architecture of Microprocessor (8086) and Microcontroller (8051).

UNIT V	**COMMUNICATION SYSTEMS**	**(9)**

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations (Qualitative Treatment). Communication Systems: TV, Modem, Microwave, Satellite and Mobile communication (Block Diagram Approach only)

Total **45 Hours**

TEXT BOOKS

1.	V.K Mehta and Rohit Mehta, "Principle of Electrical Engineering and Electronics" S Chand & Company, Third Edition, 2016.
2.	S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGraw Hill, Second Edition, 2011.
3.	Edward Hughes, "Hughes Electrical and Electronic Technology", Pearson Education, tenth Edition 2008.
4.	David A. Bell, "Electronic Devices and Circuits", Oxford University Press, Fifth Edition, 2008.

REFERENCES

1.	Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, Seventh Education, 2006.
2.	William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, Sixth, Edition, 2002.
3.	J. Millman &Halkins, Satyebranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, Second Edition, 2008.
4.	**NPTEL :** **Prof. L. Umanand, Basic Electrical Technology, IISc Bangalore** https://nptel.ac.in/courses/108108076 **Prof. M.B. Patil Basic Electronics IIT Bombay** https://onlinecourses.nptel.ac.in/noc21_ee55/preview

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MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Mechanical Engineering**	**Programme Code**				**1081**
II Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
24GE13201	**ENGINEERING MECHANICS** (Common to Non Circuit Branches)	**L**	**T**	**P**	**C**	**100**
		3	0	0	3	
Objective(s)	**Students should develop the ability to:** • Work comfortably with basic engineering mechanics concepts required for analyzing static structures. • Model the problem using good free-body diagrams and accurate equilibrium equations. • Apply pertinent mathematical, physical and engineering mechanical principles to the system to solve and analyze the problem. • Understand the meaning of centers of gravity (mass)/centroids and moment of inertia using integration methods. • Gain knowledge in basic design concepts of statics and dynamics of the particle.					
UNIT-I	**STATICS OF PARTICLE**					**9**
Introduction to Mechanics – Fundamental Principles -Units and Dimensions – Laws of Mechanics- Principle of transmissibility- Lame's theorem, Parallelogram and triangular Law of forces- Vectorial representation of forces and moments, Coplanar forces– Resolution and Composition of forces – Equilibrium of particles - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Single equivalent force.						
UNIT-II	**STATICS OF RIGID BODY**					**9**
Free body diagram – Types of supports and their reactions-requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis– Vectorial representation of moments and couples – Scalar components of a moment- Varignon's theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions.						
UNIT-III	**PROPERTIES OF SECTIONS**					**9**
Centroid – Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus and Guldinus – Second moment of area — Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula –Parallel axis theorem -perpendicular axis theorem – Product of inertia of plane areas -Polar moment of inertia – Principal axes- Mass moment of inertia of thin rectangular section.						
UNIT-IV	**DYNAMICS OF PARTICLES**					**9**

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Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law- D'Alembert's principle – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies- Impact - direct and central impact – coefficient of restitution.

UNIT-V	**FRICTION**	**9**

Friction force – Laws of sliding friction -Laws of Coloumb friction – equilibrium analysis of simple systems with sliding friction –wedge friction - equilibrium analysis of simple contact friction –ladder friction - Rolling resistance-Applications of screw jacks and belts.

	Total hours	**45**

Outcome(s)	**End of the learning students will have an ability to:** • Analyze the engineering problems in case of equilibrium conditions. • Calculate the reaction forces of various supports on the structural members. • Evaluate various geometrical properties like centroid, centre of gravity, moment of inertia of various surfaces and solids. • Solve the problems involving dynamics of particles and rigid bodies. • Define the effects of friction and its applications, also compute various frictional components.

TEXT BOOK :

1	R.C. Hibbeller, "Engineering Mechanics – Statics and Dynamics", 11th ed., Pearson Education Asia Pvt. Ltd., 2009.
2	Ferdinand P. Beer, E. Russell Johnston, Vector Mechanics for Engineers: Statics and Dynamics (9th Edition), Tata McGraw-Hill International Edition, 2010.
3	Dr.N.Koteeswaran, "Engineering Mechanics Statics and Dynamics", Sri Balaji Publications 9th Rv.Ed., S.Chand & Co Ltd, 2013.
4	Vela Murali, "Engineering Mechanics", Oxford University Press 2010.

REFERENCES:

1	M.S. Palanichamy and S. Nagam, "Engineering Mechanics – Statics & Dynamics", 3rd ed., Tata McGraw-Hill, 2004.
2	S. Rajasekaran, G. Sankarasubramanian, "Fundamentals of Engineering Mechanics", 3rd ed., Vikas Publishing House Pvt. Ltd, 2009.
3	Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi 2008.
4	Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", 4th ed., – Pearson Education Asia Pvt. Ltd., 2005.

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Semester - II
(Common to all B.E./B.Tech. Programmes)

Course Code	Course Name	Periods/Week			Credit	Maximum Marks
		L	T	P	C	
24HS11003	தமிழரும் தொழில்நுட்பமும்	1	0	0	1	100

அலகு 1	நெசவுமற்றும் பானைத் தொழில்நுட்பம்	3

சங்ககாலத்தில்நெசவுத் தொழில்–பானைத் தொழில்நுட்பம் – கருப்புசிவப்புபாண்டங்கள்–பாண்டங்களில்கீறல்குறியீடுகள்

அலகு 2	வடிவமைப்புமற்றும் கட்டிடத் தொழில்நுட்பம்	3

சங்ககாலத்தில்வடிவமைப்புமற்றும் கட்டுமானங்கள்&சங்ககாலத்தில் வீட்டுப் பொருட்களில்வடிவமைப்பு–சங்ககாலத்தில்கட்டுமானபொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில்மேடைஅமைப்பு பற்றிய விவரங்கள்–மாமல்லபுரச் சிற்பங்களும்,கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள்மற்றும் பிறவழிபாட்டுத் தலங்கள்–நாயக்கர் காலக் கோயில்கள்–மாதிரிகட்டமைப்புகள் பற்றி அறிதல், மதுரைமீனாட்சிஅம்மன் ஆலயம் மற்றும் திருமலைநாயக்கர் மஹால்–செட்டிநாட்டுவீடுகள்–பிரிட்டிஷ்காலத்தில்சென்னையில்இந்தோ–சாரோசெனிக் கட்டிடக் கலை.

அலகு 3	உற்பத்தித் தொழில்நுட்பம்	3

கப்பல்கட்டும் கலை–உலோகவியல்–இரும்புத் தொழிற்சாலை–இரும்பைஉருக்குதல், எஃகு–வரலாற்றுச் சான்றுகளாகசெம்புமற்றும் தங்கநாணயங்கள்–நாணயங்கள்அச்சடித்தல்–மணிஉருவாக்கும் தொழிற்சாலைகள்–கல்மணிகள், கண்ணாடிமணிகள்–சுடுமண் மணிகள்–சங்குமணிகள்–எலும்புத் துண்டுகள்–தொல்லியல்சான்றுகள்–சிலப்பதிகாரத்தில்மணிகளின் வகைகள்.

அலகு 4	வேளாண்மைமற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்	3

அணை, ஏரி, குளங்கள், மதகு–சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் – கால்நடைபராமரிப்பு–கால்நடைகளுக்காகவடிவமைக்கப்பட்ட கிணறுகள்–வேளாண்மைமற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள்–கடல்சார் அறிவு–மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல்–பெருங்கடல் குறித்த பண்டையஅறிவு–அறிவுசார் சமூகம்.

அலகு 5	அறிவியல்தமிழ்மற்றும் கணித்தமிழ்	3

அறிவியல்தமிழின் வளர்ச்சி –கணித்தமிழ்வளர்ச்சி –தமிழ்நூல்களைமின்பதிப்புசெய்தல்–தமிழ்மென்பொருட்கள்உருவாக்கம் – தமிழ்இணையக் கல்விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில்தமிழ்அகராதிகள்–சொற்குவைத் திட்டம்,

TOTAL – 15 PERIODS

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Semester - II

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Course code	Course Name	Periods/week			Credit	Maximum marks
		L	T	P	C	
24HS11003	TAMILS AND TECHNOLOGY	1	0	0	1	100

UNIT-I	**WEAVING AND CERAMIC TECHNOLOGY**	3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT-II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	3

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)- ThirumalaiNayakarMahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT-III	**MANUFACTURING TECHNOLOGY**	3

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 evidences - Gem stone types described in Silappathikaram.

UNIT-IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY**	3

Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT-V	**SCIENTIFIC TAMIL & TAMIL COMPUTING**	3

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.

TOTAL HOURS	**15**

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TEXT BOOK ANDREFERENCE BOOKS	
1.	தமிழகவரலாறு–மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடுதமிழ்நாடுபாடநூல்மற்றும் கல்வியியல்பணிகள்கழகம்)
2.	கணினித் தமிழ்–முனைவர் இல. சுந்தரம் (விகடன் பிரகரம்)
3.	கீழடி–வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4.	பொருநை–ஆற்றங்கரைநாகரிகம் (தொல்லியல்துறைவெளியீடு)
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.Subaramanian, 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 Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book 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) – Reference Book.

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MAHENDRA ENGINEERING COLLEGE(Autonomous) Syllabus			**R 2024**
DEPARTMENT:	SCIENCE & HUMANITIES	Programme Code	1051

SEMESTER – I & II

COURSE CODE	**COURSE NAME**	**HOURS/WEEK**			**CREDIT**	**MAXIMUM MARKS**
		L	**T**	**P**	**C**	
24PY22001	**PHYSICS LABORATORY (FOR ALL BRANCHES)**	0	0	3	1.5	**100**

Objective(s)	To provide exposure to the students with hands on experience on various basic Physics practices for all branches.
OUTCOMES	• The hands on exercises undergone by the students will help them to apply physics principles • Principles of optics and Liquid to evaluate engineering properties of materials.

1. (a) Determination of Wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of Thickness of a thin wire-Air Wedge
4. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of Young's modulus by Non uniform bending method
6. Determination of viscosity of liquid – Poiseuille's method
7. Determination of Rigidity modulus -Torsional Pendulum
8. Determination of Band gap of a semiconductor-PN Diode
9. Determination of Young's modulus by Uniform bending method

(Choose Any 7 Experiments)

REFERENCES

1.	Physics Laboratory Manual (2023), Department of Physics, Mahendra Engineering College, Namakkal.
2	Geeta Sanon, B.Sc Practical Physics, 5th Edn. (2015), R. Chand & Co.
3	C. L. **Arora** B.Sc. Practical Physics (2001), S. Chand and Company Limited, New Delhi.
4	Indu Prakash and Ramakrishna, A. K. Jha (2012), A Text Book of Practical Physics, Kitab Mahal, New Delhi.
5	D. P. Khandelwal, A Laboratory Manual of Physics: For Undergraduate Classes (1985), Vani Educational books, New Delhi.

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MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Computer Science and Engineering**		**Programme Code**		**1041**	
I Semester						
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24CS23001	**PROBLEM SOLVING TECHNIQUES USING C LABORATORY (Common to All Branches)**	**0**	**0**	**3**	**1.5**	**100**
Objective(s)	The student should be made to: ● Understand developing applications using Office package. ● Formulate problems and implement algorithms using Scratch and Raptor tool ● Make use of arrays and functions in C. ● Learn how to use pointer concepts. ● Know the concepts of structures, unions and files					
Outcome(s)	Upon completion of this course , students will be able to ● Demonstrate the applications of Office Packages ● Solve the real world problems using Scratch and Raptor Tool ● Develop programs using arrays and functions in C. ● Illustrate the working of pointers in C ● Develop the concepts using structures, unions and files in C					

LIST OF EXPERIMENTS	
1	Prepare A bio-data Using MS Word With Appropriate Page ,Text And Table Formatting Options And Send The Same To Recipients Using Mail Merge
2	Create budget planning of your family with cell referencing, formulae, conditional formatting using Excel
3	Create a Program flow to illustrate the use of Variables and Constants using Scratch Tool
4	Construct flowchart to find the Factorial for a given number Using Raptor

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5	Students mark generation using decision statements	
6	Calculator using switch statement	
7	Prime number generation and to check whether the given number is armstrong or not using looping	
8	Greatest number using array (one dimensional)	
9	Matrix multiplication using array (two dimensional)	
10	Check the given string is palindrome or not.	
11	Write a C Program to swap two numbers using two functions one using pointer and other one without using pointer	
12	Factorial calculation and Fibonacci series using function	
13	Student mark sheet using structures	
14	Copy text from one file to other File	
	Total hours	**30**

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MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	**Mechanical Engineering**	**Programme Code**	**1081**

II Semester

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	T	P	C	
24GE23001	**Engineering Practices Laboratory(Mechanical)**	0	0	3	1.5	**100**

Objective(s)	• To introduce the students to the concepts of basic manufacturing processes • To identify the hand tools and instruments • To teach students how to perform simple welding, sheet metal and moulding operation • To help students perform some simple exercises on facing, turning, step turning and drilling

LIST OF EXPERIMENTS

- Preparation of arc welding of butt joints, lap joints and tee joints
- Fabrication of sheet metal tray and funnel
- Facing, plain turning and step turning using lathe
- Drilling operations
- Basic Study: Gas cutting and gas welding

LIST OF EQUIPMENTS (for a batch of 30 students)

1. Centre Lathe with accessories - 5 Nos
2. Arc welding machine - 4 Nos
3. Gas welding machine - 2 Nos
4. Sheet Metal Work facility- 3 Nos
5. Hand Shear 300mm- 2 Nos
6. Bench vice set up- 2 Nos
7. Standard tools and calipers for sheet metal work set up-2 Nos

TOTAL HOURS: 45

Outcome(s)	• Fabricate the models of sheet metal and welding joints • Perform facing, plain turning, step turning and drilling.

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Regulation-2024- Curriculum (CBCS)							
III Semester							
Sl. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**
THEORY							
1	24MA12301	Transforms and Partial Differential Equations	BS	3	1	0	4
2	24AE14301	Aero Engineering Thermodynamics	PC	3	0	0	3
3	24AE14302	Elements of Aeronautics	PC	3	0	0	3
4	24AE14303	Fluid Mechanics	PC	3	0	0	3
5	24AE14304	Solid Mechanics	PC	3	0	0	3
6	-	Open Elective-I	OE	3	0	0	3
7	24CY11001	Environmental Science And Sustainability	MC	2	0	0	0
PRACTICAL							
8	24AE24301	Thermal Laboratory	PC	0	0	2	1
9	24AE24302	Fluid Mechanics Laboratory	PC	0	0	2	1
10	24AE24303	Solid Mechanics Laboratory	PC	0	0	2	1
			TOTAL	**20**	**1**	**6**	**22**

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MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						**Regulations 2024**
Department	**MATHEMATICS**	**Programme Code**				
III Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24MA12301	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Aero, Aerospace, Agri, Chemical, Civil, EEE, ECE, Food, Mech, MCT & Pharma)**	3	1	0	4	**100**
Objective(s)	To enable students to ● Acquire knowledge of Z- transform to solve difference equations. ● Learn about Fourier transforms, inverse Fourier transform and its properties and apply convolution theorem and Parseval's identity to various functions. ● Construct Fourier series of various functions and to compute harmonics of Fourier series. ● Understand the partial differential equation concepts. ● Study the method of separation of variables and solving boundary value problems using Fourier series.					

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Outcome(s)	At the end of the course, the students will be able to • Apply the knowledge of Z-transform to the analysis of digital filters and discrete signals. • Solve the problems using Fourier integral and convolution theorem technique. • Apply Fourier series techniques in solving heat flow problem used in various situations. • Formulate and solve first and higher order partial differential equations. • Solve real time Engineering problems using Partial differential equations.	
UNIT-I	**Z -TRANSFORMS AND DIFFERENCE EQUATIONS**	**9+3**
Z-transforms - Elementary properties – Inverse Z-transform – Partial fraction and Residue method- Convolution theorem -Formation of difference equations – Solution of difference equations using Z-transform.		
UNIT-II	**FOURIER TRANSFORMS**	**9+3**
Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.		
UNIT-III	**FOURIER SERIES**	**9+3**
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.		
UNIT-IV	**PARTIAL DIFFERENTIAL EQUATIONS**	**9+3**
Formation of partial differential equations – Solutions of standard types of first order partial differential equations – Lagrange's linear equation – Homogeneous linear partial differential equations of second and higher order with constant coefficients.		
UNIT-V	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**9+3**
Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.		
	Total hours to be taught	**(L:45+T:15): 60 PERIODS**

TEXT BOOK :	
1	Dr.P.Kandasamy , Dr.K.Thilagavathy and Dr.K.Gunavathy, " Engineering Mathematics Volume – III",S.Chand & company Ltd. New Delhi, 2012.

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2	Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2008.
REFERENCES:	
1	Erwin Kreyszig, Advanced Engineering Mathematics.2011, John Wiley & Sons, 2010.
2	Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Laxmi Publications Pvt Ltd., 2012.
3	Veerarajan.T, "Transforms and Partial Differential Equations" , Tata McGraw Hill, 2011.

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DEPARTMENT OF AERONAUTICAL ENGINEERING

MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus						
Department	**Aeronautical Engineering**	**Programme Code**		**1101**		
III Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE14301	**AERO ENGINEERING THERMODYNAMICS**	3	0	0	3	**100**
Objective(s)	The course should enable the students to: ● Understand the role of thermodynamic properties such as internal energy, enthalpy, entropy, temperature, pressure, and specific volume. ● Explain the concepts of enthalpy, entropy, the ideal gas equation, and various gas laws. ● Understand the role of thermodynamic cycles, availability, and irreversibility. ● Quantify the Coefficient of Performance of a refrigerator or air conditioning system. ● Classify the different forms of internal combustion engines based on their operating principles.					
UNIT-I	**FIRST LAW OF THERMODYNAMICS**					**09**
Thermodynamics Systems, zeroth law, first law – Heat and Work transfer in flow and non-flow process, Clausius inequality –first law of thermodynamics applied to open system and closed system. **Problems on Process only.**						
UNIT-II	**SECOND LAW OF THERMODYNAMICS**					**09**
Second law of thermodynamics- Kelvin-Planck statement and Clausius statements of second law-reversibility and irreversibility-Carnot theorem-Carnot cycle- reversed Carnot cycle- concept of entropy-principle of energy-availability and unavailability-Energy for closed and an open system.						
UNIT-III	**GAS POWER CYCLES**					**09**
Air standard efficiency for Otto, Diesel, and Dual combustion- Brayton cycles - Sterling and Ericsson cycle, Comparison of cycles. **Problems on Otto and Brayton cycle only**.						
UNIT-V	**REFRIGERATIONAND AIR CONDITIONING**					**09**
Principles of refrigeration, - Vapour compression refrigeration system - Vapour absorption refrigeration system - Coefficient of performance, Properties of refrigerants. Air conditioning system-summer air conditioning and winter air conditioning, Psychometric properties and its charts.						
UNIT-V	**BASICS OF PROPULSION**					**09**

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DEPARTMENT OF AERONAUTICAL ENGINEERING

Working Principles of IC Engines. Comparisons: Two-stroke and four-stroke, Petrol and Diesel Engines. Systems: Lubrication, Cooling, Ignition, and Injectors. Jet engines -Turbojet, Turboprop, Turbofan, ramjet, scramjet.

Total hours to be taught	**45 PERIODS**

Outcomes:

Upon successful completion of the course, students should be able to:

- Apply the laws of thermodynamics to analyze energy transfer in various thermodynamic processes.
- Explain the Second Law of Thermodynamics and apply the concept of entropy to system analysis.
- Calculate and compare the air standard efficiencies of different gas power cycles.
- Determine the Coefficient of Performance for refrigeration systems and understand psychrometric principles in air conditioning.
- Describe the working principles and compare different types of internal combustion and jet engines

TEXT BOOK :

1	Nag, P.K., "Engineering Thermodynamics," McGraw-Hill, 6th Edition, 2022.
2	Yunus A. Cengel and Michael A. Boles, "Thermodynamics: An Engineering Approach," McGraw-Hill Science/Engineering/Math, 10th Edition, 2024.
3	Radhakrishnan, E., "Fundamentals of Engineering Thermodynamics," PHI Learning, Second Edition, 2005.

REFERENCES:

1	R.K. Rajput, "Thermal Engineering," Laxmi Publications (P) Ltd., 11th Edition,2020.
2	Sutton, George P. and Biblarz, Oscar, "Rocket Propulsion Elements," John Wiley & Sons, 9th Edition, 2017.
3	Arora C.P., "Thermodynamics," McGraw Hill Education India, New Delhi, 2003.

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DEPARTMENT OF AERONAUTICAL ENGINEERING

MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus						
Department	**Aeronautical Engineering**	**Programme Code & Name**			**1011 & Aeronautical Engineering**	
III Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE14302	**ELEMENTS OF AERONAUTICS**	3	0	0	3	**100**
Objective(s)	The course should enable the students to : ● Understand the Historical evaluation of Airplanes ● Study the different component systems and functions ● Understand the basic properties and principles behind the flight ● Study the different structures & construction ● Study the various types of power plants used in aircrafts					
UNIT-I	**HISTORY OF FLIGHT**					**8**
Balloon flight – ornithopters - early airplanes by wright brothers, biplanes and monoplanes, developments in aerodynamics, materials, structures and propulsion over the years.						
UNIT-II	**BASICS OF FLIGHT MECHANICS**					**9**
Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships, newton's law of motions applied to aeronautics - evolution of lift, drag and moment. aerofoils, mach number, maneuvers.						
UNIT-III	**AIRCRAFT CONFIGURATIONS**					**10**
Different types of flight vehicles, classifications. Components of an airplane and their functions. Conventional control, powered control, basic instruments for flying - typical systems for control actuation.						
UNIT-IV	**AIRPLANE STRUCTURES AND MATERIALS**					**9**
General types of construction, monocoque, semi-monocoque and geodesic constructions, typical wing and fuselage structure. metallic and non-metallic materials, use of aluminium alloy, titanium, stainless steel and composite materials. stresses and strains – hooke's law – stress - strain diagrams – elastic constants.						
UNIT-V	**POWER PLANTS**					**9**

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DEPARTMENT OF AERONAUTICAL ENGINEERING

Basic ideas about piston, turboprop and jet engines - use of propeller and jets for thrust production - comparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.	
Total hours to be taught	**45 PERIODS**

Outcome(s):

After completion of the course students can able to

- Describe the history of aircraft & developments over the years
- Identify the types & classifications of components and control systems
- Illustrate the basic concepts of flight & Physical properties of Atmosphere
- Differentiate the types of fuselage and constructions.
- Demonstrate the types of Engines and principles of Rocket

TEXT BOOK :

1	Anderson, J.D., "Introduction to Flight", McGraw-Hill, 1995.
2	Kermode, A.C., "Flight without Formulae", McGraw-Hill, 1997.

REFERENCES:

1	E.Radhakrishnan, "Gas Dynamics", PHI learning private limited, 5th edition 2012.
2	H.I.H.Saravanamutto, "Gas turbine theory", Pearson education limited, 19th edition, 2001.
3	Stephen. A. Brandt, "Introduction to Aeronautics: A design perspective" American Institute of Aeronautics & Astronautics,1997

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MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Aeronautical Engineering**	**Programme Code & Name**			**1011 &Aeronautical Engineering**	
III Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE14303	**FLUID MECHANICS**	3	0	0	3	**100**
Objective(s)	The course should enable the students: ● To study the applications of the conservation laws to flow through pipes and hydraulic machines. ● To formulate and analyze problems related to calculation of forces in fluid structure interaction and also to know about boundary layer concepts and its applications to pipe design. ● To understand the importance of dimensional analysis. ● To understand the importance of various types of flow in pumps and turbines. ● To learn about turbine design and its applications in aerospace industries.					
UNIT-I	**FLUID PROPERTIES AND FLOW CHARACTERISTICS**					**8**
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.						
UNIT-II	**FLOW THROUGH CIRCULAR CONDUITS**					**8**
Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.						
UNIT-III	**DIMENSIONAL ANALYSIS**					**9**
Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.						
UNIT-IV	**PUMPS**					**10**

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DEPARTMENT OF AERONAUTICAL ENGINEERING

Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps –classification.		
UNIT-V	**TURBINES**	**10**
Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.		
Total hours to be taught		**45 PERIODS**

Outcome(s)

After the completion of this course, the students can able to

- Apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Apply fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
- Apply principles of dimensional analysis and similitude to simple problems and use dimensionless parameters.
- Analyze the performance of pumps
- Analyze the performance of turbines.

TEXT BOOK :	
1	Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2004.
REFERENCES:	
1	Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010
2	Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2004
3	Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
4	Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011

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Department	**Aeronautical Engineering**	**Programme Code & Name**			**1011 &Aeronautical Engineering**	
III Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE14304	**SOLID MECHANICS**	3	0	0	3	**100**
Objective(s)	The course should enable the students: ● To provide the basic concepts and principles of strength of materials. ● To give an ability to calculate stresses and deformations of objects under external loadings. ● To give an ability to apply the knowledge of strength of materials on engineering applications and design problem					
UNIT-I	**INTRODUCTION**					8
Definition of stress, strain and their relations – relations between material constants – axial loading - statically determinate and indeterminate problems in tension & compression						
UNIT-II	**STRESSES IN BEAMS**					10
Shear force & bending moment diagrams: bending and shear stress variation in beams of symmetric sections, a typical spar section: beams of uniform strength - beams of two materials						
UNIT-III	**DEFLECTION OF BEAMS**					10
Double integration method – macaulay‟s method – moment area method – conjugate beam method – principle of superposition – maxwell‟s reciprocal theorem.						
UNIT-IV	**SHAFT AND SPRINGS**					**10**
Torsion of circular shafts - shear stresses and twist in solid and hollow circular shafts, Torsion of noncircular shafts, Saint Venant's theory, Prandtl's stress function approach, Leaf and helical springs.						
UNIT-V	**BIAXIAL STRESSES**					**7**

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Stresses in thin-walled pressure vessels – combined loading of circular shaft with bending, torsion andaxialloadings–Mohr‟scircleanditsconstruction–determinationofprincipalstresses.	
Total hours to be taught	**: 45 PERIODS**

Outcome(s):

After completion of this course students will be able to:

- Describe the concepts of stress and strain in simple and compound bars
- Calculate stress distribution due to shearing force and bending moment.
- Solve deflection of beams under various loading conditions
- Calculate the stress and strain of springs, columns and member under torsion.
- Estimate the biaxial stress acting in pressure vessels

TEXT BOOK :	
1	R. K. Bansal, “A Text Book of Strength of Materials”, Sixth Edition, Lakshmi Publications Pvt. Limited, New Delhi, 2012.
2	R.K. Rajput,” Strength of materials”, Seventh Edition ,S. Chand Limited, 2018.
REFERENCES:	
1	J. E Shigley, “Applied Mechanics of Materials”, International Student Edition, McGraw Hill Koyakusha Limited, 2000.
2	Parviz Ghavami, “Mechanics of Materials: An Introduction to Engineering Technology”, First Edition, Springer International Publishing, 2015.
3	Egor P. Popov., “Engineering mechanics of solids”, Second edition, Pearson Education India, 2015.

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MAHENDRA ENGINEERING COLLEGE

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DEPARTMENT OF AERONAUTICAL ENGINEERING

MAHENDRA ENGINEERING COLLEGE (Autonomous)-Syllabus							R 2024
DEPARTMENT:	**SCIENCE & HUMANITIES**			**Programme Code & Name**			**CY& CHEMISTRY**
SEMESTER-III (For Non Circuit Branches) & SEMESTER- IV (For Circuit Branches)							
COURSE CODE	**COURSE NAME**	**HOURS/WEEK**				**CREDIT**	**MAXIMUM MARKS**
		L	**T**	**P**		**C**	
24CY11001	**ENVIRONMENTAL SCIENCE AND SUSTAINABILITY**	2	0	0		0	**100**
Objectives	To make the students familiar with: 1. The importance of Environment and Ecosystem. 2. The basic concepts of biodiversity and emphasize on the biodiversity of India and its conservation. 3. The causes, effects and prevention measures of environmental pollution. 4. The social issues of the environment and National laws for environment protection. 5. The concept of sustainable development goals and appreciate the inter dependence of economic and social aspects of sustainability, recognize and analyze.						
Outcomes	At the end of the course the student will be able to 1. Explain the importance of Environment and types of Ecosystem. 2. Classify the biodiversity and measure the variety of animals, plants and microbial species. 3. Identify the different types of Pollution and be familiar with control measures 4. List out the environmental issues and essential legislation on environmental laws. 5. Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.						
UNIT-I	**ENVIRONMENT& ECOSYSTEM**						9 Hrs

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Definition, Scope and Importance of Environment – Need for public awareness – Ecosystem: concept of an ecosystem – structure and function of an ecosystem – energy flow in the ecosystem –Introduction, types, characteristic features, Structure and function of the terrestrial (Forest and Grassland) ecosystem.

UNIT-II	**BIODIVERSITY AND ITS CONSERVATION**	9 Hrs

Biodiversity: Introduction – definition - genetic, species and ecosystem diversity – value of biodiversity – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity – Field visit to local area. Definition – causes, effects and control measures of: (a) Air, (b) Water, (c) Soil, (d) Noise, (e) Thermal pollution– solid waste management: causes, effects and control methods of municipal solid wastes– E-waste and plastic waste: recycling and reuse - role of an individual in prevention of pollution – pollution case studies (vizag gas leakage).

UNIT-III	**ENVIRONMENTAL POLLUTION**	9 Hrs

Definition– causes, effects and control measures of: (a) Air, (b) Water, (c) Soil, (d) Noise pollution – solid waste management: causes, effects and control methods of municipal solid wastes – E-waste and plastic waste: recycling and reuse- role of an individual in prevention of pollution – pollution case studies (vizaggas leakage).

UNIT-IV	**SOCIAL ISSUES & ENVIRONMENTAL IMPACT ASSESMENT**	9 Hrs

Social issues – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies (Global warming). – EPA: Environment protection act - EIA: EIA structure- methods of baseline data acquisition. Planning and management of impact studies - operational aspects of EIA - methods for impact identification.

UNIT-V	**SUSTAINABILITY AND MANAGEMENT**	9 Hrs

Development , GDP ,Sustainability- concept, needs and challenges - economic, social and aspects of sustainability - from unsustainability to sustainability - millennium development goals, and protocols- Sustainable Development Goals - targets, indicators and intervention areas.

	TOTAL	**45 Hrs**

TEXT BOOKS :

1. Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press (2015)

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2.	Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2017.
3.	Dr.A.Ravikrishnan, "Environmental Science and Engineering" , Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2014.
4.	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
REFERENCES	
1.	R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2.	Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 3nd Edition, Pearson Education, 2023.
3.	Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.

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DEPARTMENT OF AERONAUTICAL ENGINEERING

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Aeronautical Engineering**	**Programme Code & Name**			**1011 &Aeronautical Engineering**	
III Semester						
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE24301	**THERMAL LABORATORY**	**0**	**0**	**2**	**1**	**100**
Objective(s)	To provide practical exposure to the principles of applied thermodynamics and heat transfer					
Outcome(s)	After completion of this course students will be able to: • Analyze engine performance by conducting tests on internal combustion engines (4-stroke, 2-stroke valve/port timing) and comprehend gas turbine engine operation through demonstration. • Evaluate the effectiveness of various heat transfer systems (e.g., heat exchangers, finned surfaces, insulating materials) and assess the Coefficient of Performance (COP) for vapor compression refrigeration and air-conditioning units. • Measure thermal properties of materials and determine fluid properties such as viscosity through experimental procedures					

LIST OF EXPERIMENTS	
1.	Valve timing of a 4 – stroke engine and port timing of a 2-stroke engine
2.	Performance test on a 4-stroke engine
3.	Determination of effectiveness of a parallel flow heat exchanger
4.	Determination of effectiveness of a counter flow heat exchanger
5.	Determination of the viscosity coefficient of a given liquid
6.	Study of a Vapour Compression Refrigeration System.
7.	Demonstration and Component Study of a Gas Turbine Engine.
8.	Determination of thermal conductivity using Pin-Fin apparatus.
9.	Determination of Thermal Resistance of an insulating material.
Total hours to be taught	**30 PERIODS**

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DEPARTMENT OF AERONAUTICAL ENGINEERING

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Aeronautical Engineering**		**Programme Code & Name**		**1011 &Aeronautical Engineering**	
III Semester						
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE24302	**FLUID MECHANICS LABORATORY**	**0**	**0**	**2**	**1**	**100**
Objective(s)	• To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.					
Outcome(s)	After completion of the course students can able to • Describe various operating characteristics of Venturimeter and Orifice meter. • Explain various operating characteristics of Kaplan, Francis and Pelton Wheel Turbines. • Describe various operating characteristics of Centrifugal pump and reciprocating pump					

LIST OF EXPERIMENTS	
1.	Determination of the Coefficient of discharge of given Orifice meter.
2.	Determination of the Coefficient of discharge of given Venturimeter.
3.	Calculation of the rate of flow using Rotameter.
4.	Determination of friction factor for a given set of pipes.
5.	Conducting experiments and drawing the characteristic curves of centrifugal pump/ submergible pump
6.	Conducting experiments and drawing the characteristic curves of reciprocating pump.
7.	Conducting experiments and drawing the characteristic curves of Gear pump.
8.	Conducting experiments and drawing the characteristic curves of Pelton wheel.
9.	Conducting experiments and drawing the characteristics curves of Francis turbine.
10.	Conducting experiments and drawing the characteristic curves of Kaplan turbine.
	Total hours to be taught **30 PERIODS**

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Syllabus						
Department	**Aeronautical Engineering**		**Programme Code & Name**		**1011 &Aeronautical Engineering**	
III Semester						
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE24303	**SOLID MECHANICS LABORATORY**	**0**	**0**	**2**	**1**	**100**
Objective(s)	• To study the mechanical properties of materials when subjected to different types of loading. • To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.					
Outcome(s)	After completion of the course students can able to • Predict the tension, torsion, hardness, Compression, and Deformation values of Solid materials. • Evaluate the flow measurements.					

LIST OF EXPERIMENTS	
1.	Tension and Compression test on mild steel rod
2	Double shear test on metal
3	Torsion test on mild steel rod
4	Impact test on metal specimen (Iron and Al) analysis
5	Hardness test on metals (Rockwell and Brinell Hardness Tests)
6	Deflection test on metal beam
7	Deflection of a simply-supported beam
8	Deflection of a cantilever beam.
9.	Study of non-destructive testing procedures
10	Determination of flexural rigidity of composite beam, Truss and frame
	Total hours to be taught **30 PERIODS**

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Regulation-2024- Curriculum (CBCS)							
IV Semester							
Sl. No.	**Course code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**
THEORY							
1	24MA12404	Numerical Methods	BS	3	0	0	3
2	24AE14401	Low Speed Aerodynamics	PC	3	0	0	3
3	24AE14402	Mechanics of Machines	PC	3	0	0	3
4	-	Open Elective-II	OE	3	0	0	3
5	-	Open Elective-III	OE	3	0	0	3
6	24HS11006	Universal Human Values-II	HS	3	0	0	3
PRACTICAL							
8	24AE24401	Aerodynamics Laboratory	PC	0	0	2	1
9	24AE26401	Modelling and simulation Laboratory	EEC	0	0	4	2
10	24HS21002	Professional Communicational Skills	HS	0	1	2	2
			TOTAL	**18**	**1**	**8**	**23**

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MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus						
Department	**Aeronautical Engineering**	**Programme Code & Name**			**1011 & Aeronautical Engineering**	
IV Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE14401	**LOW SPEED AERODYNAMICS**	3	0	0	3	**100**
Objective(s)	The course should enable the students: ● Understand the behaviour of airflow over bodies with particular emphasis on airfoil sections in the incompressible flow regime. ● Introduce the concepts of mass, momentum and energy conservation relating to aerodynamics. ● Make the student understand the concept of vorticity, irrotationality, theory of airfoils and wing sections. ● Introduce the basics of viscous flow.					
UNIT-I	**INTRODUCTION TO AERODYNAMICS**					**9**
Importance of Aerodynamics – Aerodynamic forces and moments – Pressure distribution on an airfoil – Types of drag – Flow similarity, Types of flow – Continuity, momentum and energy equations – Incompressible-inviscid flow – Irrotational flow – Circulation and Vorticity – Euler's equation – Bernoulli's Equation – Pitot tube: Measurement of airspeed. Pressure Coefficient.						
UNIT-II	**TWO DIMENSIONAL FLOWS**					**9**
Basic flows – Source, Sink, Free and Forced vortex, uniform parallel flow. Their combinations, Pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows.						
UNIT-III	**GENERATION OF LIFT**					**8**
Kutta Joukowski's theorem. Kutta condition. Blasius theorem.						
UNIT-IV	**AIRFOIL AND WING THEORY**					**11**
Joukowski, Karman - Trefftz, Profiles - Thin aerofoil theory and its applications. Vortex line, Horse shoe vortex, Biot and Savart law, Lifting line theory and its limitations.						
UNIT-V	**PROPELLER THEORY**					**8**
Froude momentum and Blade element theories – Propeller coefficients – Performance of fixed and variable pitch propeller.						
Total hours to be taught						**45 PERIODS**

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Outcomes:

Upon successful completion of the course, students should be able to:

- Apply airfoil theory to predict air foil perform
- Determine aerodynamic forces and moments on airfoil, wing and body of revolution in subsonic flow, including compressibility effect.
- Analyze boundary layer: velocity profile, thickness and friction coefficient.
- Determine basic aerodynamic characteristics of propeller.
- Apply presented numerical implementations to basic elements of aircraft configurations.

TEXT BOOK :

1	Anderson, J.D., "Fundamentals of Aerodynamics", McGraw-Hill Book Co., New York, 1998.

REFERENCES:

1	Houghton, E.L., and Carruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 1989.
2	Milne Thomson, L.H., "Theoretical aerodynamics", Macmillan, 1985.
3	Clancey, L.J., "Aerodynamics", Pitman, 1986

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MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Aeronautical Engineering**	**Programme Code& Name**			**1011 & Aeronautical Engineering**	
IV Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE14402	**MECHANICS OF MACHINES**	3	0	0	3	**100**
Objective(s)	The course should enable the students to: ● Understand the basic components and layout of linkages in the assembly of a system machine. ● Understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration of a mechanism. ● Analyze the friction in motion transmission and in machine components. ● Solve the problems on toothed gearing and kinematics of gear trains ● Analyze the balancing and governors effect					
UNIT-I	**INTRODUCTION**					**9**
Machine structures, Kinematic Link, pairs, chain, degrees of freedom, Grubler's criterion, Mechanism, structure, Inversion, Inversions of Four bar chain; Single slider crank chain and Double slider crank chain. Kinematic analysis of simple mechanisms.						
UNIT-II	**VELOCITY AND ACCELERATION ANALYSIS OF MECHANISMS**					**9**
Velocity and acceleration analysis of Four Bar mechanism, slider crank mechanism and Simple Mechanisms by vector polygons: Relative velocity and acceleration of particles in a common link, - Corolis component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing. Velocity analysis by instantaneous center method.						
UNIT-III	**FRICTION**					**9**
Friction in screw and nut – Pivot and collar – Thrust bearing – Plate and disc clutches – Belt (flat and V) and rope drives. Ratio of tensions – Effect of centrifugal and initial tension – Condition for maximum power transmission – Open and crossed belt drive.						
UNIT-IV	**GEARING AND CAMS**					**9**

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Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains: Simple, compound gear trains and epicylic gear trains - Determination of speed and torque - Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions		
UNIT-V	**BALANCING**	**9**
Static and dynamic balancing – Single and several masses in different planes –Balancing of reciprocating masses- primary balancing and concepts of secondary balancing – Single and multi cylinder engines (Inline) – Balancing of radial V engine – direct and reverse crank method		
	Total hours to be taught	**45 PERIODS**

Outcomes:

Upon successful completion of the course, students should be able to:

- Describe the various mechanisms and its degree of freedom.
- Compute the velocity and acceleration for simple mechanism.
- Analyze the effect of friction in machine elements.
- Solve problems in various motion transmissions on gears, gear trains and cams.
- Solve problems on balancing and governors effect

TEXT BOOK :

1	Ambekar A.G., “Mechanism and Machine Theory” Prentice Hall of India, New Delhi, 2007
2	Ballaney.P.L, “Theory of Machines”, Khanna Publishers, New Delhi, 2002.
3	"Theory of Machines", Sadhu Singh, Pearson Education (Singapore) Pvt. Ltd., Indian Branch, New Delhi, 2nd Edi. 2006.

REFERENCES:

1	Shigley, J.E. and Uicker, J.J., “Theory of Machines and Mechanisms”, McGraw-Hill, 4th Edition, 2014.
2	J.K.Gupta and R.S.Khurmi, “Theory of Machines”, S.Chand Publication, 2005
3	"Theory of Machines -I", by A.S.Ravindra, Sudha Publications Revised 5th Edi. 2004.
4	"Theory of Machines & Mechanisms", Shigley. J. V. and Uickers, J.J., OXFORD University press.2004.

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Syllabus							
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IV Semester							
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**	
24AE24401	**AERODYNAMICS LABORATORY**	**L**	**T**	**P**	**C**	**100**	
		0	0	2	1		
Objective(s)	The course should enable the students to: • To predict different aerodynamic propulsion used in aero application						
Outcomes(s)	Upon successful completion of the course, students should be able to: • Describe the fundamental aerodynamic and geometrical properties related to external flows over airfoils, wings, and bluff bodies. • Calculate the aerodynamic forces and moments experienced by airfoils, wings and bluff bodies. • Use thin aerofoil theory to evaluate the performance of thin airfoils and the effects of angle of attack and camber. • Use wind tunnel instrumentation to measure flow velocity and lift and drag. • Visualize the flow and pressure distribution over 2D and 3D bodies by water flow and smoke methods.						

LIST OF EXPERIMENTS	
1.	Study of Subsonic wind tunnel
2.	Plot of RPM vs test section velocity in a subsonic wind tunnel.
3.	Flow visualization of different models in smoke tunnel
4.	Pressure distribution over a circular cylinder.
5.	Pressure distribution over a symmetric aerofoil.
6.	Pressure distribution over a cambered aerofoil.
7.	Force measurement of symmetric aerofoil using wind tunnel balance.
8.	Force measurement of cambered aerofoil using wind tunnel balance.
9.	Flow visualization in water flow channel
10.	Study of Schlieren system to visualize shock.
11.	Study of Shadowgraph system to visualize shock
12.	Study of supersonic wind tunnel
	Total hours to be taught **30 PERIODS**

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MAHENDRA ENGINEERING COLLEGE
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Syllabus

Department	**Aeronautical Engineering**	**Programme Code**	**1101**

- Semester

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AE26401	**MODELING AND SIMULATION LABORATORY**	0	0	2	1	**100**

Objective(s)

The course should enable the students to :

- Recognize and navigate toolbars
- Access workbenches
- Efficiently create fully constrained sketches
- Create and modify solid parts
- Create basic surfaces

LIST OF EXPERIMENTS

1. Introduction to CATIA.
2. Creating the Swivel part using multiple Sketches.
3. Creating the Top U Joint using multiple Sketches
4. Creating the Bottom U Joint using multiple Sketches.
5. Assembling Part Drawings.

Total	**30 Periods**

Outcomes:

After completion of the course students can able to:

- Create and Save various types of CATIA V5 documents
- Differentiate and switch between a selection of workbenches
- Perform various tasks concerning 3D Navigation and geometry selection
- Create and constrain sketches
- Describe the functional capabilities and general usage of Part Design, Generative Shape Design and Assembly Design.

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