

KONGU ENGINEERING COLLEGE

(Autonomous Institution Affiliated to Anna University, Chennai)

PERUNDURAI ERODE – 638 060

TAMILNADU INDIA



REGULATIONS, CURRICULUM & SYLLABI – 2024

(CHOICE BASED CREDIT SYSTEM AND
OUTCOME BASED EDUCATION)

(For the students admitted from the academic year 2024 - 2025)

BACHELOR OF ENGINEERING DEGREE IN AUTOMOBILE ENGINEERING

DEPARTMENT OF AUTOMOBILE ENGINEERING

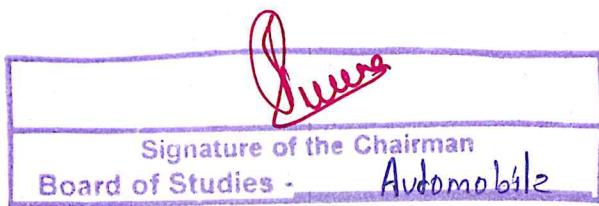


B.E. AUTOMOBILE ENGINEERING CURRICULUM – R2024
(For the students admitted from the academic year 2024-25 onwards)

SEMESTER – I														
Course Code	Course Title	Hours / Semester						Credit	Maximum Marks			Category	Type	
		CI		LI	TW	SL	TH		CA	ESE	Total			
		L	T	P										
Theory/Theory with Practical														
24EGT11	English for Effective Communication - I	45	0	0	45	0	90	3	40	60	100	HS	C	
24MAC11	Matrices and Ordinary Differential Equations	45	7	16	52	0	120	4	50	50	100	BS	A	
24CYT12	Chemistry for Mechanical Systems	45	0	0	45	0	90	3	40	60	100	BS	C	
24CSC11	Problem Solving and Programming in C	45	0	30	45	0	120	4	100	0	100	ES	OT	
24MET11	Engineering Drawing	30	15	0	45	0	90	3	40	60	100	ES	A	
24TAM01	Heritage of Tamils	15	0	0	15	0	30	1	100	0	100	HS	OT	
Practical / Employability Enhancement														
24CYL12	Chemistry Laboratory for Mechanical Systems	0	0	30	0	0	30	1	60	40	100	BS		
24GCL12	Foundation Laboratory – Electrical, IoT and Web Technologies	0	0	90	0	0	90	3	100	0	100	ES		
24MNT12	Quantitative Aptitude – I	20	0	0	10	0	30	0	100	0	100	MC		
24MNT11	Student Induction Program	0	0	90	0	0	90	0	100	0	100	MC		
Total Credits to be earned									22					

CI – Classroom Instructions, LI – Laboratory Instructions, TW – Term Work, SL – Self Learning, L – Lecture, T – Tutorial, P – Practical, C – Credit, TH – Total Hours, CA – Continuous Assessment, ESE – End Semester Examination.

Type: A – Analytical, D – Design using Hardware, S – Simulation using Coding, C – Concept, OC – Online course, OT - others



B.E. AUTOMOBILE ENGINEERING CURRICULUM – R2024
 (For the students admitted from the academic year 2024-25 onwards)

SEMESTER – II														
Course Code	Course Title	Hours / Semester						Credit	Maximum Marks			Category	Type	
		CI		LI	TW	SL	TH		CA	ESE	Total			
		L	T	P										
	Theory/Theory with Practical													
24EGT21	English for Effective Communication - II	45	0	0	45	0	90	3	40	60	100	HS	C	
24MAC22	Multivariable Calculus and Partial Differential Equations	45	7	16	52	0	120	4	50	50	100	BS	A	
24PHT21	Applied Physics	45	0	0	45	0	90	3	40	60	100	BS	C	
24ITC23	Python Programming	45	0	30	45	0	120	4	100	0	100	ES	OT	
24AUT21	Statics and Dynamics	45	0	0	45	0	90	3	40	60	100	PC	A	
24TAM02	Tamils and Technology	15	0	0	15	0	30	1	100	0	100	HS	OT	
	Practical / Employability Enhancement													
24PHL21	Applied Physics Laboratory	0	0	30	0	0	30	1	60	40	100	BS		
24GCL11	Foundation Laboratory – Manufacturing, Design and Robotics	0	0	90	0	0	90	3	100	0	100	ES		
24MNT21	Quantitative Aptitude – II	20	0	0	10	0	30	0	100	0	100	MC		
24VEC11	Yoga and Values for Holistic Development	10	0	10	10	0	30	1	100	0	100	HS		
Total Credits to be earned									23					

CI – Classroom Instructions, LI – Laboratory Instructions, TW – Term Work, SL – Self Learning, L – Lecture, T – Tutorial, P – Practical, C – Credit, TH – Total Hours, CA – Continuous Assessment, ESE – End Semester Examination

Type: A – Analytical, D – Design using Hardware, S – Simulation using Coding, C – Concept, OC – Online course, OT - others



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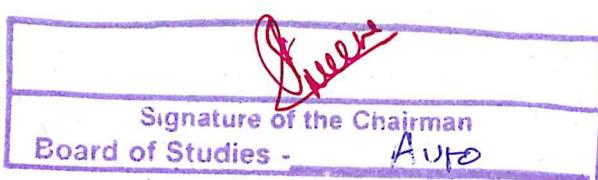
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B.E. AUTOMOBILE ENGINEERING CURRICULUM – R2024
(For the students admitted from the academic year 2024-25 onwards)

SEMESTER – III																
Course Code	Course Title	Hours / Semester						Credit	Maximum Marks			Category	Type			
		CI		LI	TW	SL	TH		CA	ESE	Total					
		L	T													
Theory/Theory with Practical																
24AUC31	Basics of Electrical and Electronic Circuits	45	0	30	45	0	120	4	50	50	100	PC	A			
24AUC32	Hydraulics and Pneumatics	45	0	30	45	0	120	4	50	50	100	PC	S			
24AUT31	Thermodynamics and Heat Transfer	45	15	0	60	0	120	4	40	60	100	BS	A			
24AUT32	Mechanics of Deformable Bodies	45	0	0	45	0	90	3	40	60	100	ES	A			
24AUT33	Automotive Engines	45	0	0	45	0	90	3	40	60	100	ES	C			
24GET31	Universal Human Values	30	0	0	30	0	60	2	100	0	100	HS	OT			
Practical / Employability Enhancement																
24AUL31	Automotive Engines Laboratory	0	0	30	0	0	30	1	60	40	100	PC				
24AUL32	Automotive Fuels and Lubricants Laboratory	0	0	30	0	0	30	1	60	40	100	PC				
24GEP31	Mini Project - I	0	0	30	0	0	30	1	100	0	100	EC				
Total Credits to be earned									23							

CI – Classroom Instructions, LI – Laboratory Instructions, TW – Term Work, SL – Self Learning, L – Lecture, T – Tutorial, P – Practical, C – Credit, TH – Total Hours, CA – Continuous Assessment, ESE – End Semester Examination.

Type: A – Analytical, D – Design using Hardware, S – Simulation using Coding, C – Concept, OC – Online course, OT - others



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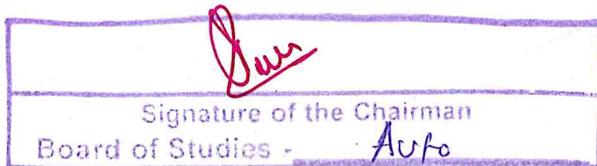
B.E. AUTOMOBILE ENGINEERING CURRICULUM – R2024
(For the students admitted from the academic year 2024-25 onwards)

SEMESTER – IV													
Course Code	Course Title	Hours / Semester					Credit	Maximum Marks			Category	Type	
		CI		LI	TW	SL		CA	ESE	Total			
		L	T	P									
Theory/Theory with Practical													
24MAT41	Numerical Methods for Engineers	45	15	0	60	0	120	4	40	60	100	BS A	
24AUC41	Automotive Electrical Systems and Drives	45	0	30	45	0	120	4	50	50	100	PC D	
24AUT41	Mechanics of Machines	45	15	0	60	0	120	4	40	60	100	PC A	
24AUT42	Vehicle Components Design – I	45	0	0	45	0	90	3	40	60	100	PC OC/A	
24AUT43	Automotive Control System	45	0	0	45	0	90	3	40	60	100	PC S	
Practical / Employability Enhancement													
24AUL41	Computer Aided Design Laboratory	0	0	30	0	0	30	1	60	40	100	PC	
24AUL42	Automotive Chassis Components Laboratory	0	0	30	0	0	30	1	60	40	100	PC	
24GCL41/ 24GCI41	Professional Skills Training – I / Industrial Training – I\$	0	0	45	35	0	80	2	100	0	100	EC	
24GEP41	Mini Project - II	0	0	30	0	0	30	1	100	0	100	EC	
Total Credits to be earned								23					

\$ 80 hours of Training

CI – Classroom Instructions, LI – Laboratory Instructions, TW – Term Work, SL – Self Learning, L – Lecture, T – Tutorial, P – Practical, C – Credit, TH – Total Hours, CA – Continuous Assessment, ESE – End Semester Examination.

Type: A – Analytical, D – Design using Hardware, S – Simulation using Coding, C – Concept, OC – Online course, OT - others



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24EGT11 - ENGLISH FOR EFFECTIVE COMMUNICATION - I																		
(Common to all Engineering and Technology Branches)																		
Programme & Branch	All B.E/B.Tech Branches	Sem	Category	L	T	P	SL*	Total	Credit									
Prerequisites	Nil	1	HS	45	0	0	45	90	3									
Preamble	This course is designed to enhance the communication skills and verbal aptitude in English language required for various workplace communication and social interactions.																	
Unit – I	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing																	
Grammar: Parts of Speech – Articles – Determiners – Verbal Aptitude: Synonyms and Antonyms – Selecting Words – Listening: Listening and Filling in Information – Speaking: Introducing Oneself – Discussion on Social Media Etiquette – Reading: Importance of Good Communication – Comprehension and Inference, Reading for facts and opinions – Building a Positive Attitude: An Excerpt from <i>You Can Win</i> – Writing: Email Etiquette – Email Writing – Responding to Emails																		
Unit – II	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing																	
Grammar: Types of Sentences – Assertive, Interrogative, Imperative and Exclamatory – Question Tags– Verbal Aptitude: Prefixes and Suffixes – Collocations – Idiomatic Expressions – Listening: Identifying main and Secondary Points – Speaking: Asking Questions – Role Play – Reading: Reading for Comprehension – Verbal and Non-Verbal Communication – Winning Strategies: An Excerpt from <i>You Can Win</i> - Writing: Descriptive Writing – Product/Process Description – Letter Writing: Formal Letters – Seeking Permission and Inviting Chief Guest																		
Unit – III	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing																	
Grammar: Tenses – Phrasal Verbs– Verbal Aptitude: Jumbled Sentences – Sentence Formation– Listening: Taking Notes from a Discussion – Speaking: Retelling an Incident – Discussing Tourist Destinations – Reading: Process of Communication–Scanning - Motivating Yourself and Others Every Day: An Excerpt from <i>You Can Win</i> – Writing: Paragraph Writing: Narrative and Compare & Contrast																		
Unit – IV	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing																	
Grammar: Prepositions – Transitional Words/Phrases – Discourse Markers – Verbal Aptitude: One Word Substitution - Sentence Completion – Listening: Listening for Specific Information – Speaking: Small Talk–Telephonic Conversations– Reading: Channels of communication – Building Positive Self-Esteem and Image: An Excerpt from <i>You Can Win</i> – Writing: Instructions – Recommendations and Suggestions																		
Unit – V	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing																	
Grammar: Subject Verb Agreement – Gerunds and Infinitives– Verbal Aptitude: Homonyms, Homophones and Homographs – Cloze Test using Verb Forms, Prepositions and Articles – Listening: Listening and Identifying Parts from a Description – Speaking: Agreeing and Disagreeing – Reading: Skimming – Reading to Summarize – Setting and Achieving your Goals: An Excerpt from <i>You Can Win</i> – Writing: Transcoding: Identifying Trends and Patterns in Graphs and Expressing with Graph Specific Vocabulary																		
TEXT BOOK:																		
1.	Sudharshana N P and Savitha C, <i>English for Technical Communication</i> , 2 nd Edition, Cambridge University Press, New Delhi, 2016.																	
REFERENCES:																		
1.	Ashraf Rizvi. <i>Effective Technical Communication</i> , 2 nd Edition, McGraw-Hill India, 2017.																	
2.	S. P. Dhanavel. <i>English and Communication Skills for Students of Science and Engineering</i> , Orient Black Swan Publishers, Hyderabad, 2009.																	
3.	Shiv Khera. <i>You Can Win: A Step-by-Step Tool for Top Achievers</i> . Bloomsbury Publishing, 2018.																	

* includes Term Work (TW) & Assignments, Tutorials and Case Studies

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)
CO1	learn and use various aspects of English vocabulary to perform well in verbal aptitude tests of different types										
CO2	listen and understand different spoken discourses										
CO3	present ideas clearly and confidently in formal and informal conversations and discussions										
CO4	comprehend the given text and respond appropriately for technical and professional purposes										
CO5	select appropriate words , phrases and grammatical units and apply them in both spoken and written communication										

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						1		1	3	1	1		
CO2									1	3		1	
CO3									2	3	1	2	
CO4						1				3	1	2	
CO5										3		2	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understa nding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	35	50	-	-	15	100
CAT2	-	45	35	-	-	20	100
CAT3	-	30	35	35	-	-	100
ESE	-	20	40	20	-	20	100

* ±3% may be varied (CAT 1,2& 3 – 50 marks & ESE – 100 marks)



Signature of the Chairman
Board of Studies - S&H (English)





24MAC11 - MATRICES AND ORDINARY DIFFERENTIAL EQUATIONS										
(Common to all Engineering and Technology branches)										
Programme & Branch	All B.E/B.Tech Branches	Sem.	Category	L	T	P	SL*	Total	Credit	
Prerequisites	Nil	1	BS	45	7	16	52	120	4	
Preamble	To provide the skills to the students for solving different real time problems by applying matrices and ordinary differential equations.									
Unit - I	Matrices:									
	Introduction – Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley – Hamilton theorem (Statement and applications only) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Nature of Quadratic forms - Reduction of quadratic form to canonical form by orthogonal transformation.									
Unit - II	Ordinary Differential Equations:									
	Introduction – Solution of First order differential equations: Exact differential equations – Leibnitz's Linear Equation – Bernoulli's equation – Clairaut's equation - Applications: Law of natural growth and decay.									
Unit - III	Ordinary Differential Equations of Higher Order:									
	Linear differential equations of second and higher order with constant coefficients - Particular Integrals for the types: e^{ax} – $\cos ax / \sin ax$ – $x^n - e^{ax}x^n$, $e^{ax} \sin bx$ and $e^{ax} \cos bx$ – Differential Equations with variable coefficients: Euler-Cauchy's equation – Legendre's equation.									
Unit - IV	Applications of Ordinary Differential Equations:									
	Method of variation of parameters – Simultaneous first order linear equations with constant coefficients – Applications of differential equations: Simple harmonic motion – Electric circuits (Differential equations and associated conditions need to be given).									
Unit - V	Laplace Transform:									
	Introduction – Conditions for existence – Laplace transform of elementary functions – Basic properties – Derivatives and integrals of transforms – Transform of periodic functions - Inverse Laplace transform: Inverse Laplace transform of elementary functions – Partial fraction method – Convolution Theorem – Applications: Solution of linear ODE of second order with constant coefficients.									
LIST OF EXPERIMENTS / EXERCISES:										
1.	Introduction to MATLAB									
2.	Computation of eigen values and eigen vectors									
3.	Solving first order ordinary differential equations									
4.	Solving higher order ordinary differential equations									
5.	Solution of Simultaneous first order ODEs									
6.	Solving second order ODE by variation of parameters									
7.	Determining Laplace and inverse Laplace transform of basic functions									
8.	Solution of Second order ODE by employing Laplace transforms									
TEXT BOOK:										
1.	Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics For First Year B.E/B.Tech", Reprint Edition 2016, S.Chand and Co., New Delhi.									
REFERENCES/ MANUAL / SOFTWARE:										
1.	Kreyszig E, "Advanced Engineering Mathematics ", 10 th Edition, John Wiley, New Delhi, India, 2016.									
2.	Ramana B V, "Higher Engineering Mathematics", 1 st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.									
3.	Duraisamy C., Vengataasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - I", 2 nd Edition, Pearson India Education, New Delhi, 2018.									
4.	Grewal B.S., "Higher Engineering Mathematics" 44th Edition, Khanna Publishers, New Delhi, 2018.									
5.	Matrices and Ordinary Differential Equations Laboratory Manual.									

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)
CO1	Use the matrix algebra methods and MATLAB for solving practical problems.										
CO2	Identify the appropriate method for solving first order ordinary differential equations.										
CO3	Solve higher order linear differential equations with constant and variable coefficients.										
CO4	Apply the concept of ordinary differential equations for modeling and finding solutions to engineering problems.										
CO5	Apply Laplace Transform to solve complex engineering problems.										

Mapping of COs with POs and PSOs

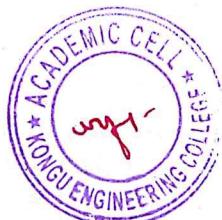
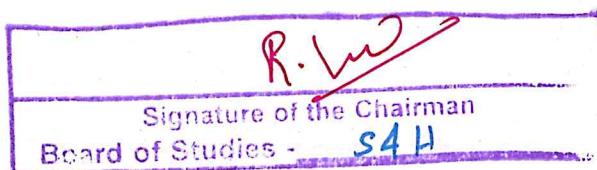
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2		3								
CO2	3	3	2		3								
CO3	3	3	2		3								
CO4	3	3	2		3								
CO5	3	3	3		3								

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		30	70				100
ESE		30	70				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)



24CYT12 - CHEMISTRY FOR MECHANICAL SYSTEMS																				
(Common to Mechanical, Mechatronics & Automobile branches)																				
Programme & Branch	B.E - MECH, MTS & AUTO branches	Sem.	Category	L	T	P	SL*	Total	Credit											
Prerequisites	Nil	1	BS	45	0	0	45	90	3											
Preamble	This course explores the basic principles of water treatment, energy storage devices, electrochemistry, corrosion, fuels and combustion. It also aims to impart the fundamentals of chemistry of engineering materials towards innovations in engineering and also for societal applications.																			
Unit – I	WATER TECHNOLOGY																			
Introduction - types of water - hardness of water- expression of hardness - units of hardness –water quality parameters-estimation of hardness of water by EDTA method – determination of alkalinity - DO, BOD and COD (Definition and Significance only) - disadvantages of using hard water in industry: scale, sludge and boiler corrosion - softening of water: Internal treatment process - carbonate and calgon conditioning - External treatment method - demineralization process and reverse osmosis.																				
Unit – II	ELECTROCHEMISTRY AND CORROSION																			
Electrochemistry: Introduction - cells - types - representation of galvanic cell – Electrode potential – Nernst equation (derivation of cell EMF) – construction, working and applications of glass electrode - conductometric titrations – mixture of weak and strong acid Vs strong base. Corrosion: Introduction - chemical corrosion - Pilling – Bedworth's rule - electrochemical corrosion - mechanism with examples - galvanic series- factors influencing rate of corrosion - corrosion control by organic coating (paints) - constituents and functions with examples.																				
Unit – III	ENERGY STORAGE DEVICES																			
Batteries: Introduction - discharging and charging of battery - characteristics of battery - types of batteries – primary battery: silver button cell - secondary battery: Ni-Cd battery -modern battery: lithium-ion battery - choice of batteries for electric vehicles. Fuel Cells: Introduction - Importance and classification of fuel cells - description, principle, components and working of fuel cells: alkaline fuel cell, phosphoric acid fuel cell and direct methanol fuel cell - comparison of batteries with fuel cells.																				
Unit – IV	FUELS AND COMBUSTION																			
Introduction – classification of fuels - characteristics of a good fuel - combustion - calorific values – gross and net calorific values (simple problems) -Flue gas analysis by Orsat's method- solid fuels - coal and its varieties – proximate analysis – significance – metallurgical coke - Otto-Hoffman byproduct method - liquid fuel - refining of petroleum - knocking: spark ignition engine - octane number, compression ignition engine - cetane number - gaseous fuel - LPG.																				
Unit – V	CHEMISTRY OF ENGINEERING MATERIALS																			
Lubricants: Introduction – classification - properties: viscosity, viscosity index, flash and fire point, cloud and pour point, oiliness, aniline point and carbon residue. Explosives: Introduction - classification - manufacture of important explosives (TNT, GTN and RDX). Adhesives: Introduction-requisites of a good adhesive - classification of adhesives - adhesive bonding- chemical action of adhesive - industrial adhesives.																				
TEXT BOOK:																				
1.	Roussak , O.V. Gesser, H. D. " Applied Chemistry: A Textbook for Engineers and Technologists", 2 nd Edition ,Springer, 2013, for Units I, II, IV.																			
2.	Palanisamy P.N., Manikandan P., Geetha A., Manjula Rani K., Kowshalya V.N., "Chemistry for Engineering", Revised Edition ,Pearson Education, New Delhi, 2024, for Units I, III, IV, V																			
REFERENCES:																				
1.	Payal B. Joshi, Shashank Deep, "Engineering Chemistry", Oxford University Press, New Delhi, 2019.																			
2.	Wiley Editorial Board, "Wiley Engineering Chemistry", 2nd Edition, Wiley India Pvt. Ltd, New Delhi, Reprint 2019.																			

*includes Term Work(TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	analyze the water quality parameters for suitability of industrial and domestic applications.											Analysing (K4)
CO2	investigate the fundamental principles of electrochemistry and corrosion control measures to prevent corrosion.											Analysing (K4)
CO3	examine the chemistry of energy storing devices and meeting the future prospectus of energy storage.											Analysing (K4)
CO4	investigate the concepts of fuels and combustion for efficient engineering applications.											Analysing (K4)
CO5	examine the needy engineering materials for betterment of industries.											Analysing (K4)

Mapping of COs with POs and PSOs

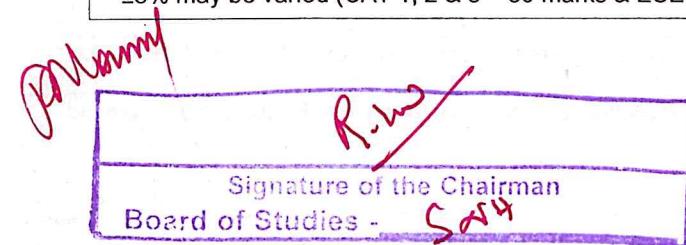
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1		1							
CO2	3	2	1	1									
CO3	3	2	1	1									
CO4	3	2	1	1									
CO5	3	2	1	1									

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	50	10			100
CAT2		40	50	10			100
CAT3		40	50	10			100
ESE		40	50	10			100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)



24CSC11 - PROBLEM SOLVING AND PROGRAMMING IN C

Programme & Branch	All BE/BTech Engineering & Technology branches, except CSE, IT,CSD, AI&ML, AI&DS	Sem	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	1	ES	45	0	30	45	120	4
Preamble	The course is designed for use by freshmen students taking their first course in programming. It deals with the techniques needed to practice computational thinking, the art of using computers to solve problems and the ways the computers can be used to solve problems. This course also focuses on developing programming skills using C language.								
Unit – I	Introduction to Computer and Problem Solving: Overview of computers: Types, Generations, Characteristics, Basic computer Organization – Problem solving techniques: Algorithms - Flowcharts – Pseudo codes – Structuring the logic: Sequential, selection and repetitive structure								
Unit – II	Introduction to C and Control Statements: The structure of a C program – Compiling and executing C program – C Tokens – Character set in C – Keywords – identifiers- Basic data Types – Variables – constants – Input / Output statements – operators - decision making and looping statements								
Unit – III	Arrays and Functions: Declaring, initializing and accessing arrays – operations on arrays – Two dimensional arrays and their operations. Functions : Introduction- Using functions, function declaration and definition – function call – return statement – passing parameters to functions: basic data types and arrays – storage classes – recursive functions								
Unit – IV	Strings and Pointers: Strings :Introduction – operations on strings : finding length, concatenation, comparing and copying – string and character manipulation functions, Arrays of strings. Pointers: declaring pointer variables – pointer expression and arithmetic, pointers and 1D arrays , pointers and strings								
Unit – V	User-defined Data Types and File Handling: User-defined data types: Structure: Introduction – nested structures– arrays of structure – structure and functions - unions – enumerated data type. File Handling: Introduction - opening and closing files – reading and writing data to files -Manipulating file position indicator : fseek(), ftell() and rewind()								
LIST OF EXPERIMENTS / EXERCISES:									
1.	Writing algorithms and drawing flowcharts using Raptor Tool for problems involving sequential, Selection and repetition structures								
2.	Programs for demonstrating the use of different types of format Specifiers								
3.	Programs for demonstrating the use of different types of operators like arithmetic, logical, relational and ternary operators								
4.	Programs for demonstrating using decision making statements								
5.	Programs for demonstrating using repetitive statements								
6.	Programs for demonstrating one-dimensional array								
7.	Programs for demonstrating two-dimensional array								
8.	Programs to demonstrate modular programming concepts using functions								
9.	Programs to demonstrate strings (Using built-in and user-defined functions)								
10.	Programs to illustrate the use of pointers								
11.	Programs to illustrate the use of structures and unions								
12.	Programs to implement file Handling								

*includes Term Work(TW) & Online / Certification course hours

TEXT BOOK:													
1.	Reema Thareja, "Programming in C ", 2nd Edition, Oxford University Press, New Delhi, 2018												
REFERENCES/ MANUAL / SOFTWARE:													
1.	Yashavant Kanetkar, "Let us C", 16th Edition, BPB Publications, 2018.												
2.	Sumitabha Das, "Computer Fundamentals and C Programming", 1st Edition, McGraw Hill, 2018.												
3.	Balagurusamy E., "Programming in ANSI C", 7th Edition, McGraw Hill Education, 2017.												
4.	Behrouz A. Forouzan & Richard F.Gilberg, "Computer Science A Structured Programming Approach Using C", 3 rd Edition, Cengage,2017.												
5.	https://www.cprogramming.com/tutorial/c-tutorial.html												
COURSE OUTCOMES:													
On completion of the course, the students will be able to												BT Mapped (Highest Level)	
CO1	apply problem-solving techniques to express the solutions for the real world problems.											Applying (K3) Precision (S3)	
CO2	develop simple C programs using appropriate looping and control statements											Applying (K3) Precision (S3)	
CO3	develop simple C programs using the concepts of arrays and modular programming											Applying (K3) Precision (S3)	
CO4	apply the concepts of pointers and develop C programs using strings and pointers											Applying (K3) Precision (S3)	
CO5	make use of user-defined data types and file concepts to solve real world problems											Applying (K3) Precision (S3)	
Mapping of COs with POs and PSOs													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1					1	1	1		
CO2	3	2	2	1					1	1	1		
CO3	3	2	2	1					1	1	1		
CO4	3	2	2	1					1	1	1		
CO5	3	2	2	1					1	1	1		

R.B. ✓

Signature of the Chairman
Board of Studies - CSE



P. Kalaiarvami

24MET11 – ENGINEERING DRAWING																	
(Common to Civil, Mech, MTS, Auto, Chem, ECE, EEE, EIE, FT branches)																	
Programme & Branch	BE / BTech – Civil, Mech, MTS, Auto, Chem, ECE, EEE, EIE, FT branches	Sem.	Category	L	T	P	SL*	Total	Credit								
Prerequisites	Nil	1 / 2 [#]	ES	30	15	0	45	90	3								
Preamble	To impart knowledge on engineering curves, orthographic projections, sectional views, development of surfaces, isometric projections and AutoCAD through free hand sketching and drawing instruments.																
Unit – I	Introduction to Engineering drawing and Engineering Curves								6+3								
Use of drafting instruments - BIS conventions and specifications - Size, layout and folding of drawing sheets - Lettering and dimensioning. Projection of points in different quadrants. Engineering Curves: Conic section- Ellipse, Parabola, Hyperbola (Eccentricity method). Cycloidal Curves- Cycloids and Involutes of circle and Hexagon.																	
Unit – II	Projection of planes and Solids								6+3								
Projection of polygonal surface and circular lamina inclined to both reference planes. Projections of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.																	
Unit – III	Sectioning of Solids and Development of Surfaces								6+3								
Sectioning of prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to HP and perpendicular to VP - Obtaining true shape of section. Development of Lateral Surfaces of Simple and truncated Solids Like Prisms, Pyramids, Cylinders and Cones(Cutting planes inclined to HP and perpendicular to VP only).																	
Unit – IV	Isometric Projection								6+3								
Principles of isometric projection - Isometric scale - Isometric projections of simple and truncated solids like prisms, pyramids and cylinders. Conversion of orthographic in to isometric views																	
Unit – V	Orthographic Projection and Introduction to AutoCAD								6+3								
Conversion of isometric projection into orthographic projection (Freehand sketching only). Introduction to Computer Aided Drawing: Role of CAD in design and development of new products. Creating two-dimensional drawing with dimensions using suitable software (Minimum 2 exercises mandatory). Introduction to Solid Modelling: Creating 3D models of various components using suitable modelling software. (Minimum 2 exercises mandatory).																	
TEXT BOOK:																	
1.	Basant Agrawal, Agrawal C.M., "Engineering Drawing", 3rd Edition, McGraw Hill Education, 2019.																
REFERENCES:																	
1.	Lakh winder pal singh, Harwinder Singh., "Engineering Drawing and Principles and Applications", 1 st Edition, Cambridge University Press, 2021																

*includes Term Work(TW) & Online / Certification course hours

#sem1: Civil, Mech, MTS, Auto, Chem branches & sem 2: ECE, EEE, EIE, FT branches

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	interpret international standards of drawings and sketch the engineering curves											Applying (K3)
CO2	draw the projection of planes and solids											Applying (K3)
CO3	draw sectioning and developing of 3D primitive objects like prisms, pyramids, cylinders, cones											Applying (K3)
CO4	sketch the isometric projections of simple and truncated solids and convert orthographic projection in to isometric drawing											Applying (K3)
CO5	obtain multi view projections and solid models of objects using CAD tools											Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1			2					3			
CO2	3	1	1		2					3			
CO3	3	1	1		2					3			
CO4	3	1	1		2					3			
CO5	3	1	1		2					3			

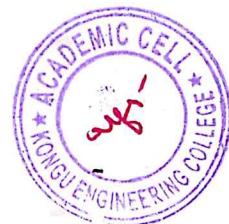
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	-	100	-	-	-	100
CAT2	-	-	100	-	-	-	100
CAT3	-	-	100	-	-	-	100
ESE	-	-	100	-	-	-	100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

<i>Chairman</i> Signature of the Chairman of Studies - Mechanical



K-V-J
✓

24TAM01- HERITAGE OF TAMILS																	
(Common to All Engineering and Technology Branches)																	
Programme & Branch	All B.E/B.Tech Branches	Sem.	Category	L	T	P	SL*	Total	Credit								
Prerequisites	NIL	1	HS	15	0	0	15	30	1								
Preamble	The objective of this course is to impart knowledge about Tamil language, literature, paintings, sculptures, folk arts, heroic games, doctrines, contribution of Tamils to Indian culture.																
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 bharathiya 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 - villu pattu - kaniyan koothu – 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.																	
TEXT BOOK:																	
1.	S.Muthuramalingam, M.Saravanakumar, Heritage of Tamils, Yes Dee Publishing Pvt Ltd, 2023, for Units I,II,III,IV,V.																
REFERENCES:																	
1.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukarasu) (Published by : International Institute of Tamil Studies).																
2.	The Contribution of Tamil of the Tamils to Indian Culture(Dr.M.Valarmathi)(Published by International Institute of Tamil Studies).																
3.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu).																

*includes Term Work(TW) & Online / Certification course hours

COURSE OUTCOMES:		BT Mapped (Highest Level)
படிப்பை முடித்தவுடன், மாணவர்கள்		
CO1	explain valuable concepts in language and literature of tamils.	Understanding (K2)
CO2	illustrate about the tamils sculpture and their paintings.	Understanding (K2)
CO3	summarize about the tamils folk and martial arts.	Understanding (K2)
CO4	explain the thinai concept of tamils.	Understanding (K2)
CO5	explain the contribution of Tamils to the Indian National Movement and Indian culture.	Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						2	3	2	2		3		
CO2						2	3	2	2		3		
CO3						2	3	2	2		3		
CO4						2	3	2	2		3		
CO5						2	3	2	2		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

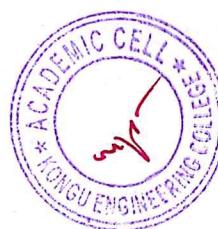
ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE				NA			

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks)

R. Vel

Signature of the Chairman
Board of Studies - S & H (Chemistry)



24TAM01-தமிழர் மரபு											
(Common to All Engineering and Technology Branches)											
Programme & Branch	All B.E/B.Tech Branches	Sem.	Category	L	T	P	SL*	Total	Credit		
Prerequisites	NIL	1	HS	15	0	0	15	30	1		
Preamble	தமிழர்களின் மொழி, இலக்கியம், ஓவியங்கள், சிற்பக்கலைகள், நாட்டுப்புறக் கலைகள், வீர வினாயாட்டுக்கள், தினைக் கோட்பாடுகள், இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பைப் பற்றிய அறிவை வழங்குவதே இந்த பாடத்தின் நோக்கமாகும்.										
அலகு - I	மொழி மற்றும் இலக்கியம்										3
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற் தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.											
அலகு - II	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை										3
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஜம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.											
அலகு - III	நாட்டுப்புறக் கலைகள் மற்றும் வீர வினாயாட்டுக்கள்										3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் வினாயாட்டுகள்.											
அலகு - IV	தமிழர்களின் தினைக் கோட்பாடுகள்										3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்கக்காலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.											
அலகு - V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு										3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறபகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.											
TEXT BOOK:											
1.	ஆ. பூபாலன், தமிழர் மரபு, VRB Publishers Pvt Ltd, 2022,அலகு I,II,III,IV,V.										
REFERENCES:											
1.	தமிழக வரலாறு- மக்களும் பண்பாடும்- கே கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)										
2.	கணினித்தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)										
3.	சீழை - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம். (தொல்லியல் துறை வெளியீடு)										
4.	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)										

*includes Term Work(TW) & Online / Certification course hours

COURSE OUTCOMES:			BT Mapped (Highest Level)
படிப்பை முடித்தவுடன், மாணவர்கள்			
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தில் மதிப்புமிக்க கருத்துக்களை விளக்க முடியும்.	Understanding (K2)	
CO2	தமிழர்களின் சிற்பம் மற்றும் அவர்களின் ஒவியங்கள் பற்றி விளக்க முடியும்.	Understanding (K2)	
CO3	தமிழர்களின் நாட்டுப்புற மற்றும் தற்காப்புக் கலைகளைப் பற்றி சுருக்கமாகக் கூற முடியும்.	Understanding (K2)	
CO4	தமிழர்களின் திணைக் கோட்பாடுகளைப் பற்றி விளக்க முடியும்.	Understanding (K2)	
CO5	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு பற்றி விளக்க முடியும்.	Understanding (K2)	

Mapping of COs with POs and PSOs

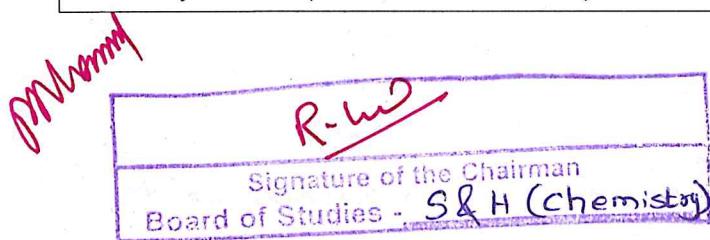
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						2	3	2	2		3		
CO2						2	3	2	2		3		
CO3						2	3	2	2		3		
CO4						2	3	2	2		3		
CO5						2	3	2	2		3		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE	NA						

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks)



24CYL12 – CHEMISTRY LABORATORY FOR MECHANICAL SYSTEMS

(Common to MECH, MTS & Automobile branches)

Programme & Branch	B.E & MECH, MTS & AUTO branches	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	1	BS	0	0	30	0	30	1

Preamble	This course aims to impart the basic concepts of volumetric, conductometric, spectrophotometric and pH meter experiments for the estimation of given samples and thereby, to improve the analytical skills. It also aims to impart knowledge on water quality parameters like hardness, alkalinity, DO, COD, corrosion rate of iron, chromium and sulphur.
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LIST OF EXPERIMENTS / EXERCISES:

1.	Assessment of the given water sample for the suitability of drinking / industrial purpose by estimating the carbonate, non-carbonate and total hardness by EDTA method.
2.	Estimation of type and amount of alkalinity present in the given river/bore well water sample.
3.	Volumetric estimation of chromium present in the given solution using permanganometric method.
4.	Perform Winkler's method for the determination of dissolved oxygen in the given wastewater sample.
5.	Determination of strength and amount of acid in a given solution using pH meter.
6.	Determination of strength and amount of mixture of acids present in the given solution using Conductivity meter.
7.	Determination of COD in the given water sample.
8.	Determination of concentration of Nickel by Spectrophotometric method.
9.	Performing Permanganometric titration for the determination of corrosion rate of iron in acidic medium.
10.	Estimation of sulphur present in the given fuel using electro-analytical techniques.
11.	Construction and working of Zinc -Copper Electrochemical Cell (Demonstration).
12.	Report preparation -based on the data received from the analysed water quality parameters (Demonstration).

REFERENCES/ MANUAL /SOFTWARE:

1.	Palanisamy P.N., Manikandan P., Geetha A. and Manjula Rani K., "Chemistry Laboratory Manual", 1st Edition, Rajaganapathy Publishers, Erode, 2024.
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COURSE OUTCOMES:

On completion of the course, the students will be able to

**BT Mapped
(Highest Level)**

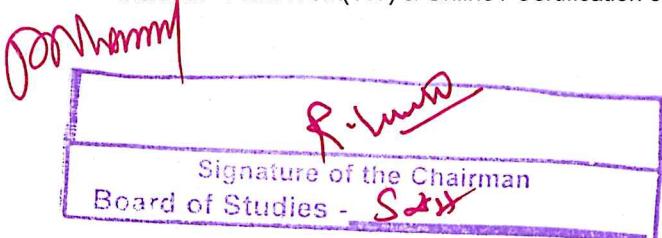
CO1	determine the amount of water quality parameters like, hardness, alkalinity, DO, COD present in the given solution.	Analyzing (K4), Precision (S3)
CO2	estimate the concentration of Nickel by spectrophotometer and sulphur by electro analytical method.	Analyzing (K4), Precision (S3)
CO3	estimate the strength and amount of acids using conductivity meter and pH meter, iron and chromium using permanganometric method.	Analyzing (K4), Precision (S3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	3	2		2	1						
CO2	2	2	3	2		2	1						
CO3	2	2	3	2		2	1						

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

*includes Term Work(TW) & Online / Certification course hours



24GCL12 - FOUNDATION LABORATORY – ELECTRICAL, IOT AND WEB TECHNOLOGIES																						
(Common to all BE/BTech branches)																						
Programme & Branch		All BE/BTech Branches			Sem.	Category	L	T	P	SL*	Total	Credit										
Prerequisites		Nil			1/2	ES	0	0	90	0	90	3										
Preamble		This course is designed to provide a foundational knowledge on engineering with hands-on experience on the house wiring, Internet of Things and Web Technologies.																				
LIST OF EXPERIMENTS / EXERCISES:																						
PART A – Electrical Installation (30 Hours)																						
1.	Determination of load currents and select suitable components for Protection																					
2.	Develop a wiring circuit for incandescent lamp and fluorescent lamp using Simple and Staircase Wiring																					
3.	Develop and Investigate wiring circuits for Calling Bell System and Dimmable Light																					
4.	Create wiring circuit for single phase motor																					
5.	Development of IOT based energy monitoring and control																					
6.	Measurement and analysis of electrical parameters for Photovoltaic Solar Panel																					
PART B – Internet of Things (30 Hours)																						
1.	Design a Single layer PCB layout designing																					
2.	Fabricate Single layer PCB printing																					
3.	Assembling, soldering and desoldering practice on single layer PCB																					
4.	Sensor and actuator interfacing with internet enabled microcontroller																					
5.	Sensor and actuator calibration																					
6.	Integration of microcontroller based system with Cloud platform																					
PART C – Web Technologies (30 Hours)																						
1.	Design a simple web page using basic HTML tags and CSS properties																					
2.	Design a responsive webpage using Bootstrap framework																					
3.	Design a webpage for signup and login validation form using Javascript and PHP																					
4.	Create a database connectivity using PHP, MySQL and host the website in the server.																					
REFERENCES/ MANUAL /SOFTWARE:																						
1.	Laboratory Manual																					
2.	Eric T.Freeman,Elisabeth Robson, "Head First JavaScript Programming A Brain-Friendly Guide", 1st Edition, O'Reilly , 2014.																					
3.	Eric T.Freeman,Elisabeth Robson, "Head First HTML and CSS",2nd Edition, O'Reilly , 2012																					
4.	Lynn Beighley,"Head First SQL",1st Edition, O'Reilly,2007.																					
COURSE OUTCOMES:																						
On completion of the course, the students will be able to																						
CO1	Design electrical wiring circuits for buildings based on their requirement										BT Mapped (Highest Level)											
CO2	Develop IoT based solutions and PCB for real world use cases.										Applying(K3), Precision (S3)											
CO3	Design and host an interactive dynamic website.										Applying(K3), Precision (S3)											
Mapping of COs with POs and PSOs																						
COs/POs /PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2									
CO1	3	3	3	2	3			1	3	2	2	2										
CO2	3	3	3	2	3			1	3	2	2	2										
CO3	3	2	1	1				3	3	2	2	3										
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy																						

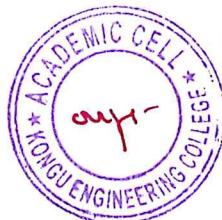
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Board of Studies - EEE



24MNT12 - QUANTITATIVE APTITUDE - I																							
(Common to all Engineering and Technology branches)																							
Programme & Branch	All B.E/B.Tech Branches			Sem.	Category	L	T	P	SL*	Total	Credit												
Prerequisites	Basic Mathematical skills			1	MC	20	0	0	10	30	0												
Preamble	To impart problem solving skills and enhance analytical skills.																						
Unit - I	Number system and Equations: 6																						
Number systems: Classification of numbers – Rules of divisibility – BODMAS Rule – HCF and LCM – Decimal fractions – Simplification – Problems.																							
Equations: Solving equations with one variable – Solving simultaneous linear equations with two variables – Applications of simultaneous linear equations – Problems on ages – Simple problems.																							
Unit - II	Ratio, Proportion and Percentage: 6																						
Ratio and Proportion: Third, Fourth and mean proportional – Comparison of ratios – Compound ratio – Duplicate ratio – Sub duplicate ratio – Triplicate ratio – Sub triplicate ratio – Chain rule – Simple problems.																							
Percentages: Basic Concepts – Problems on percentages – Problems on population – Problems on depreciation.																							
Unit - III	Profit and Loss, Interest: 8																						
Profit and Loss: Basic concepts – Cost price – Selling price – Profit and Loss – Simple problems.																							
Simple and Compound interest: Concepts – Percentage of interest – Difference between simple interest and compound interest – Simple problems.																							
TEXT BOOK:																							
1.	Dr R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S.Chand and company limited, 2022.																						
REFERENCES/ MANUAL / SOFTWARE:																							
1.	Abhijit Guha,"Quantitative Aptitude for Competitive Examination", 7 th Edition, McGraw Hill Education, India, 2020.																						
2.	https://www.indiabix.com/aptitude/questions-and-answers																						
3.	https://www.geeksforgeeks.org/aptitude-questions-and-answers																						
COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)												
CO1	Solve equations with one and two variables.										Applying (K3)												
CO2	Solve ratio, proportion and percentage problems.										Applying (K3)												
CO3	Solve profit and loss, simple interest and compound interest problems.										Applying (K3)												
Mapping of COs with POs and PSOs																							
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2										
CO1	2	2																					
CO2	2	2																					
CO3	3	3																					
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy																							
ASSESSMENT PATTERN - THEORY																							
Test / Bloom's Category*	Remembering (K1) %		Understanding (K2) %		Applying (K3) %		Analyzing (K4) %		Evaluating (K5) %		Creating (K6) %		Total %										
CAT1			30		70								100										
CAT2			30		70								100										
CAT3			30		70								100										
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)																							
*includes Term Work (TW) & Online / Certification course hours																							

R.W

Signature of the Chairman
Board of Studies - S4H



24EGT21 - ENGLISH FOR EFFECTIVE COMMUNICATION - II																		
(Common to all Engineering and Technology branches)																		
Programme & Branch	All B.E/B.Tech Branches	Sem	Category	L	T	P	SL*	Total	Credit									
Prerequisites	Nil	2	HS	45	0	0	45	90	3									
Preamble	This course aims at up skilling the learners to listen, speak, read, and write as well as to facilitate the students in practicing the language skills to acquire verbal and communicative proficiency in professional and academic contexts.																	
sUnit – I	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing								9									
Grammar: Simple, Compound, and Complex Sentences – Verbal Aptitude: Odd Words – Paired words – Listening: Listening to a Match Commentary and Filling in a Table – Listening to TED talks - Speaking: Apologizing – Talking about Manners and Etiquette – Reading: Scanning a Text, Power Point Presentations – The Best Way to Start a New Habit : An Excerpt from <i>Atomic Habits</i> Writing: Business Letters: Enquiry and Complaint																		
Unit – II	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing								9									
Grammar: Direct and Indirect Speech – Verbal Aptitude: Words often Confused – Verbal Analogy – Listening: Listening to a Lecture and Sorting Information – Career Related Conversation – Speaking: Group Discussion – Speaking about Career Choices and Professional Skills – Reading: Reading for Local and Global Comprehension – How to Find and Fix the Causes of Your Bad Habits: An Excerpt from <i>Atomic Habits</i> - Writing: Job Application: Cover Letter and Resume – Student Portfolio																		
Unit – III	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing								9									
Grammar: Active and Passive Voice – Verbal Aptitude: Error Spotting – Sentence Improvement – Abbreviations and Acronyms – Listening: Listening to Podcast Interviews and News/Motivational Speeches – Speaking: Presenting a Point of View – Giving Opinions about Podcast – Reading: Reading a Procedure – Cross Cultural Communication - How to Make Good Habits Inevitable and Bad Habits Impossible: An Excerpt from <i>Atomic Habits</i> – Writing: Types of Essays: Argumentative and Opinion based Essays																		
Unit – IV	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing								9									
Grammar: If/Conditional Clause – Modals Verbs – Conversational Devices - Verbal Aptitude: Sentence Correction – Sentence Selection – Listening: Listening and Filling a Mind Map – Listening to Interviews, Celebrity talks – Speaking: Giving Advice and Suggestions – Interviewing Classmates - Reading: Reading for Information, Researching for Supporting Evidence – Technical Communication: Modes of Technology-based Communication – How to Stick with Good Habits Every Day : An Excerpt from <i>Atomic Habits</i> Writing: Dialogue Writing – Writing Reviews: Product and Documentary films/Web Series																		
Unit – V	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing								9									
Grammar: Common Errors in Tenses – Verb - Preposition combinations – Verbal Aptitude: Coding and Decoding – Listening: Listening for key points – Speeches of New Inventions – Speaking: Asking for and Giving Permission – Talking about Gadgets, Inventions and Technology – Reading: Categorizing Information – Technical Communication: Effective use of Technology-based Communication – The Goldilocks Rule: How to Stay Motivated in Life and Work: An Excerpt from <i>Atomic Habits</i> – Writing: Report Writing: IV Report and Case Study Report																		
TEXT BOOK:																		
1.	Sudharshana N P and Savitha C, <i>English for Technical Communication</i> , 2 nd Edition, Cambridge University Press, New Delhi, 2016.																	
REFERENCES:																		
1.	Ashraf Rizvi. Effective Technical Communication, 2 nd Edition, McGraw-Hill India, 2017.																	
2.	S. P. Dhanavel. English and Communication Skills for Students of Science and Engineering, Orient Black Swan Publishers, Hyderabad, 2009.																	
3.	James Clear. <i>Atomic Habits</i> By James Clear. Dharman, 2023.																	

* includes Term Work (TW) & Assignments, Tutorials and Case Studies

COURSE OUTCOMES:											BT Mapped (Highest Level)	
On completion of the course, the students will be able to												
CO1	construct contextual and functional grammar to enhance the linguistic competence											Applying (K3)
CO2	listen, comprehend and infer implied meanings of the given text											Applying (K3)
CO3	speak clearly to develop competence to participate in oral discourses such as discussions / meetings / interviews and deliver presentations											Creating (K6)
CO4	critically read various texts by understanding contextual meanings and respond appropriately											Understanding (K2)
CO5	Analyze different genres of writing and making precise non-technical and technical documents											Analyzing (K4)

Mapping of COs with POs and PSOs

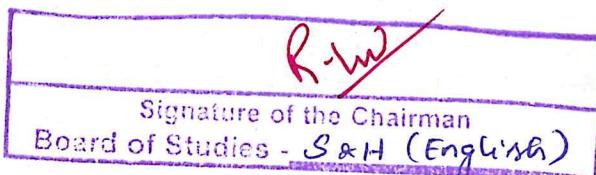
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						1		1	3	1	1		
CO2								2	3		1		
CO3								2	3	1	2		
CO4						1			3	1	2		
CO5									3		2		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understand ing (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	30	70	-	-	-	100
CAT2	-	30	35	-	-	35	100
CAT3	-	20	45	35	-	-	100
ESE	-	20	55	10	-	15	100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)



J. Rajai



24MAC21 - MULTIVARIABLE CALCULUS AND COMPLEX ANALYSIS									
(Common to CIVIL, MECH, MTS, ECE, EEE, EIE & FT branches)									
Programme & Branch	B.E – CIVIL, MECH, MTS, ECE, EEE, EIE & B.Tech - FT	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	2	BS	45	7	16	52	120	4
Preamble	To impart the knowledge of partial derivatives, evaluation of real and complex integrals, vector calculus and analytic functions to the students for solving the problems related to various engineering disciplines.								
Unit – I	Functions of Several Variables: Functions of two or more variables – Partial derivatives – Total differential – Applications: Maxima and minima – Constrained maxima and minima – Lagrange's multiplier method.								
Unit – II	Multiple Integrals: Double integration in cartesian coordinates – Change of order of integration – Application: Area between two curves – Triple integration in cartesian coordinates – Volume as triple integrals.								
Unit – III	Vector Calculus: Directional derivative – Gradient of a scalar point function – Divergence of a vector point function – Curl of a vector – Solenoidal and Irrotational vectors – Vector Integration: Introduction – Green's and Gauss divergence theorems (without proof) – Verification of the above theorems and evaluation of integrals using them.								
Unit – IV	Analytic Functions: Functions of a complex variable – Analytic functions – Necessary and sufficient conditions (excluding proof) – Cauchy–Riemann equations (Statement only) – Properties of analytic function (Statement only) – Harmonic function – Construction of analytic function – Conformal mapping: $w = z + a, az, 1/z$ – Bilinear transformation.								
Unit – V	Complex Integration: Introduction – Cauchy's theorem (without proof) – Cauchy's integral formula – Singularities – Classification – Cauchy's residue theorem (without proof) – Applications: Evaluation of definite integrals involving sine and cosine functions over the circular contour.								
LIST OF EXPERIMENTS / EXERCISES:									
1.	Finding ordinary and partial derivatives								
2.	Computing extreme values of function of two variables								
3.	Evaluating double and triple integrals								
4.	Finding the area between two curves								
5.	Computing gradient, divergence and curl of point functions								
6.	Applying Milne-Thomson method for constructing analytic function								
7.	Determination of Möbius transformation for the given set of points								
8.	Finding poles and residues of an analytic function								
TEXT BOOK:									
1.	Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics For First Year B.E/B.Tech", Reprint Edition 2016, S.Chand and Co., New Delhi.								
REFERENCES/ MANUAL / SOFTWARE:									
1.	Kreyszig E, "Advanced Engineering Mathematics ", 10 th Edition, John Wiley, New Delhi, India, 2016.								
2.	Ramana B V, "Higher Engineering Mathematics", 1 st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.								
3.	Duraisamy C., Vengatasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - II", 2 nd Edition, Pearson India Education, New Delhi, 2018.								
4.	Grewal B.S, "Higher Engineering Mathematics" 44th Edition, Khanna Publishers, New Delhi, 2018.								
5.	Multivariable Calculus and Complex Analysis Laboratory Manual.								

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES:										BT Mapped (Highest Level)
On completion of the course, the students will be able to										
CO1	Compute the total derivatives and extreme values of multivariable functions.									
CO2	Apply multiple integrals to compute the area and volume of the regions.									
CO3	Apply the concepts of derivatives and line integrals of point functions in engineering problems.									
CO4	Construct analytic functions and bilinear transformations and determine the image of given region under the given conformal mapping.									
CO5	Apply the techniques of complex integration to evaluate real and complex integrals over closed curves.									

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2		3								
CO2	3	3	2		3								
CO3	3	3			3								
CO4	3	3			3								
CO5	3	3	3		3								

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		40	60				100
CAT3		50	50				100
ESE		30	70				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

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	<i>R. M</i>
	Signature of the Chairman B.Tech. of Studies - <i>S A H</i>



24PHT21 – APPLIED PHYSICS																				
(Common to CIVIL, MECH, MTS and AUTO branches)																				
Programme& Branch	BE - CIVIL, MECH, MTS and AUTO branches	Sem.	Category	L	T	P	SL*	Total	Credit											
Prerequisites	Nil	2	BS	45	0	0	45	90	3											
Preamble	This course aims to impart the knowledge on crystal physics, quantum physics, acoustics, ultrasonics, laser, fiber optics and select materials characterization techniques. It also describes the applications of aforementioned topics in engineering.																			
Unit – I	Crystal Physics:																			
Classification of solids – Space lattice – Unit cell – Crystal structure – Bravais lattice – Single and polycrystalline materials – Lattice planes – Miller indices – Interplanar spacing in cubic crystal – Number of atoms per unit cell – Atomic radius – Coordination number – Atomic packing factor – Body centered cubic– Face centered cubic – Hexagonal close packed crystal structure – Crystal imperfections: line, surface and volume imperfections.																				
Unit – II	Quantum Physics and Applications:																			
Blackbody radiation – Planck's theory – Compton scattering – Matter waves – Properties – Heisenberg uncertainty principle – Schrodinger's time-independent and time-dependent wave equations – Physical significance of wave function – Particle in a one-dimensional box.																				
Unit – III	Acoustics and Ultrasonics:																			
Classification of sound – Characteristics of sound – Reverberation and reverberation time – Growth and decay of sound – Sabine's formula for reverberation time – Determination of sound absorption coefficient – Factors affecting acoustics of buildings and their remedies – Ultrasonics – Properties of ultrasonic waves – Generation of ultrasonic waves – Magnetostrictive generator and Piezoelectric generator – Non-destructive testing – Flaw detection.																				
Unit – IV	Laser and Fiber optics:																			
Stimulated absorption – Spontaneous emission – Stimulated emission – Einstein's coefficients and their relations – Population inversion – Pumping – CO ₂ laser – Holography – Fiber optics – Numerical aperture and acceptance angle – Classification of optical fibers based on refractive index, modes and materials – Fiber optic communication system – Temperature and displacement sensors.																				
Unit – V	Characterization Techniques and Advanced Materials:																			
Importance of materials characterization – X-ray diffraction (powder method) – Scanning electron microscope – Transmission electron microscope – UV-visible spectroscopy – Raman spectroscopy – Nuclear Magnetic Resonance – Role of physics in advanced materials – Metallic glasses – Shape memory alloys .																				
TEXT BOOK:																				
1.	Katiyar A.K, Pandey C.K, "Engineering Physics: Theory and Practical", 2 nd edition, Wiley, 2015 (Unit I, II).																			
2.	Tamilarasan K and Prabu K, "Physics for Engineering I", 1 st Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2023(Unit III, IV, V).																			
REFERENCES:																				
1.	Malik H.K and Singh A.K, "Engineering Physics", 2 nd Edition McGraw-Hill Education, New Delhi, 2022.																			
2.	Euth Ortiz Ortega, HamedHosseini, Ingrid Berenice Aguilar Meza, Maria Jose Rosales Lopez, Andrea Rodriguez Vera, Samira Hosseini, "Material Characterization Techniques and Applications", Springer 2022.																			

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES:											BT Mapped (Highest Level)
On completion of the course, the students will be able to											
CO1	analyze seven crystal systems, interplanar spacing in cubic lattice, BCC, FCC, HCP crystal systems and the types of crystal imperfections and their impacts.										
CO2	investigate the concepts of quantum mechanics to describe Planck's theory, Compton effect and the behavior of electrons in a metal by solving Schrodinger's wave equations.										
CO3	explore the concepts of growth and decay of sound energy in a hall to compute Sabine's formula and to recognize the requirements of acoustically good buildings and also to describe the production of ultrasonic waves and testing of materials by non-destructive method.										
CO4	examine the concepts of stimulated emission of radiation to explain the working and the applications of laser in engineering and technology. To apply the principle of propagation of light through optical fiber to compute acceptance angle and numerical aperture and also to explain fiber optic communication system and the working of fiber optic sensors.										
CO5	Inspect Raman effect, X-ray diffraction, matter waves, nuclear magnetic resonance, metallic glasses and shape memory alloys.										

Mapping of COs with POs and PSOs

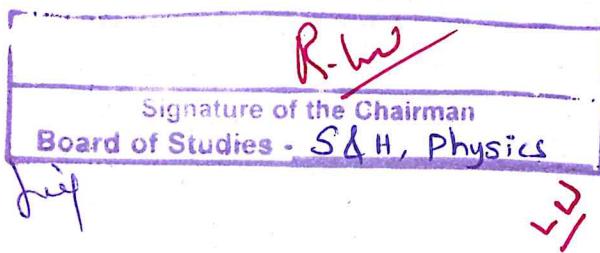
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2					1	1		1		
CO2	3	2	2					1	1		1		
CO3	3	2	2					1	1		1		
CO4	3	2	2					1	1		1		
CO5	3	2	2					1	1		1		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	50	10			100
CAT2		40	50	10			100
CAT3		40	50	10			100
ESE		40	50	10			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)



24ITC23 - PYTHON PROGRAMMING (Common to Civil, Mechanical, Mechatronics, Chemical, Food Technology & Automobile Engineering branches)									
Programme & Branch	B. E Civil , Mechanical, Automobile B.Tech Chemical Engineering ,Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Programming in C	2	ES	45	0	30	45	120	4
Preamble	This course deals with core python programming. It gives a comprehensive introduction to problem solving using python constructs and libraries.								
Unit -I	Introduction:								
	Problem solving strategies – program design tools – Types of errors – Testing and Debugging- Basics: Literals – variables and identifiers – data types – input operation – comments – reserved words – indentation – Operators and Expressions – Decision Control Statements: Introduction – conditional statement – iterative statements – Nested Loops – break, continue and pass statements– elsein loops.								
Unit -II	Lists, Tuples and Dictionary:								
	Lists: Access, update, nested, cloning, operations, methods , comprehensions, looping – Tuple: Create, utility, access, update, delete, operations, assignments, returning multiple values, nested tuples, index and count method – Dictionary: Create, access, add and modify, delete, sort, looping, nested, built-in methods – list vs tuple vs dictionary.								
Unit -III	Strings and Regular Expressions:								
	Strings: Concatenation , append, multiply on strings – Immutable – formatting operator – Built-in string methods and functions – slice operation – functions – operators – comparing – iterating – string module – Regular Expressions – match, search, sub, findall and finditer functions – flag options.								
Unit -IV	Functions and Modules:								
	Functions: Introduction – definition – call – variable scope and lifetime – return statement – function arguments – lambda function – documentation strings – programming practices recursive function- Modules: Modules – packages – standard library methods – function redefinition.								
Unit -V	Object Orientation:								
	Class and Objects: Class and objects–class methods and self–constructor–class and object variables–destructor–public and private data member. NumPy : NumPy Arrays – Computation on NumPy Arrays. Matplotlib : Line plots – Scatter Plots								
LIST OF EXPERIMENTS / EXERCISES:									
1.	Programs using conditional and looping statements								
2.	Implementation of list and tuple operations								
3.	Implementation of dictionary operations								
4.	Perform various string operations								
5.	Use regular expressions for validating inputs								
6.	Demonstration of different types of functions and parameter passing								
7.	Develop programs using classes and objects								
8.	Perform computation on Numpy arrays								
9.	Draw different types of plots using Matplotlib								
TEXT BOOK:									
1.	Reema Thareja., "Python Programming using problem solving approach", 3 rd impression, Oxford University Press., New Delhi, 2017.								
REFERENCES:									
1.	Nageswara Rao, "Core Python Programming", 2 nd Edition, DreamTech Press, New Delhi, 2018.								
2.	Jake Vander Plas, " Python Data Science Handbook Essential Tools for Working with Data", O'Reilly Publishers, 1 st Edition, 2016.								

*includes Term Work(TW) & Online / Certification course hours

COURSE OUTCOMES:											BT Mapped (Highest Level)
On completion of the course, the students will be able to											
CO1	use basic python constructs to build simple programs										
CO2	apply list, tuple and dictionary to handle variety of data.										
CO3	apply strings and regular expression for searching and retrieval										
CO4	solve the problems using functions and modules.										
CO5	apply object oriented concepts and perform data science operations using python										

Mapping of COs with POs and PSOs

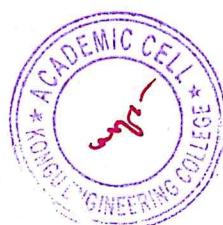
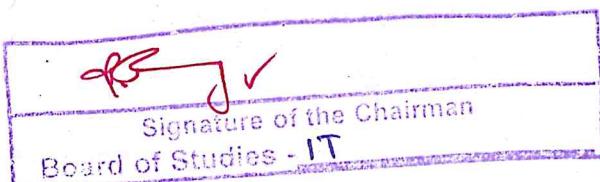
COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2	1				1	1	1	3	1
CO2	3	2	2	2	1				1	1	1	3	1
CO3	3	2	2	2	1				1	1	1	3	1
CO4	3	2	2	2	1				1	1	1	3	1
CO5	3	2	2	2	1				1	1	1	3	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		25	75				100
CAT2		25	75				100
CAT3		25	75				100
ESE		25	75				100

*±3% may be varied (CAT 1,2,3–50marks & ESE–100marks)



24AUT21 – STATICS AND DYNAMICS

Programme & Branch	B.E – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit									
Prerequisites	Nil	2	ES	45	0	0	45	90	3									
Preamble	This course provides knowledge to represent engineering system as a force system and solve the system for equilibrium under static and dynamic conditions																	
Unit – I	Statics of Particles:																	
Introduction and laws of mechanics - System of forces - Principle of transmissibility - parallelogram and triangular law of forces - Resultant of forces in plane and space - Equilibrium of a particle in plane and space. Applications - Lifting a load by crane, towing a vehicle and resultant force acting on various automotive components.																		
Unit – II	Statics of Rigid Bodies:																	
Moment and couple - Vectorial representation of moment and couple – Varignon's theorem - Types of supports and their reactions - Resultant moment and couple in plane and space - Equilibrium of rigid bodies in plane and space. Applications - Moment about hinges in doors and bonnet - Moment about fixed joint in foot rest - Overturning of crane while lifting large loads - Better position to hold a spanner.																		
Unit – III	Friction:																	
Introduction and laws of dry friction - Coefficient of friction - Angle of friction and repose - Sliding friction - Ladder friction - Wedge friction - Belt friction - Wheel friction and rolling resistance. Applications - Coefficient of friction required to move a vehicle - Horizontal force required to overcome rolling resistance of a vehicle - Maximum load a vehicle can pull.																		
Unit – IV	Properties of Surfaces and Solids:																	
First moment of area and centroid of sections - Moment of inertia of plane areas - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia and product of inertia - Principal moments of inertia of plane areas.																		
Unit – V	Dynamics of Particles and Rigid Body:																	
Equations of motion - Rectilinear motion of particles - Curvilinear motion - Projectile motion. Principle of work and energy of particles and rigid body - Impulse - Momentum equations of particles and rigid body - Impact of elastic bodies. Applications - Linear and angular velocity of a vehicle, acceleration and deceleration of a vehicle, force transmitted due to vehicle impact and force exerted by driver on seat belt.																		
TEXT BOOK:																		
1.	P Beer Ferdinand , Jr Russel Johnston , David F. Mazure, Philip J. Cornwell & Sanjeev Sanghi., "Vector Mechanics for Engineers: Statics and Dynamics", 12th Edition, McGraw Hill Education, New Delhi, 2019.																	
REFERENCES:																		
1.	N.H Dubey , "Engineering Mechanics: Statics and Dynamics", 1st Edition, McGraw Hill Education, New Delhi, 2016.																	
2.	R.C. Hibbeler, "Engineering Mechanics", 14th Edition, Pearson Education, United Kingdom, 2017.																	

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)	
CO1	represent the forces in vector components (both 2D and 3D) and apply equilibrium conditions to find the unknown force in automotive systems.										Applying (K3)
CO2	calculate the moment produced by various force systems and solve rigid body problems by applying equilibrium conditions for designing automotive systems.										Applying (K3)
CO3	apply the laws of dry friction to calculate frictional force and torque in various automotive systems to analyze a vehicle.										Applying (K3)
CO4	calculate the centroid and area moment of inertia for designing automotive chassis frame.										Applying (K3)
CO5	analyze the motion of particles and rigid bodies using various principles.										Analyzing (K4)

Mapping of COs with POs and PSOs

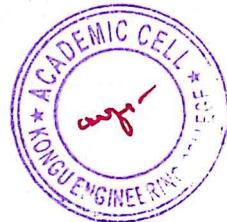
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	2	2	1	1	1	1	3	
CO2	3	3	2	2	2	2	2	1	1	1	1	3	
CO3	3	3	2	2	2	2	2	1	1	1	1	3	
CO4	3	3	2	2	2	2	2	1	1	1	1	3	
CO5	3	3	2	2	2	2	2	1	1	1	1	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		30	70				100
CAT2		30	70				100
CAT3		30	55	15			100
ESE		20	60	20			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)



J. G. L.

MFC

24TAM02 - TAMILS AND TECHNOLOGY

(Common to All Engineering and Technology Branches)

Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	SL*	TOT	Credit									
Prerequisites	Nil	2	HS	15	0	0	15	30	1									
Preamble	This course aims to impart the essential knowledge on the tamil culture and related technology																	
UNIT – I	WEAVING AND CERAMIC TECHNOLOGY																	
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.									3									
UNIT – II	DESIGN AND CONSTRUCTION TECHNOLOGY																	
Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) – Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.																		
UNIT – III	MANUFACTURING TECHNOLOGY																	
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																	
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.																		
UNIT – V	SCIENTIFIC TAMIL & TAMIL COMPUTING																	
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.																		
TEXT BOOK:																		
1.	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)																	
2.	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).																	
REFERENCES:																		
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்), உலகத் தமிழராய்ச்சி நிறுவனம், சென்னை, 2002																	
2.	கணினித்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசரம், 2016																	
3.	சீழை வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)																	
4.	பொருநை ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)																	
5.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)																	
6.	The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Published by International Institute of Tamil Studies).																	
7.	Keeladi – 'Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)																	
8.	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by : The Author)																	
9.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)																	
10.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.																	

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1 explain weaving and ceramic technology in tamil culture and tamil society.											Understanding (K2)	
CO2 Illustrate about the design and construction technology.											Understanding (K2)	
CO3 summarize about the manufacturing technology.											Understanding (K2)	
CO4 explain the agriculture and irrigation technology.											Understanding (K2)	
CO5 explain the significance of tamil in scientific and computing.											Understanding (K2)	

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						3		3	2	2			
CO2						3		3	2	2			
CO3						3		3	2	2			
CO4						3		3	2	2			
CO5						3		3	2	2			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

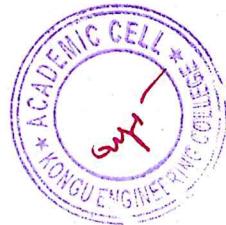
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE	NA						

* ±3% may be varied (CAT 1,2,3 – 50 marks)

R-W
Signature of the Chairman
Board of Studies - S & H (Physics)

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Programme & Branch	All BE/BTech Branches	Sem.	Category	L	T	P	SL*	TOT	Credit
Prerequisites	Nil	2	HS	15	0	0	15	30	1
முன்னுரை	தமிழ் கலாச்சாரத்தோடு ஒன்றிய தொழில் நுட்பங்களைப் பற்றிப் படுத்துவதற்காக								
அலகு - I	நெசவு மற்றும் பானை தொழில்நுட்பம்								3
சங்க காலத்தில் நெசவு தொழில் - பானைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் - பாண்டகளில் கீறல் குறியீடுகள்									
அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்								3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச்சிற்பங்களும், கோவில்களும் - சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரிகட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டில் காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடத்தைக் கலை.									
அலகு - III	உற்பத்தித் தொழில்நுட்பம்								3
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் - கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.									
அலகு - IV	வேளாண்மை மற்றும் நிர்ப்பாசனத் தொழில்நுட்பம்								3
அணை, ஏரி, குளங்கள், மதகு - சோழர்கால குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.									
அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்								3
அறிவியல் தமிழின் வளர்ச்சி - கணினித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்.									

TEXT BOOK:

- தமிழக வரலாறு - மக்களும் பண்பாடும் - கே கே பிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்), உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, 2002
- கணினித்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2016

REFERENCES:

- கீழடிவைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
- பொருநை-ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
- Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
- Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
- Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
- The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Published by International Institute of Tamil Studies).
- Keeladi – Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
- Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)
- Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES:			BT Mapped (Highest Level)
படிப்பை முடித்தவுடன், மாணவர்கள்			
CO1	தமிழ் கலாச்சாரம் மற்றும் தமிழ் சமூகத்தினுடைய நெசவு மற்றும் பானை தொழில்நுட்பம் பற்றி விளக்க முடியும்.		Understanding (K2)
CO2	தமிழர்களின் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்ப ஆற்றல் பற்றி விளக்க முடியும்.		Understanding (K2)
CO3	தமிழர்களின் உற்பத்தித் தொழில்நுட்பம் பற்றி சுருக்கமாகக் கூற முடியும்.		Understanding (K2)
CO4	தமிழர்களின் வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம் பற்றி விளக்க முடியும்.		Understanding (K2)
CO5	தமிழர்களின் அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் பற்றி விளக்க முடியும்.		Understanding (K2)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						3		3	2	2			
CO2						3		3	2	2			
CO3						3		3	2	2			
CO4						3		3	2	2			
CO5						3		3	2	2			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	40	60					100
CAT2	40	60					100
CAT3	40	60					100
ESE	NA						

* ±3% may be varied (CAT 1,2,3 – 50 marks)

<i>R-W</i>
Signature of the Chairman
Board of Studies - <i>S & H (Physics)</i>



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24PHL21 - APPLIED PHYSICS LABORATORY																						
(Common to CIVIL, MECH, MTS and AUTO branches)																						
Programme& Branch	BE - CIVIL, MECH, MTS and AUTO branches				Sem.	Category	L	T	P	SL*	TOT	Credit										
Prerequisites	Nil				2	BS	0	0	30	0	30	1										
Preamble	This course aims to impart hands on training in the determination of the physical parameters such as Young's modulus, thermal conductivity, AC frequency, compressibility of a liquid, wavelength of laser, particle size, acceptance angle and numerical aperture of an optical fiber, specific resistance, band gap, thickness of a thin film and also to impart skills on writing coding / developing project / product related to societal requirement.																					
LIST OF EXPERIMENTS / EXERCISES:																						
1.	Determination of the Young's modulus of the material of a given beam using uniform bending method.																					
2.	Determination of the thermal conductivity of a bad conductor using Lee's disc.																					
3.	Determination of the frequency of alternating current using electrically vibrating tuning fork (Meldé's apparatus).																					
4.	Determination of the wavelength of the given semiconductor laser.																					
5.	Determination of the particle size of the given powder using laser.																					
6.	Determination the acceptance angle and numerical aperture of the given optical fiber.																					
7.	Determination of the specific resistance of the given metallic wire using Carey Foster's bridge.																					
8.	Determination of the band gap of a given semiconducting material using post-office box.																					
9.	Determination of the thickness of a thin film using air-wedge arrangement.																					
10.	Writing coding for any one of the above experiments / developing a project / a product.																					
REFERENCES/ MANUAL /SOFTWARE:																						
1.	Laboratory Manual																					
COURSE OUTCOMES:																						
On completion of the course, the students will be able to																						
CO1	determine the Young's modulus of a material, the thermal conductivity of a bad conductor and the frequency of an alternating current.										Analyzing (K4), Precision (S3)											
CO2	determine the wavelength of a semiconductor laser, the particle size of a powder material, and the acceptance angle and numerical aperture of an optical fiber.										Analyzing (K4), Precision (S3)											
CO3	determine the specific resistance of a metallic wire, the band gap of semiconducting materials, the thickness of a thin film and develop a coding / project / product.										Analyzing (K4), Precision (S3)											
Mapping of COs with POs and PSOs																						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2									
CO1	3	2	2	3				3	1		2											
CO2	3	2	2	3				3	1		2											
CO3	3	2	2	3				3	1		2											

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

*includes Term Work (TW) & Online / Certification course hours

<i>R-hm</i>
Signature of the Chairman Board of Studies - S&H, (Physics)

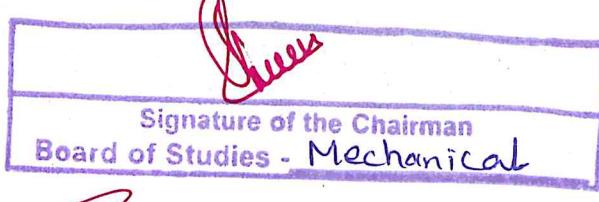
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24GCL11 – FOUNDATION LABORATORY - MANUFACTURING, DESIGN AND ROBOTICS (Common to all BE/BTech branches)													
Programme & Branch		All BE/BTech Branches			Sem.	Category	L	T	P	SL*	Total	Credit	
Prerequisites		Nil			1/2	ES	0	0	90	0	90	3	
Preamble		This course provides the hands-on experience to develop a prototype model with the basic knowledge of Computer-aided Design, Manufacturing Processes, 3D Printing Technology, Robotics and Embedded Control.											
LIST OF EXPERIMENTS / EXERCISES:													
PART A – Manufacturing Laboratory (30 Hours)													
1	Selection of product, free hand sketching and detailing												
2	Construction of model using Arc/TIG/MIG/Gas/Spot welding operations												
3	Enhancing the model with sheet metal												
4	Creating the parts of the model using lathe												
5	Creating the parts of the model using milling and drilling machines												
PART B – Product Design and Development Laboratory (30 Hours)													
1	Free hand sketching and detailing of the component												
2	3D part modelling of the component using CAD software												
3	Engineering Analysis of the component model												
4	Generate the component using 3D printer												
PART C – Robotics Laboratory (30 Hours)													
1	Design of electronic circuit and its debugging												
2	Assembly and interfacing of sensors, actuators and wireless communion modules with audrino UNO												
3	Development of embedded programming and interfacing for motion control and obstacle avoidance												
4	Demonstration and testing of robot in static environment												
REFERENCES/ MANUAL /SOFTWARE:													
1	Foundation Engineering Laboratory Manual												
2	SOLID WORKS 2022 Software												
COURSE OUTCOMES: On completion of the course, the students will be able to													
CO1	develop the prototype model using mechanical operations like welding, forming and machining processes												
CO2	sketch 3D model and develop the prototype using 3D printer												
CO3	design and develop the autonomous robot for real-time applications												
Mapping of COs with POs and PSOs													
COs/POs /PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2				3	2		2		
CO2	3	3	3	3				3	2		2		
CO3	3	3	3	2				3	2		2		

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy



24MNT21 - QUANTITATIVE APTITUDE - II																								
(Common to all Engineering and Technology branches)																								
Programme & Branch		All B.E/B.Tech Branches			Sem.	Category	L	T	P	SL*	Total	Credit												
Prerequisites	Basic Mathematical skills			2	MC	20	0	0	10	30	0													
Preamble	To impart problem solving skills and enhance analytical skills.																							
Unit – I	Averages, Alligations, Time and Work:																							
Averages, Alligations or Mixtures: Concepts – Definition – Formula – Simple problems on averages – Alligation or Mixture rule – Applications – Problems.																								
Time and Work: Concepts – Work and wages – Pipes and Cisterns – Simple problems.																								
Unit – II	Time and Distance:																							
Time and Distance: Time, speed and distance – Conversions – Average speed – Relative speed – Problems on boats and streams – Upstream and downstream – Simple problems.																								
Unit – III	Permutation and Combination, Probability:																							
Permutation and Combination: Concepts – Simple problems.																								
Probability: Basic Concepts – Applications – Simple problems.																								
TEXT BOOK:																								
1.	Dr.R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S.Chand and company limited, 2022.																							
REFERENCES/ MANUAL / SOFTWARE:																								
1.	Abhijit Guha,"Quantitative Aptitude for Competitive Examination", 7 th Edition, McGraw Hill Education, India, 2020.																							
2.	https://www.indiabix.com/aptitude/questions-and-answers																							
3.	https://www.geeksforgeeks.org/aptitude-questions-and-answers																							
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)														
CO1	Solve averages, alligations or mixtures, time and work problems.										Applying (K3)													
CO2	Solve the problems on time and distance, upstream and downstream oriented applications problems.										Applying (K3)													
CO3	Solve problems involving permutation, combination and probability concepts.										Applying (K3)													
Mapping of COs with POs and PSOs																								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2											
CO1	2	2																						
CO2	2	3																						
CO3	3	2																						
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy																								
ASSESSMENT PATTERN - THEORY																								
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %																	
CAT1		30	70				100																	
CAT2		30	70				100																	
CAT3		30	70				100																	
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)																								

*includes Term Work (TW) & Online / Certification course hour

 Signature of the Chairman	
Board of Studies - S4H	



COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	realize the importance of yoga in physical health.	Applying (K3)
CO2	realize the importance of yoga in mental health.	Applying (K3)
CO3	realize the role of yoga in personality development and diet.	Applying (K3)
CO4	do the loosening practices, Asanas and realize its benefits.	Applying (K3)
CO5	do the practice of Pranayama, meditation and realize its benefits	Applying (K3)

Mapping of COs with POs and PSOs

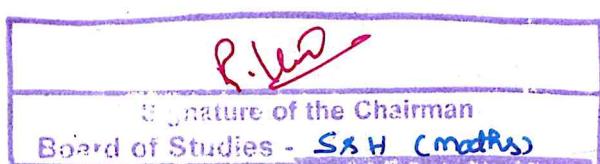
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1						3		2	1		
CO2						3		2			
CO3						3		3			
CO4						3		2	3		
CO5						3		3			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1	-	-	-	-	-	-	-
CAT2	-	-	-	-	-	-	-
CAT3	20	30	50	-	-	-	100
ESE	-	-	-	-	-	-	-

* ±3% may be varied (CAT3 – 100 marks)



24AUC31 – BASICS OF ELECTRICAL AND ELECTRONIC CIRCUITS

Programme & Branch	B.E. – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	3	PC	45	0	30	45	120	4

Preamble This course deals with the basic knowledge of automotive Electricals and Electronics components

Unit – I	DC Circuits:	9
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Active and passive devices with examples - Ohm's Law – Kirchhoff's Laws - Resistors in Series and Parallel -Network Reduction -Voltage and Current Division Rule - Mesh Analysis of Simple Resistive Networks- Star and Delta Transformation

Unit – II	AC Circuits:	9
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Alternating (Sinusoidal) Voltage and Current - R.M.S and Average Value - Power Factor - Form Factor and Peak Factor - AC Series Circuits -RL, RC & RLC

Unit – III	Semi-Conductor Devices:	9
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Conductors, Semiconductors and Insulators - PN Junction Diode - Rectifiers and Filters - Zener Diode – LDR- Transistors: Principle of Operation - Static Characteristics - CE Transistor as an Amplifier and Switch – Operational amplifier – automotive applications

Unit – IV	Binary Numbers and Minimization Techniques:	9
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Number systems - Complements - Logic Gates – Boolean algebra – De Morgan's law - Minimization of Boolean expressions - Canonical forms - Karnaugh map minimization - Implementations of logic functions using universal gates

Unit – V	Combinational and Sequential circuits:	9
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Introduction to combinational circuits - Half adder and subtractor – Full adder and subtractor – Multiplexer - demultiplexer – Parity generator and checker - Magnitude comparator - Introduction to Sequential circuits – Flip-flops – SR, JK, D, T Flip-flops

LIST OF EXPERIMENTS / EXERCISES:

1.	Design and implementation of voltage divider circuit for automotive applications
2.	Characteristics of PN junction diode
3.	Characteristics of Zener diode
4.	Characteristics of Bridge rectifier
5.	Characteristics of LDR
6.	Input and output characteristics of transistor under CE configuration
7.	Verification of Boolean theorems using digital logic gates
8.	Design and implementation of half adder and full adder using digital logic gates
9.	Design and implementation of Multiplexer and demultiplexer using digital logic gates
10.	Design and implementation of Flip-flop using digital logic gates

TEXT BOOK:

1.	Bhattacharya S.K., "Basic Electrical and Electronics Engineering", 2nd Edition, Pearson India Education Services Pvt. Ltd., India, 2017 for Units I,II,III
2.	Morris Mano M., "Digital Design", 6th Edition, Pearson Education Pvt. Ltd., New Delhi, 2018 for Units IV & V

REFERENCES:

1.	Sudhakar A. and Shyammohan S. Palli, "Circuits and Networks Analysis and Synthesis", 5th Edition, McGraw-Hill Education, New Delhi, 2017.
2.	Salivahanan S. and Sureshkumar N., "Electronic Devices and Circuits", 4th Edition, McGraw-Hill, New Delhi, 2017
3.	Floyd T L, "Digital Fundamentals", 11th Edition, Pearson Education, New Delhi, 2015.

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	calculate voltage and current measurements in DC circuits for automotive applications											Applying (K3), Precision (S3)
CO2	describe AC circuits in automotive applications											Applying (K3), Precision (S3)
CO3	explain the operation of semiconductor devices and their applications in automobiles											Understanding (K2), Precision (S3)
CO4	apply boolean law and karnaugh map techniques for gate level logic minimization.											Applying (K3), Precision (S3)
CO5	illustrate the operation of combinational and sequential logic circuits using the truth table											Applying (K3), Precision (S3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	1	1	1	1	1	1	2	1	3
CO2	3	3	2	1	1	1	1	1	1	1	2	1	3
CO3	3	3	2	1	1	1	1	1	1	1	2	1	3
CO4	3	3	2	1	1	1	1	1	1	1	2	1	3
CO5	3	3	2	1	1	1	1	1	1	1	2	1	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	60				100
CAT2		60	40				100
CAT3		50	50				100
ESE		60	40				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)



24AUC32 - HYDRAULICS AND PNEUMATICS

Programme & Branch	B.E – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	3	PC	45	0	30	45	120	4

Preamble To provide knowledge on hydraulic and pneumatic components for low cost automation in the automobile field.

Unit – I	Hydraulic Pumps:	9
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Review of Fluid mechanics - Basics of fluid power system - Advantages and applications of Fluid power systems. Hydraulic pumps: Pumping theory-Gear, Vane, Screw pump, Lobe and Piston pumps, Pump Performance, Characteristics and Selection - Sizing of pumps.

Unit – II	Hydraulic Actuators:	9
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Hydraulic cylinders: single acting and double acting cylinders, Special type cylinders: Rodless, tandem and Telescopic Cylinders- Calculation of cylinder force - Hydraulic Motors: Gear and vane motors.

Unit – III	Hydraulic Valves:	9
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Direction control valves: Three way valve, Four way valve, Check valve and shuttle valve – Actuation mechanisms in DCV –Pressure control valves: Pressure relief, Pressure Reducing, Counter balance, Sequencing and Unloading Valves –Flow control valves and its types –Proportional Valves –Servo valves: Mechanical type and Electro hydraulic servo valves.

Unit – IV	Pneumatic Components:	9
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Review of Gas laws and Compressor– Fluid conditioning Elements: Filter Regulator and Lubricator unit, Pneumatic silencers, After coolers, Air dryers – Air control valves – Fluid power actuators: Linear and Rotary actuators – types – Cushioning mechanism in cylinders – Sizing of Actuators.

Unit – V	Industrial Circuits and Maintenance:	9
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Construction of Hydraulic circuits - Counter balance circuit - Fail safe circuit - Regenerative circuit - Pressure intensifier circuits - Accumulator circuits. Construction of Pneumatic circuits: Cascade method - Sequence circuit. Electro-pneumatic circuit - Basics of Fluidics. Sealing devices: Types and materials – Safety aspects in Fluid Power System, Installation, Maintenance and troubleshooting of Fluid Power systems.

LIST OF EXPERIMENTS / EXERCISES:

1.	Design and testing of speed control circuits (Meter in, Meter out and Bleed off circuits)
2.	Design and testing of Electro-hydraulic circuit with pressure sequence valve
3.	Design and testing of Sequential circuit with pneumatic control (with and without time delay)
4.	Design and testing of Electro Pneumatic sequential circuit with limit switches
5.	Design and testing of Pneumatic circuits with logic controls – AND valve and OR valve
6.	Design and simulation of Sequential fluid power circuits using cascade method
7.	Design and testing of Pneumatic circuit with vacuum cup and rod less cylinder
8.	Design and testing of Hydraulic circuit with Proportional control of Pressure and Flow
9.	Design and testing of sequential circuits using cascade method
10.	Design, testing and simulation of electro pneumatic circuit with timers and counters

TEXT BOOK:

1.	Anthony Esposito, "Fluid Power with Application", 7th Edition, Pearson Education Ltd, New Delhi, 2013.
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REFERENCES:

1.	Srinivasan R, "Hydraulic and Pneumatic Controls", 2nd Edition, McGraw-Hill Education Pvt. Ltd. , New Delhi, 2008.
2.	Andrew Parr, " Hydraulics and Pneumatics: A Technician's and Engineer's Guide ", 3rd Edition, Butterworth-Heinemann, United Kingdom, 2011.

*includes Term Work(TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to								BT Mapped (Highest Level)	
CO1	select the suitable hydraulic pumps for industrial applications.								Applying (K3), Precision (S3)
CO2	choose the appropriate hydraulic cylinder and motor for automotive applications.								Applying (K3), Precision (S3)
CO3	make use of the correct hydraulic valves for hydraulic applications.								Applying (K3), Precision (S3)
CO4	Identify the suitable pneumatic valves and actuators for pneumatic applications.								Applying (K3), Precision (S3)
CO5	develop the hydraulic and pneumatic circuits for various applications using the cascade method and explain the significance of fluid power circuits for various applications and maintenance								Applying (K3), Precision (S3)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	2	2	1	1	1	2	3	
CO2	3	3	2	2	2	2	2	1	1	1	2	3	
CO3	3	3	2	2	2	2	2	1	1	1	2	3	2
CO4	3	3	2	2	2	2	2	1	1	1	2	3	2
CO5	3	3	2	2	2	2	2	1	1	1	2	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		20	80				100
CAT2		20	80				100
CAT3		20	80				100
ESE		20	80				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

	
Signature of the Chairman Dr. B. S. Reddy Head of Studies	
	





24AUT31 - THERMODYNAMICS AND HEAT TRANSFER

Programme & Branch	B.E. Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit									
Prerequisites	Nil	3	BS	45	15	0	60	120	4									
Preamble	This course provides the knowledge on basic concepts of thermodynamics, its laws, applications, properties of water and air, working of air compressors, vapour compression and absorption refrigeration systems, various heat transfer techniques.																	
Unit – I	First Law of Thermodynamics:																	
Thermodynamic systems – closed, open and isolated systems. Zeroth Law of Thermodynamics, Specific heat capacities, heat transfer and work transfer directions, first law of thermodynamics, Perpetual motion Machine Types, work done in various processes, First Law applied to flow processes, Mass and Energy Balance, Steady flow energy equation (SFE) for various applications.																		
Unit – II	Second Law of Thermodynamics:																	
Kelvin Planck statement, Clausius Statement, Carnot cycle, Heat engine, reversed Carnot cycle – efficiency, heat engine efficiency and work done, COP of refrigerator, COP of heat pump, combined refrigerator–heat engine plant, heat pump–heat engine plant.																		
Unit – III	Properties of Water and Air:																	
Steam table - mollier chart, steam expansion, work done, sensible heat, latent heat, various phases of water, heat involved in phase change. Psychrometric chart, DBT, WBT, Relative Humidity, processes – cooling, heating, humidification, dehumidification, cooling-dehumidification, heating-humidification processes, cooling load calculations.																		
Unit – IV	Conductive and Convective Heat Transfer:																	
Modes of heat transfer, Conduction through the plane wall, composite wall, cylinder, and spherical systems. Extended surfaces, fin efficiency, fin effectiveness, critical thickness of insulation. Forced convection, Free convection.																		
Unit – V	Radiation and Heat Exchangers																	
Radiation, black body, grey body, shape factor of perpendicular planes. Fundamentals of Heat exchanger, Types - parallel flow, counter flow, cross flow heat exchangers, LMTD and NTU method.																		
TEXT BOOK:																		
1.	Nag P.K., "Engineering Thermodynamics", 6 th Edition, McGraw Hill Education, New Delhi, 2017 for Units I,II,III.																	
2.	Yunus A. Cengel, Afshin J. Ghajar, "Heat and Mass Transfer: Fundamentals and Applications", 6 th Edition, McGraw Hill Education, New Delhi, 2020 for Units IV & V.																	
REFERENCES:																		
1.	Rajput R.K., "Engineering Thermodynamics", 10 th Edition, Laxmi Publications, New Delhi, 2018.																	
2.	Yunus A. Cengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", 8 th Edition, McGraw Hill Education, New Delhi, 2017.																	

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to								BT Mapped (Highest Level)	
CO1	apply the first law of thermodynamics to solve and analyze thermal systems								Applying (K3)
CO2	solve second law of thermodynamics problems on heat engines, heat pumps, and refrigerator								Applying (K3)
CO3	make use of air and water properties for solving various engineering applications								Analyzing (K4)
CO4	solve heat transfer problems related to conduction and convection.								Analyzing (K4)
CO5	analyze the problems of radiative heat transfer and the heat exchangers.								Analyzing (K4)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2		1						3	3
CO2	3	3	2	2		1						3	3
CO3	3	3	2	2		1						3	3
CO4	3	3	2	2		1						3	3
CO5	3	3	2	2		1						3	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		23	77				100
CAT2		26	40	34			100
CAT3		26	34	40			100
ESE		14	36	50			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)



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24AUT32 - MECHANICS OF DEFORMABLE BODIES

Programme & Branch	B.E. – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Statics and Dynamics	3	ES	45	0	0	45	90	3
Preamble	This course provides knowledge to evaluate performance of engineering structure due to various external loads by analyzing stresses, strains and deformations.								
Unit – I	Stress, Strain and Deformation of Solids:								
	Introduction to material properties – Stress-strain curve for ductile and brittle materials – Hooke's law – Poisson's ratio – Factor of safety. Elastic constants and their relationship. Stresses and strains due to axial force, shear force, and thermal effect. Stresses in the compound bars. Strain energy.								
Unit – II	Analysis of Stresses in Two Dimensions:								
	State of stresses at a point - Normal and shear stresses on inclined planes - Principal planes and stresses - Plane of maximum shear stress – Mohr's circle for biaxial stress with shear stress. Hoop and longitudinal stresses in thin cylindrical and spherical shells - Changes in dimensions and volume.								
Unit – III	Loads and Stresses in Beams:								
	Types of beams - Supports and Loads - Shear force and Bending Moment in beams - Cantilever, simply supported and overhanging beams - Point of contra flexure. Theory of simple bending - Bending and shear stress - Stress variation along the length and section of the beam - Section modulus.								
Unit – IV	Deflection of Beams and Columns:								
	Slope and Deflection of the cantilever, simply supported and overhanging beams - Double integration method and Macaulay's method. Columns Types - Equivalent length – Euler's and Rankine's formulae - Slenderness ratio – Limitations of Euler's formula.								
Unit – V	Torsion in Circular Shafts and Coiled Helical Springs:								
	Analysis of torsion of circular solid and hollow shafts - stepped shaft - compound shaft - Shear stress distribution - angle of twist and torsional stiffness. Closed coil helical spring - stresses and deflection under axial load - Maximum shear stress in spring section including Wahl Factor.								
TEXTBOOK:									
1.	Ferdinand P. Beer F.P and Johnston E.R., "Mechanics of Materials", 7 th Edition, McGraw Hill Education, New Delhi, 2017.								
REFERENCES:									
1.	Hibbeler R.C., " Mechanics of Materials ", 9th Edition, Pearson Education, New Delhi, 2018.								
2.	S.S. Rattan., "Strength of Materials", 3rd Edition, McGraw Hill Education, New Delhi, 2017.								

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)	
CO1	analyze mechanical behavior of materials under simple tension or compression for varying cross sections.										Analyzing (K4)
CO2	calculate principal stresses and strains to analyze automotive components.										Analyzing (K4)
CO3	examine the theory of simple bending to design automotive chassis frame.										Analyzing (K4)
CO4	inspect beam and column strength with help of slope and deflection for various loads.										Analyzing (K4)
CO5	analyze shafts and springs based on torsional behavior.										Analyzing (K4)

Mapping of COs with POs and PSOs

COs/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	3	1	1	2	1	1	1	3	
CO2	3	3	2	2	3	1	1	2	1	1	1	3	
CO3	3	3	2	2	3	1	1	2	1	1	1	3	
CO4	3	3	2	2	3	1	1	2	1	1	1	3	
CO5	3	3	2	2	3	1	1	2	1	1	1	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		20	36	44			100
CAT2		20	36	44			100
CAT3		20	36	44			100
ESE		20	36	44			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)



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24AUT33 – AUTOMOTIVE ENGINES

Programme & Branch	B.E – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit									
Prerequisites	Nil	3	ES	45	0	0	45	90	3									
Preamble	This course provides knowledge on IC engines and its subsystems for understanding their role in automobiles																	
Unit – I	Engine Fundamentals:																	
Classification of Engines; IC. Engines - Types - Working of two stroke and four stroke IC engines – Port and valve timing diagram - Firing order. Basic Principles of Air Standard cycle - Otto Cycle - Diesel Cycle – Dual Cycle.																		
Unit – II	Fuel Supply system and ignition system																	
SI Engine: Air - Fuel ratio, Simple Carburetor – Injection systems – Single point and Multipoint fuel injection - Gasoline Direct Injection. Ignition System - Battery Ignition System - Magneto Ignition System. CI Engine: Jerk type fuel injection pump - Distributor type fuel injection pump. Common rail direct injection system.																		
Unit – III	Combustion In SI Engines																	
Combustion process - Stages of combustion, Flame propagation - Flame velocity and area of flame front - Rate of pressure rise - Cycle to cycle variation, Abnormal combustion - Effect of engine operating and design variables on combustion, Combustion chambers – Types, factors controlling combustion chamber design.																		
Unit – IV	Combustion in CI Engines																	
Importance of air motion – Swirl, squish and tumble – Swirl ratio. Fuel air mixing – Stages of combustion – Delay period – Factors affecting delay period, Knock in CI engines – methods of controlling diesel knock. CI engine combustion chambers – Combustion chamber design objectives – open and divided. Induction swirl, turbulent combustion chambers. – Air cell chamber – M Combustion chamber.																		
Unit – V	Engine Subsystem																	
Types of cooling systems and its working, Properties of coolants. Crankcase ventilation. Engine lubrication - Types of lubricating systems and its working - Properties of lubricants – Engine oil ratings. Supercharging and Turbocharging working principles.																		
TEXT BOOK:																		
1.	Ganesan V , "Internal combustion engines", 4 th edition, Tata McGraw Hill Education, 2017.																	
REFERENCES:																		
1.	John. B, Heywood, "Internal Combustion Engine Fundamentals", 2nd edition, McGraw Hill Publishing Co., New York, 2017																	
2.	Rajput R. K, "A textbook of Internal Combustion Engines - 2nd edition, Laxmi Publications (P) Ltd, 2017.																	

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	Apply various thermodynamics analysis to IC engine.											Analyzing (K4)
CO2	illustrate the types of ignitions and injection system in SI and CI engine.											Analyzing (K4)
CO3	explore the different stages of combustion in SI engine and its effects on operating variables.											Analyzing (K4)
CO4	Examine the various stages of combustion in CI engine and its operating variables.											Analyzing (K4)
CO5	Interpret the importance of cooling and lubricating system.											Analyzing (K4)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	1	2					1	3	
CO2	3	2	1	1	1	2					1	3	2
CO3	3	2	1	1	1	2					1	3	
CO4	3	2	1	1	1	2					1	3	
CO5	3	2	1	1	1	2					1	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		40	40	20			100
CAT2		40	40	20			100
CAT3		40	40	20			100
ESE		24	59	17			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)


Signature of the Chairman
Board of Studies - 



24GET31- UNIVERSAL HUMAN VALUES

(Common to All Engineering and Technology Branches)

Programme & Branch	All B.E & B.Tech Branches	Sem.	Category	L	T	P	SL*	Total	Credit									
Prerequisites	Nil.	3 / 6	HS	30	0	0	30	60	0									
Preamble	To make the student to know what they 'really want to be' in their life and profession, understand the meaning of happiness and prosperity for a human being. Also to facilitate the students to understand about harmony at all the levels of human living, and live accordingly																	
Unit – I	Introduction																	
Need and Basic Guidelines of Value Education – Content and Process of Value Education – Self Exploration – purpose of self-Exploration – Content and Process of Self exploration – Natural Acceptance – Realization and Understanding – Basic Human Aspirations – Continuous Happiness and Prosperity – Exploring Happiness and Prosperity – Basic Requirement for Fulfillment of Human Aspirations – Relationships – Physical Facilities – Right Understanding.																		
Unit – II	Harmony in the Self and Body																	
Human Being and Body – Understanding Myself as Co-existence of Self ('I') and Body, Needs of the Self and Body, Activities in the Self and Body, Self ('I') as the Conscious Entity, the Body as the Material Entity – Exercise – Body as an Instrument– Harmony in the Self ('I') – Understanding Myself – Harmony with Body.																		
Unit – III	Harmony in the Family and Society																	
Harmony in the Family – Justice – Feelings (Values) in Human Relationships – Relationship from Family to Society – Identification of Human Goal – Five dimensions of Human Endeavour.																		
Unit – IV	Harmony in Nature and Existence																	
Order of Nature – Interconnectedness – Understanding the Four order – Innateness – Natural Characteristic – Basic Activity – Conformance – Introduction to Space – Co-existence of units of Space – Limited and unlimited – Active and No-activity – Existence is Co-existence.																		
Unit – V	Implications of the above Holistic Understanding of Harmony on Professional Ethics																	
Values in different dimensions of Human Living – Definitiveness of Ethical Human Conduct –Implications of Value based Living – Identification of Comprehensive Human Goal – Humanistic Education – Universal Human Order – Competence and Issues in Professional Ethics.																		
TEXT BOOK:																		
1.	Gaur R.R., Sangal R., Bagaria G.P., "A Foundation Course in Human Values and Professional Ethics", 1 st edition, Excel Books Pvt. Ltd., New Delhi, 2009.																	
REFERENCES:																		
1.	Ivan Illich, "Energy & Equity", The Trinity Press, USA, 1974.																	
2.	Schumacher E.F., "Small is Beautiful: a study of economics as if people mattered", 1 st Edition, Britain, 1973.																	

*includes Term Work(TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	identify the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society	Applying (K3)
CO2	interview between the Self and the Body, understand the meaning of Harmony in the Self, the Co-existence of Self and Body	Applying (K3)
CO3	build harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society	Applying (K3)
CO4	experiment with themselves to co-exist with nature by realising interconnectedness and the four orders of nature	Applying (K3)
CO5	identify the differences between ethical and unethical practices, and apply ethical and moral practices for a better living	Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	2		1	2				2	3	2
CO2	3	2	2	2		1	2				2	3	2
CO3	3	2	2	2		1	2				2	3	2
CO4	3	2	2	2		1	2				2	3	2
CO5	3	2	2	2		1	2				2	3	2

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

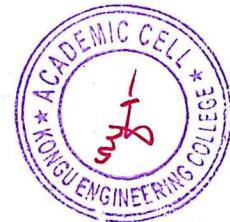
ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		80	20				100
CAT2		80	20				100
CAT3		80	20				100
ESE	NA						

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks)

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 Signature of the Chairman Board of Studies -
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24AUL31 - AUTOMOTIVE ENGINES LABORATORY												
Programme & Branch		B.E. – Automobile Engineering			Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites		Nil			3	HS	0	0	30	0	30	1
Preamble		This course provides hands on experience about dismantling cum assembling of engine and transmission components.										
LIST OF EXPERIMENTS / EXERCISES:												
1. Dismantling and assembling of four stroke single cylinder IC engine												
2. Dismantling and assembling of four stroke multi cylinder IC engine												
3. Dismantling and assembling of Cooling and Lubricating system												
4. Dismantling and assembling of Turbocharger and Supercharger												
5. Valve timing diagram for four stroke diesel engine & port timing diagram for stroke petrol engine												
6. Performance test on four stroke diesel engine using eddy current dynamometer												
7. Heat balance test on four stroke diesel engines using eddy current dynamometer												
8. Performance test on four stroke diesel engine by mechanical loading												
9. Heat balance test on four stroke diesel engines by mechanical loading												
10. Emission test on Diesel and Petrol engines using exhaust gas analyzer												

REFERENCES/ MANUAL /SOFTWARE:

1. Laboratory Manual

COURSE OUTCOMES:

On completion of the course, the students will be able to

		BT Mapped (Highest Level)
CO1	dismantle and assemble various automobile engine components.	Applying (K3), Precision (S3)
CO2	analyze performance characteristics of single cylinder CI engine.	Precision (S3), Manipulation (S2)
CO3	analyze emission characteristics of single cylinder CI engine.	Analyzing (K4), Precision (S3)

Mapping of Cos with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1		2	3	3	3		1	3	
CO2	3	3	2	1		2	3	3	3		1	3	
CO3	3	3	2	1		2	3	3	3		1	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

*includes Term Work (TW) & Online / Certification course hours



F.Y.L.

W.F.

24AUL32 – AUTOMOTIVE FUELS AND LUBRICANTS LABORATORY

(Common to All Engineering and Technology Branches)

Programme & Branch	B.E. – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit
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Prerequisites	Automotive Engines	3	PC	0	0	30	0	30	1
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Preamble	This course provides hands on experience for testing fuels and lubricants to find various properties
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LIST OF EXPERIMENTS / EXERCISES:

1.	Determine calorific value of gaseous fuel
2.	Determine calorific value of liquid fuel
3.	Identify flash and fire points of petrol and diesel
4.	Determine viscosity for the given fuel and lubricant
5.	Identify drop point of grease
6.	Conduct mechanical penetration test of grease
7.	Measure vapour pressure for gasoline fuel
8.	Measure carbon residue for liquid fuel
9.	Conduct corrosion test for liquid fuel and lubricant
10.	Identify cloud and pour point for liquid fuel and lubricant

REFERENCES/ MANUAL /SOFTWARE:

1.	Laboratory Manual
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COURSE OUTCOMES:

On completion of the course, the students will be able to

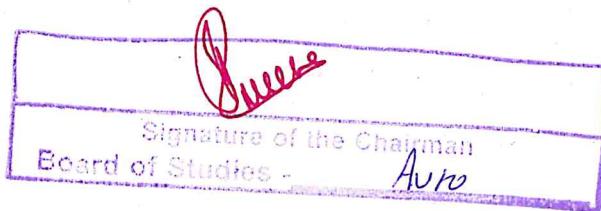
CO1	determine the properties of fuels and lubricants.	BT Mapped (Highest Level)
CO2	identify the flow properties of fuels and lubricants.	Applying (K3), Manipulation (S2)
CO3	analyze the quality of fuels and lubricants.	Applying (K3), Manipulation (S2)

Mapping of Cos with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	3	2	3	3	3		2	3	
CO2	3	2	1	1	2	2	3	3	3		2	3	
CO3	3	2	1	1	2	2	3	3	3		2	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

*includes Term Work (TW) & Online / Certification course hours



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24MAT41 – NUMERICAL METHODS FOR ENGINEERS																	
(Common to Automobile, Civil, Mechanical, Mechatronics and Food Technology Branches)																	
Programme & Branch	BE – Automobile, Civil, Mechanical and Mechatronics Engineering & B.Tech – Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit								
Prerequisites	Nil	4	BS	45	15	0	60	120	4								
Preamble	To impart knowledge in interpolation, numerical differentiation and integration. Also develop skills to apply numerical algorithms to identify roots of algebraic and transcendental equations and solve linear system of equations, ordinary and partial differential equations.																
Unit – I	Solution to Algebraic and Transcendental Equations:								9+3								
Method of false position – Newton-Raphson method – Solution of linear system of equations – Direct methods: Gauss elimination method and Gauss - Jordan method – Iterative methods: Gauss Jacobi and Gauss – Seidel methods.																	
Unit – II	Interpolation:								9+3								
Interpolation with equal intervals: Newton's forward and backward difference formulae – Central difference interpolation formulae: Gauss forward and backward interpolation formulae – Interpolation with unequal intervals: Lagrange's interpolation formula – Newton's divided difference formula.																	
Unit – III	Numerical Differentiation and Integration:								9+3								
Differentiation using Newton's forward and backward difference formulae – Numerical integration: Trapezoidal rule – Simpsons 1/3 rd rule – Double integrals using Trapezoidal and Simpson's rules.																	
Unit – IV	Numerical Solution of First order Ordinary Differential Equations:								9+3								
Single step methods: Taylor series method – Euler method – Modified Euler method – Fourth order Runge-Kutta method – Multi step methods: Milne's predictor corrector method.																	
Unit – V	Solutions of Boundary Value Problems in PDE:								9+3								
Solution of one dimensional heat equation – Bender -Schmidt recurrence relation – Crank - Nicolson method – One dimensional wave equation – Solution of two dimensional Laplace equations – Solution of Poisson equation.																	
TEXT BOOK:																	
1.	Veerarajan T, Ramachandran T., "Numerical Methods", 1 st Edition, McGraw Hill Education, Chennai, 2019.																
REFERENCES:																	
1.	Sankara Rao. K., "Numerical Methods for Scientists and Engineers", 3 rd Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2007.																
2.	Steven C. Chapra, Raymond P. Canale., "Numerical Methods for Engineers", 7 th Edition, McGraw-Hill Education, 2014.																
3.	Sastry, S.S, "Introductory Methods of Numerical Analysis", 5 th Edition, PHI Learning Pvt. Ltd, 2015.																
4.	Ramana B V, "Higher Engineering Mathematics", 1 st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2006.																

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES:		BT Mapped (Highest Level)
On completion of the course, the students will be able to		
CO1	Apply various numerical techniques to solve algebraic and transcendental equations.	Applying (K3)
CO2	Perform interpolation on given data using standard numerical techniques.	Applying (K3)
CO3	Apply the concepts of numerical differentiation and integration in engineering problems.	Applying (K3)
CO4	Compute the solution of first order ordinary differential equations using numerical techniques..	Applying (K3)
CO5	Apply various numerical techniques for solving partial differential equations.	Applying (K3)

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1										
CO2	3	2	2										
CO3	3	3	2										
CO4	3	2	1										
CO5	3	3	3										

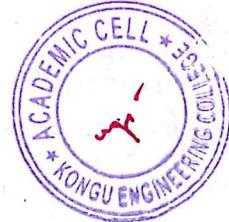
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		20	80				100
CAT2		20	80				100
CAT3		20	80				100
ESE		20	80				100

* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

 Signature of the Chairman Board of Studies
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24AUC41- AUTOMOTIVE ELECTRICAL SYSTEMS AND DRIVES										
Programme & Branch	B.E. -- Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit	
Prerequisites	Basics of Electrical and Electronic Circuits	4	PC	45	0	30	45	120	4	
Preamble	This course provides knowledge on automobile wiring, charging and starting systems with various control strategies.									
Unit - I	Electrical Wiring and Components: Introduction – Electrical wiring, terminals and switching devices. Output Devices: Relays – Relay logic diagram – Contactors – OLR – DOL Starter – MCB – Fuses – Timer – Counter. Automotive Electrical systems.									
Unit - II	Charging and Starting System: Requirements of charging system – Charging system principles – Alternators and charging circuits. Starting system circuits – starter motor- types – Integrated starter- Speed and Torque characteristics of starter motor – drive mechanisms – capacity requirements.									
Unit - III	Advanced Ignition System: Battery coil ignition system – Electronic – Programmed - Distributor less ignition systems – Coil on Plug - Spark advance and retard mechanisms - Types of spark plugs									
Unit - IV	Power Electronic Devices: Concept of Power Electronics – Power electronic systems – Power Semiconductor Devices – Principle of operation – Steady state and switching characteristics of Power diodes - Power BJT - Power MOSFET - IGBT – Steady state and switching characteristics of SCR – DIAC – TRIAC – GTO.									
Unit - V	Electric Motor Drives: Introduction - DC to DC converters – Boost converter and Buck converter - Single phase and three phase DC to AC convertors - AC induction motor and control - BLDC motor and control - Plug in battery charger design. Stepper Motor and Control - Servo Motor and control - Permanent Magnet Synchronous Motor and control and Switched Reluctance Motors and control.									
LIST OF EXPERIMENTS / EXERCISES:										
1.	Design and development of vehicle interior and exterior lighting systems									
2.	Design and development of horn circuit and tuning									
3.	Design and implementation of wiper motor circuit									
4.	Hardware implementation of power window circuit									
5.	Design and implementation of central locking circuit									
6.	Performance test on batteries									
7.	Speed control of DC motor									
8.	Speed control of Induction motor									
9.	Speed control of BLDC motor									
10.	Speed control of Switched Reluctance motor									
TEXT BOOK:										
1.	Tom Denton, "Automobile Electrical and Electronic Systems", 5th Edition, Routledge, United Kingdom, 2017 for Unit I,II,III									
2.	Rashid M.H., "Power Electronics: Circuits Devices and Applications", 4th Edition, Pearson Education, New Delhi, 2017 for Unit IV,V									
REFERENCES/ MANUAL / SOFTWARE:										
1.	Wei Liu, "Introduction to Hybrid Vehicle System Modeling and Control", 1st Edition, Wiley, New Delhi, 2015.									
2.	Robert Bosch GmbH, "Automotive Electrics/Automotive Electronics", 4th Edition, Wiley-Blackwell, 2004.									

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	design and application electrical circuits for automotive applications											Applying (K3), Precision (S3)
CO2	Illustrate the various starting and charging systems and their operating characteristics.											Applying (K3), Precision (S3)
CO3	explain the various ignition systems with advance and retard mechanisms.											Understanding (K2), Precision (S3)
CO4	Identify and apply various power electronic devices with their characteristics and functions.											Applying (K3), Precision (S3)
CO5	demonstrate different types of electric motors with different control strategies.											Applying (K3), Precision (S3)

Mapping of COs with POs and PSOs

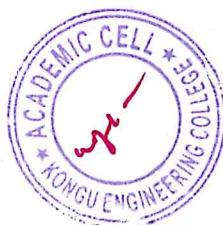
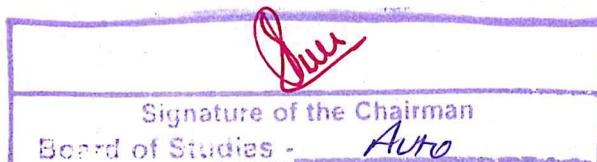
COs/POs /PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2		1		3	2	2	2	2	1	3
CO2	3	3	2		1		3	2	2	2	2	1	3
CO3	3	3	2		1		3	2	2	2	2	1	3
CO4	3	3	2		1		3	2	2	2	2	1	3
CO5	3	3	2		1		3	2	2	2	2	1	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		30	70				100
CAT2		60	40				100
CAT3		30	70				100
ESE		30	70				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)



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24AUT41 - MECHANICS OF MACHINES

Programme & Branch	B.E. – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Statics and Dynamics	4	PC	45	15	0	60	120	4
Preamble	This course provides knowledge on kinematics of mechanisms and the effect of balancing in different machine elements.								
Unit – I	Basics of Mechanisms: Mechanism - Machine Structure - Kinematic link, pair and chain – Kutzback's equation - Grueblers criteria - Constrained motion - Degrees of freedom - Grashof's law - Slider crank and crank rocker mechanisms - Inversions - Applications - Kinematic analysis of simple mechanisms - Velocity and acceleration - Four bar and slider crank using relative velocity method.								
Unit – II	Design of Cam Profile: Types of cams and followers – Terminology. Follower motions - Uniform motion, simple harmonic motion, constant acceleration and deceleration motion and cycloidal motion. Cam profile – Roller, Flat faced and Knife edge follower - Graphical method.								
Unit – III	Kinematics of Gear Trains: Introduction to gears, Classification – Gear terminologies, Gear ratio - Velocities – Simple gear train, Compound gear train, Reverted gear train and Epicyclic gear train, compound epicyclic gear train.								
Unit – IV	Balancing of Masses: Rotating masses – Single mass - single plane – single mass – different plane - Several mass – Single and different plane. Reciprocating masses - Primary and secondary balancing. Balancing - Single and multi-cylinder In-line engines.								
Unit – V	Vibration: Free, forced and damped vibrations of single degree of freedom systems – Force transmitted to supports – Vibration isolation – Vibration absorption – Torsional vibration of shaft – Single and multi-rotor systems – Critical speed of shaft.								
TEXT BOOK:									
1.	Rattan S.S., "Theory of Machines", 4th Edition, McGraw Hill Education, New Delhi, 2017.								
REFERENCES:									
1.	Norton R.L., "Kinematics and Dynamics of Machinery", Special Indian Edition, McGraw Hill Education , New Delhi, 2017.								
2.	Shigley J.E, Pennock G.R, Uicker J.J Cornwell & Sanjeev Sanghi., "Theory of Machines and Mechanisms", 4th Edition, Oxford University Press, Oxford, 2014.								

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)	
CO1	calculate the velocity and acceleration of various links of simple mechanisms.											Analyzing (K4)
CO2	design cam profile for different follower motions.											Analyzing (K4)
CO3	evaluate the kinematics aspects of gears and gear trains.											Analyzing (K4)
CO4	determine the static and dynamic balancing of various mechanical systems.											Analyzing (K4)
CO5	Analyze the dynamic response of mechanical systems											Analyzing (K4)

Mapping of COs with POs and PSOs

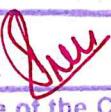
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2		1	1	1	1	1	1	3	
CO2	3	3	2	2		1	1	1	1	1	1	3	
CO3	3	3	2	2		1	1	1	1	1	1	3	
CO4	3	3	2	2		1	1	1	1	1	1	3	
CO5	3	3	2	2		1	1	1	1	1	1	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		27	40	33			100
CAT2		27	40	33			100
CAT3		27	40	33			100
ESE		15	39	46			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

 Signature of the Chairman Board of Studies - 



24AUT42 – VEHICLE COMPONENTS DESIGN – I																				
Programme & Branch	B.E. – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit											
Prerequisites.	22AUT11 - Statics and Dynamics	4	PC	45	0	0	45	90	3											
Preamble	This course provides knowledge on construction, working and design of chassis and its sub systems.																			
Unit – I	Chassis and Frames:																			
Classification of vehicles. Frame construction – conventional - integral and semi integral type - material - load acting - selection of cross section. Chassis construction - Types of chassis layout based on powertrain location.																				
Unit – II	Suspension System:																			
Sprung and unsprung weight – Functions of suspension system – Types of suspension springs – Leaf spring suspension system - Torsion bar. Shock absorbers - Mono tube - twin tube - Independent suspension system – Types. Air suspension system.																				
Unit – III	Design of Vehicle Frame and Suspension:																			
Moments and stresses on frame members – Design of frame for commercial vehicles. Design of leaf springs – Graduated leaf and extra full-length leaves. Design of coil spring.																				
Unit – IV	Front axle and Steering system:																			
Front axle and stub axle – Types. Importance of wheel alignment and wheel balancing. Steering geometry - Ackerman steering Mechanism. Understeer and oversteer – Factors affecting understeer and oversteer. Steering gearboxes – Types – Hydraulic power steering.																				
Unit – V	Design of front axle and Steering system:																			
Moments and stresses at different sections of front axle – Design of front axle beam. Turning Circle Radius– Ackermann linkage Geometry – Analytical Solution – Steering Gear box – Determination of Gear Ratio.																				
TEXT BOOK:																				
1.	Dr. Kirpal Singh, "Automobile Engineering Volume 1 ", 14th Edition, Standard Publishers Distributors, New Delhi, 2020. Units-I,II,IV																			
2.	Giri N.K., "Automobile Mechanics", 8th Edition, Khanna Publications, New Delhi, 2020. Units-III,V																			
REFERENCES:																				
1.	James D Halderman, "Automotive Chassis Systems", 8th Edition, Pearson Publication, 2020																			
2.	Khurmi R.S. & Gupta J.K., "A Text Book of Machine Design", 34th Edition, Eurasia Publishing House Pvt. Ltd., New Delhi, 2005																			

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES: On completion of the course, the students will be able to											BT Mapped (Highest Level)
CO1	summarize the construction and selection of cross section for chassis frame.										
CO2	explain the construction and working of suspension systems and their types.										
CO3	design of chassis frame and suspension springs of an automobile.										
CO4	Illustrate construction and working of front axle and steering system.										
CO5	design front axle and steering system of an automobile.										

Mapping of COs with POs and PSOs

COs/ POs /PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2			1	1	1	1	1	1	2	3	
CO2	3	2			1	1	1	1	1	1	2	3	
CO3	3	3	3	2	1	1	1	1	1	1	2	3	
CO4	3	2			1	1	1	1	1	1	2	3	
CO5	3	3	3	2	1	1	1	1	1	1	2	3	

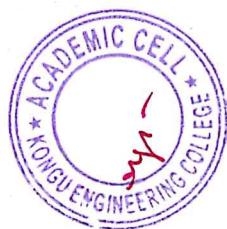
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		100					100
CAT2		40		60			100
CAT3		50		50			100
ESE		60		40			100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

<i>Chairman</i>	
Signature of the Chairman	
Board of Studies :-	<i>Auto</i>



F.YL
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Dr. C.J

24AUT43 - AUTOMOTIVE CONTROL SYSTEM										
Programme & Branch	B.E. – Automobile Engineering	Sem.	Category	L	T	P	SL*	Total	Credit	
Prerequisites	Automotive Electrical Systems and Drives	4	PC	45	0	0	45	90	3	
Preamble	This course provides knowledge on various systems modeling and control techniques in automobiles.									
Unit - I	Mathematical Modeling of Systems: Open loop and closed loop systems - Transfer function: Mechanical systems, Electrical systems and Electro mechanical systems - Block diagram reduction techniques - Signal flow graphs.									
Unit - II	Time Response Analysis: System poles and zeros - First order system - Response for impulse, step and ramp signals. Step response of Second order Under damped system - Time domain specifications - Steady-state error constants - Position, velocity and acceleration error constants.									
Unit - III	Frequency Response and Stability Analysis: Frequency domain specifications - Peak resonance, resonant frequency, bandwidth and cut-off rate. Stability in the frequency domain - Gain and Phase margins: Bode plot. Routh-Hurwitz criterion of stability-Root Locus techniques for Stability Analysis									
Unit - IV	State Variable Analysis: Introduction - General state space representation - Converting transfer function to state space and vice versa - Applications - Controllability - Controller design - Observability - Observer design.									
Unit - V	Automotive Control Techniques: Proportional control - Integral control - Derivative control - PI and PID control actions - Tuning rules: ZN tuning rule, Cohen-koon tuning rule. Applications - Fuel Control - Spark - Timing Control - Idle-speed Control - Cruise Control - Automatic transmission control - ABS control.									
TEXT BOOK:										
1.	Salivahanan, S., R. Rengaraj, and G. R. Venkatakrishnan. Control systems engineering. Pearson, 2015									
REFERENCES:										
1.	Norman S. Nise, "Control System Engineering", 8th Edition, John Wiley & Sons, 2019.									
2.	Ogata K, "Modern Control Engineering", 5th Edition, Pearson Education India, New Delhi, 2015.									
3.	Nagrath I J & Gopal M, "Control System Engineering", 6th Edition, New Age International, New Delhi, 2018.									

*includes Term Work (TW) & Online / Certification course hours

COURSE OUTCOMES:											BT Mapped (Highest Level)
On completion of the course, the students will be able to											
CO1	apply the mathematical models for linear time-invariant systems of different sub systems in automobile engineering										
CO2	model a state-feedback controller using pole placement to meet transient response specification										
CO3	apply the frequency domain analysis techniques to determine the system response and stability										
CO4	identify the system elements and their representations in state space form										
CO5	apply the control methodologies for automotive applications										

Mapping of COs with POs and PSOs

COs/ POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	2	2	1	1	1	1	2	3
CO2	3	3	2	2	2	2	2	1	1	1	1	2	3
CO3	3	3	2	2	2	2	2	1	1	1	1	2	3
CO4	3	3	2	2	2	2	2	1	1	1	1	2	3
CO5	3	3	2	2	2	2	2	1	1	1	1	2	3

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN - THEORY

Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		20	80				100
CAT2		20	80				100
CAT3		20	80				100
ESE		20	80				100

* ±3% may be varied (CAT 1,2,3 – 50 marks & ESE – 100 marks)

	<i>Chairman</i>
Signature of the Chairman Board of Studies - <i>Arun</i>	



m/f

F. Bl

24AUL41 - COMPUTER AIDED DESIGN LABORATORY															
(Common to All Engineering and Technology Branches)															
Programme & Branch		B.E. – Automobile Engineering			Sem.	Category	L	T	P	SL*	Total	Credit			
Prerequisites		Engineering Drawing			4	PC	0	0	30	0	30	1			
Preamble	This course provides hands on experience to design and model various automotive components by using CAD package.														
LIST OF EXPERIMENTS / EXERCISES:															
1.	Apply 2D and 3D drafting tools to model automobile components like Cylinder block, Piston and Connecting rod.														
2.	Conversion of 3D solid model of Connecting rod cum Piston assembly to 2D drawing - different views, sections, isometric view and drafting														
3.	Design vehicle chassis frame using CAD tools														
4.	Develop 3D Part modeling of Flange coupling and Knuckle joint														
5.	Design simple gear trains using CAD tools														
6.	Model disc brake assembly using CAD tools														
7.	Develop 3D Part modeling of automotive Leaf Spring														
8.	Develop the independent suspension system using CAD Tools														
9.	Model Auto car body using CAD tools														
10.	Simulate the Automotive mechanism by using CAD tools														
REFERENCES/ MANUAL /SOFTWARE:															
1.	K.R. Gopala Krishna, "Machine Drawing", 6th Edition, Subhash Publication, New Delhi, 2017.														
2.	Laboratory Manual														
COURSE OUTCOMES: On completion of the course, the students will be able to										BT Mapped (Highest Level)					
CO1	sketch 2D drawing by using different sketching tools in CAD packages.									Applying (K3), Precision (S3)					
CO2	apply principles associated with CAD and common drafting techniques in designing 3D model of automotive components.									Applying (K3), Precision (S3)					
CO3	simulate automotive mechanism in a CAD package and fabricate CAD model by using 3D printer.									Applying (K3), Precision (S3)					
Mapping of Cos with POs and PSOs															
COs/POs /PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2		
CO1	3	2	2	1	3		3	2	2			3			
CO2	3	2	2	1	3		3	2	2			3			
CO3	3	2	2	1	3		3	2	2			3			

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

*Includes Term Work (TW) & Online / Certification course hours


Signature of the Chairman
Board of Studies - Auto





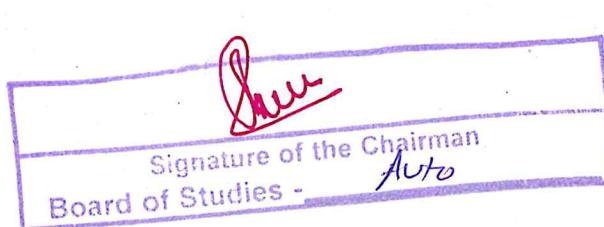




24AUL42- AUTOMOTIVE CHASSIS COMPONENTS LABORATORY													
Programme & Branch		B.E & AUTOMOBILE ENGINEERING			Sem.	Category	L	T	P	SL*	Total	Credit	
Prerequisites	Nil			4	PC	0	0	30	0	30	1		
Preamble	This course provides practice on dismantle, assemble and performance of automotive chassis components.												
LIST OF EXPERIMENTS / EXERCISES:													
1.	Measurement of Light and Heavy Commercial Vehicle Chassis Frame												
2.	Calculation of gear ratios and steering angles for various steering system												
3.	Dismantling and Assembling of Transfer case												
4.	Dismantling and Assembling of Gear box and calculate the various gear ratios												
5.	Dismantling and Assembling of Differential Unit												
6.	Dismantling and Assembling of Constant Velocity Joint												
7.	Dismantling and Assembling of Rear Axle												
8.	Dismantling and Assembling of Disc and Drum Brake system												
9.	Performance test on Coil Spring												
10.	Performance test on Shock Absorber												
REFERENCES/ MANUAL /SOFTWARE:													
1.	Laboratory Manual												
COURSE OUTCOMES:													
On completion of the course, the students will be able to											BT Mapped (Highest Level)		
CO1	Dismantle and assemble various transmission elements in a vehicle.										Applying (K3), Manipulation(S2)		
CO2	Dismantle and assemble steering systems and braking systems in an automobile.										Applying (K3), Precision (S3)		
CO3	Determine the performance test on coil spring, shock absorber and Two wheeler chassis										Applying (K3), Precision (S3)		
Mapping of Cos with POs and PSOs													
COs/POs /PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2		1		2	3	3	3		3	3	
CO2	3	2		1		2	3	3	3		3	3	
CO3	3	3		2		2	3	3	3		3	3	

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

*Includes Term Work (TW) & Online / Certification course hours



Dr. N. S.

Dr. N. S.

F.Y.L.

24GCL41 - PROFESSIONAL SKILLS TRAINING – I																						
(Common to all Engineering & Technology Branches)																						
Programme & Branch	All B.E/B.Tech Branches			Sem.	Category	L	T	P	SL*	Total	Credit											
Prerequisites	Nil			4	EC	0	0	45	35	80	2											
Preamble	This subject is to enhance the employability skills and to develop career competency.																					
Unit – I	Soft Skills - I																					
Soft skills and its importance: Pleasure and pains of transition from an academic environment to work environment-Need for change- Fear, stress and competition in the professional world-Importance of positive attitude- Self motivation and continuous knowledge upgradation-Self-confidence. Professional grooming and practices: Basics of corporate culture-Key pillars of business etiquette- Basics of etiquette-Introductions and greetings-Rules of the handshake, earning respect, business manners-Telephone etiquette- Body Language.																						
Unit – II	Quantitative Aptitude & Logical Reasoning - I																					
Problem solving level I: Quantitative Aptitude: Numbers, H.C.F. and L.C.M. of Numbers, Square Root and Cube Root, Simplification, Percentage, Average, Ratio and Proportion, Partnership, Profit and Loss, Alligation or Mixture, Permutations and Combinations, Probability. Logical Reasoning : Series, Analogy, Coding Decoding, Directions Decision Making, Blood Relations.																						
TEXT BOOK:																						
1.	Nishit Sinha, Dinesh Khattar& Showick Thorpe, "Placement Training Companion: Think. Solve. Succeed", Pearson Education 2025																					
REFERENCES:																						
1.	Dr. R.S. Agarwal, "Quantitative Aptitude for Competitive Examinations". S. Chand publications New Delhi, 2025.																					
2.	Gopalaswamy Ramesh & Mahadevan Ramesh - The Ace of Soft Skill: Attitude, Communication and Etiquette for Success, Pearson Education, 2024.																					
COURSE OUTCOMES:																						
On completion of the course, the students will be able to											BT Mapped (Highest Level)											
CO1	develop the soft skills of learners to support them work efficiently in an organization as an individual and as a team.										Applying(K3), Precision(S3)											
CO2	solve real time problems using numerical ability.										Applying(K3), Precision(S3)											
CO3	solve basic problems in logical reasoning by applying standard problem-solving techniques.										Applying(K3), Precision(S3)											
Mapping of COs with POs and PSOs																						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11											
CO1	3	2				3		3		3	2											
CO2	3	2				3		3		3	2											
CO3	3	2				3		3		3	2											
1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy																						
ASSESSMENT PATTERN - THEORY																						
Test / Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %															
CAT1		50	50				100															
CAT2		50	50				100															
CAT3		50	50				100															
ESE	NA																					
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks)																						

<i>RGP ✓</i>
Signature of the Chairman
Board of Studies - CSE



(C.N. SHANTHA)