KONGU ENGINEERING COLLEGE

(Autonomous Institution Affiliated to Anna University, Chennai)

PERUNDURAI   ERODE – 638 060

TAMILNADU INDIA

Estd : 1984

REGULATIONS, CURRICULUM & SYLLABI – 2024

(CHOICE BASED CREDIT SYSTEM AND OUTCOME BASED EDUCATION)

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

BACHELOR OF TECHNOLOGY DEGREE IN FOOD TECHNOLOGY

DEPARTMENT OF FOOD TECHNOLOGY

Assuring the Best

B.TECH. FOOD TECHNOLOGY 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
24CYT15	Chemistry for Food Technology	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
24FTT11	Fundamentals of Biochemistry	45	0	0	45	0	90	3	40	60	100	ES	C
24TAM01	Heritage of Tamils	15	0	0	15	0	30	1	100	0	100	HS	OT
Practical / Employability Enhancement													
24CYL15	Chemistry Laboratory for Food Technology	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	30	0	0	0	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

Signature of the Chairman
Board of Studies - Food Technology

B.TECH. FOOD TECHNOLOGY CURRICULUM – R2024
(For the students admitted from the academic year 2024-25 onwards)

Course Code	Course Title	CI L	CI T	LI P	TW	SL	TH	Credit	CA	ESE	Total	Category	Type
SEMESTER – II													
Theory/Theory with Practical													
24EGT21	English for Effective Communication - II	45	0	0	45	0	90	3	40	60	100	HS	C
24MAC21	Multivariable Calculus and Complex Analysis	45	7	16	52	0	120	4	50	50	100	BS	A
24PHT24	Physics for Food Technology	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
24MET11	Engineering Drawing	30	15	0	45	0	90	3	40	60	100	ES	A
24TAM02	Tamils and Technology	15	0	0	15	0	30	1	100	0	100	HS	OT
Practical / Employability Enhancement													
24PHL24	Physics Laboratory for Food Technology	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	30	0	0	0	0	30	0	100	0	100	MC	
24VEC11	Yoga and Values for Holistic Development	15	0	15	0	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

R. omuf..
Signature of the Chairman
Board of Studies - Food Technology

B.TECH. FOOD TECHNOLOGY CURRICULUM – R2024
(For the students admitted from the academic year 2024-25 onwards)

Course Code	Course Title	CI L	CI T	LI P	TW	SL	TH	Credit	CA	ESE	Total	Category	Type
SEMESTER – III													
		Hours / Semester							**Maximum Marks**				
Theory/Theory with Practical													
24FTC31	Engineering Properties of Food Materials	45	0	30	45	0	120	4	50	50	100	PC	C
24FTT31	Food Science and Nutrition	45	0	0	15	30	90	3	40	60	100	PC	OC/C
24FTT32	Food Process Calculation	45	15	0	60	0	120	4	40	60	100	ES	A
24FTT33	Process Fluid Mechanics	45	15	0	60	0	120	4	40	60	100	PC	A
24FTT34	Food Chemistry	45	0	0	45	0	90	3	40	60	100	PC	C
24GET31	Universal Human Values	30	0	0	30	0	60	2	100	0	100	HS	OT
Practical / Employability Enhancement													
24FTL31	Fluid Flow Laboratory	0	0	30	0	0	30	1	60	40	100	PC	
24FTL32	Food Chemistry 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

Signature of the Chairman
Board of Studies - Food Technology

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	9

Grammar: Parts of Speech – Articles – Determiners – **Verbal Aptitude:** Synonyms and Antonyms – Selecting Words – **Listening:** Listening and Filling in Information – Speech Units – **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 *You Can Win* – **Writing:** Email Etiquette – Email Writing – Responding to Emails

Unit – II	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing	9

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 *You Can Win*- **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	9

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 *You Can Win* – **Writing:** Paragraph Writing: Narrative and Compare & Contrast

Unit – IV	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing	9

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 *You Can Win* – **Writing:** Instructions – Recommendations and Suggestions

Unit – V	Grammar, Verbal Aptitude, Listening, Speaking, Reading & Writing	9

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 *You Can Win* – **Writing:** Transcoding: Identifying Trends and Patterns in Graphs and Expressing with Graph Specific Vocabulary

TEXT BOOK:

1.	Sudharshana N P and Savitha C, *English for Technical Communication*, 2nd Edition, Cambridge University Press, New Delhi, 2016.

REFERENCES:

1.	Ashraf Rizvi. Effective Technical Communication, 2nd 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.	Shiv Khera. You Can Win: A Step-by-Step Tool for Top Achievers. 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	Applying (K3)
CO2	listen and understand different spoken discourses	Applying (K3)
CO3	present ideas clearly and confidently in formal and informal conversations and discussions	Creating (K6)
CO4	comprehend the given text and respond appropriately for technical and professional purposes	Understanding (K2)
CO5	select appropriate words , phrases and grammatical units and apply them in both spoken and written communication	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								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) %	Understanding (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:	9

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:	9

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:	9

Linear differential equations of second and higher order with constant coefficients - Particular Integrals for the types: e^{ax} – cosax / sinax – x^n – $e^{ax}x^n$, e^{ax} sinbx and e^{ax} cosbx – Differential Equations with variable coefficients: Euler-Cauchy's equation – Legendre's equation.

Unit – IV	Applications of Ordinary Differential Equations:	9

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:	9

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 ", 10th Edition, John Wiley, New Delhi, India, 2016.
2.	Ramana B V, "Higher Engineering Mathematics", 1st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.
3.	Duraisamy C., Vengataasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - I", 2nd Edition, Pearson India Education, New Delhi, 2018.
4.	Grewal B.S., "Higher Engineering Mathematics" 44thEdition, 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.	Applying (K3) Manipulation (S2)
CO2	Identify the appropriate method for solving first order ordinary differential equations.	Applying (K3) Manipulation (S2)
CO3	Solve higher order linear differential equations with constant and variable coefficients.	Applying (K3) Manipulation (S2)
CO4	Apply the concept of ordinary differential equations for modeling and finding solutions to engineering problems.	Applying (K3) Manipulation (S2)
CO5	Apply Laplace Transform to solve complex engineering problems.	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	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

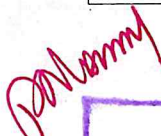* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

Signature of the Chairman
Board of Studies - S4 H

24CYT15 - CHEMISTRY FOR FOOD TECHNOLOGY

Programme & Branch	B.Tech - Food Technology	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 storing devices, polymers, food colloids and sustainable food processing. It aims to impart the fundamentals of chemistry towards innovations in Food Technology and also for societal applications.

Unit – I	WATER TECHNOLOGY	9

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	ENERGY STORAGE DEVICES	9

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 – III	POLYMERS	9

Introduction – terminology - classification - polymerization - types of polymerization (definition only)- structure and property relationship of polymers (mechanical, thermal) - plastics- difference between thermoplastics and thermosetting plastics - compounding of plastics- plastic moulding methods - compression, injection, extrusion and blow moulding methods – industrial polymers: preparation, properties and applications of PVC, Teflon – biodegradable polymers - classification and applications.

Unit – IV	FOOD COLLOIDS	9

Introduction- classification of colloidal systems –sols, gels and suspensions - properties of colloids -Emulsion and Foams: introduction- types - methods for making emulsion/foam: Super saturation, Injection, Agitation, Chemical energy – Over run – Roles of surfactant - Changes in dispersity:Growth/Dissolution - Ostwald Ripening - Coalescence – Aggregation- Partial Coalescence - Sedimentation.

Unit – V	SUSTAINABLE FOOD PROCESSING	9

Sustainability: green engineering technologies in the food processing industries – drivers for sustainable food Processing: legislative, economic, consumer, corporate performance – environmental impacts of food processing: energy, solid waste, water and wastewater - environmental impact assessment methods in food processing – carbon foot print, ecological foot print, life cycle assessment.

TEXT BOOK:

1.	Roussak , O.V. Gesser, H. D. " Applied Chemistry: A Textbook for Engineers and Technologists", 2nd Edition ,Springer, 2013, for Units I, II, III.
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 III, IV, V.

REFERENCES:

1.	Sustainable Food Processing, Brijesh K. Tiwari, Tomas Norton, Nicholas M. Holden, John Wiley & Sons, New Jersey, United States, 2013.
2.	Pieter Walstra, "Physical Chemistry of Foods (Food Science and Technology), 1st Edition, Marcel Dekker, 2003.

*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	examine the chemistry of energy storing devices and meeting the future prospectus of energy storage.	Analysing (K4)
CO3	examine the concepts of polymerization and fabrication process to get a variety of engineering plastics.	Analysing (K4)
CO4	investigate the concepts of colloids and emulsion in food industries.	Analysing (K4)
CO5	analyze the principle for sustainable food processing and life cycle assessment	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	2	1	3	1		2	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
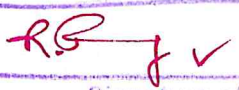
* ±3% may be varied (CAT 1, 2 & 3 – 50 marks & ESE – 100 marks)

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:	9

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:	9

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:	9

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:	9

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:	9

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", 3rd 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		

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

Signature of the Chairman
Board of Studies - CSE

P.Kalaivani

24FTT11 - FUNDAMENTALS OF BIOCHEMISTRY

Programme& Branch	B. Tech& Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	1	PC	45	0	0	45	90	3

Preamble	To impart knowledge about the structure and properties of biomolecules, actions of enzymes and metabolism	
Unit –I	Carbohydrates:	9

Classification; Simple Sugars: mono and disaccharides, Hygroscopicity and solubility, optical rotation, muta rotation; Sweetness: structure-activity relationship and sweetness index; Dextrose Equivalent; Sugar alcohols; Oligosaccharides: structure and occurrence. Polysaccharides: Starch-amylose and amylopectin- properties. Cellulose. Pectins, gums and seaweeds – structure & properties. Dietary fibres - Food sources, functional role.

Unit –II	Lipids:	9

Fatty acids - classification. Lipids -, classification -simple and compound lipids, sterols. Food lipids and health. Physical properties of fats and oils: crystal formation, polymorphism, melting point. Shortening power of fats, smoke point. Chemical properties of fats – Hydrolysis, saponification, halogenation. Hydrolytic rancidity and oxidative rancidity. Chemical constants.

Unit –III	Proteins:	9

Amino acids - Definition, structure and classification. Protein - classification and structural conformation, Food sources and biological role. Properties of proteins in food systems: solubility, hydration, foam formation & stabilization, gel formation, emulsifying effect. Denaturation.

Unit –IV	Enzymes:	9

Introduction, Nature, classification and nomenclature of enzymes. Mechanism of enzyme action; active site; Specificity. Enzyme kinetics – Michelis - Menten equation, Factors affecting enzyme action, Immobilization methods, selected application of enzyme's in food Industries and food waste management.

Unit –V	Nucleic Acids and Energy Metabolism:	9

Nucleic Acids: Composition and structure of DNA and RNA. Energy Metabolism: Glycolysis; TCA cycle; substrate level phosphorylation. Cellular respiration – electron transport chain. Fatty acid metabolism – beta oxidation and fatty acid synthesis.

Total:45

TEXT BOOK:

1.	Dr. U. Sathyanarayanan and Dr. U. Chakarapani, " Bio-chemistry", 4th edition 2013, Elsevier.

REFERENCES:

1.	Belitz H.D., Grosch W. and Schieberle P, "FoodChemistry",3rd Edition Springer Verley Berlin,2008.
2.	Jain J.L., Sunjay Jain and Nitin Jain, "Fundamentals of Biochemistry",7th Edition, S. Chand &Co., New Delhi, 2016.
3.	Rastogi S. C, "Biochemistry",3rd Edition, Tata Mc Graw Hill Publishing Company, New Delhi, 2010.

COURSEOUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	classify and outline the structure of biomolecules	Understanding (K2)
CO2	Interpret the properties of biomolecules and utilize in Food processing	Applying(K3)
CO3	Inspect the functional role of biomolecules and its applications in food processing	Analyzing (K4)
CO4	Make use of the enzymes in food industries and interpret the enzyme action and their immobilization	Applying(K3)
CO5	Infer the structure of nucleic acids and illustrate the basics of energy metabolism	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		1			1		1		3	2
CO2	3	3	2	2		1			1		1		3	2
CO3	3	3	2	2		2			1		2		3	2
CO4	3	3	3	2		1			1		2		3	2
CO5	3	1	1	1					1		1		2	1

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

ASSESSMENTPATTERN-THEORY

Test/Bloom's Category*	Remembering (K1) %	Understanding (K2) %	Applying (K3) %	Analyzing (K4) %	Evaluating (K5) %	Creating (K6) %	Total %
CAT1		75	10	15			100
CAT2		75	10	15			100
CAT3		90	10	-			100
ESE		60	20	20			100

*±3%may be varied (CAT1, 2, 3 – 50 marks & ESE –100marks)

Signature of the Chairman
Board of Studies - Food Technology

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 bharathiyar and bharathidhasan.

UNIT II	Heritage - Rock Art Paintings to Modern Art – Sculpture	3

Hero stone to modern sculpture - bronze icons - tribes and their handicrafts - art of temple car making - - massive terracotta sculptures, village deities, thiruvalluvar statue at kanyakumari, making of musical instruments - mridhangam, parai, veenai, yazh and nadhaswaram - role of temples in social and economic life of tamils.

UNIT III	Folk and Martial Arts	3

Therukoothu – karagattam - 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)(Puplished by International Institute of Tamil Studies).
3.	Keeladi – 'Sangam City C ivilzation 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: படிப்பை முடித்தவுடன், மாணவர்கள்		BT Mapped (Highest Level)
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)

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 விளையாட்டுக்கள், திணைக் 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 சார்பற்ற 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 - ஐம்பொன் 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 விளையாட்டுக்கள்	3

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

அலகு - IV	தமிழர்களின் திணைக் 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.	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு)
4.	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

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

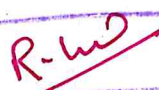| COURSE OUTCOMES: படிப்பை முடித்தவுடன், மாணவர்கள்		BT Mapped (Highest Level)
CO1	தமிழ் மொழி மற்றும் இலக்கியத்தில் மதிப்புமிக்க கருத்துக்களை விளக்க முடியும்.	Understanding (K2)
CO2	தமிழர்களின் சிற்பம் மற்றும் அவர்களின் ஓவியங்கள் பற்றி விளக்க முடியும்.	Understanding (K2)
CO3	தமிழர்களின் நாட்டுப்புற மற்றும் 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)

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

24CYL15 – CHEMISTRY LABORATORY FOR FOOD TECHNOLOGY

Programme & Branch	BTech - Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	1	BS	0	0	30	0	30	1

Preamble	This course aims to impart hands on training in the determination of the water quality parameters such as calcium, alkalinity, chloride, DO, COD, iron, and to develop the skills in handling different basic instruments and also aims to impart the basic concepts of viscometer, conductivity meter, spectrophotometer and pH meter experiments to improve the analytical capability.

LIST OF EXPERIMENTS / EXERCISES:

1.	Assessment of calcium content present in food sample by EDTA method.
2.	Estimation of type and amount of alkalinity present in the given river/bore well water sample.
3.	Determination of chloride content in the given water sample using Argentometric method.
4.	Perform Winkler's method for the determination of dissolved oxygen in the given wastewater sample.
5.	Determination of COD in the given water sample.
6.	Estimation of strength and amount of acid in a given solution using pH meter.
7.	Determination of strength and amount of mixture of acids present in the given solution using Conductivity meter.
8.	Spectrophotometric determination of concentration of Nickel.
9.	Determine the molecular weight of a polymer by Oswald viscometer.
10.	Volumetric estimation of chromium present in the given sample using permanganometric method.
11.	Report preparation -based on the data received from the analysed water quality parameters (Demonstration).
12.	Estimation of iron using Spectrophotometer (Demonstration).

REFERENCES/ MANUAL /SOFTWARE:

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

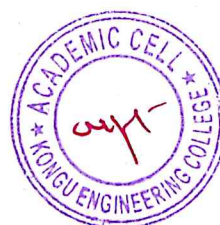| COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Estimate the Calcium in food sample and alkalinity of the given water sample.	Analyzing (K4), Precision (S3)
CO2	Demonstrate the water quality parameters of water sample by estimating Chloride, DO and COD.	Analyzing (K4), Precision (S3)
CO3	Demonstrate the determination of molecular weight by viscometer and amount of acids the given sample by pH meter and conductivity meter, Chromium by Permanganometry and Nickel by Spectrophotometer.	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

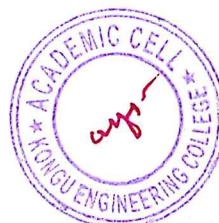*includes Term Work(TW) & Online / Certification course hours

Signature of the Chairman
Board of Studies -

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		BT Mapped (Highest Level)
CO1	Design electrical wiring circuits for buildings based on their requirement	Applying(K3) Precision (S3)
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

Signature of the Chairman
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", 7th 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

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 *Atomic Habits* **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 *Atomic Habits* - **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 *Atomic Habits* – **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 *Atomic Habits* **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 *Atomic Habits* – **Writing:** Report Writing: IV Report and Case Study Report

TEXT BOOK:

1.	Sudharshana N P and Savitha C, *English for Technical Communication*, 2nd Edition, Cambridge University Press, New Delhi, 2016.

REFERENCES:

1.	Ashraf Rizvi. Effective Technical Communication, 2nd 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. Atomic Habits By James Clear. Dharman, 2023.

* 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	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) %	Understanding (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)

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

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:**	9

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:**	9

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:**	9

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:**	9

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:**	9

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 Mobius 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 ", 10th Edition, John Wiley, New Delhi, India, 2016.
2.	Ramana B V, "Higher Engineering Mathematics", 1st Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.
3.	Duraisamy C., Vengataasalam S., Arun Prakash K. and Suresh M., "Engineering Mathematics - II", 2nd Edition, Pearson India Education, New Delhi, 2018.
4.	Grewal B.S, "Higher Engineering Mathematics" 44thEdition, Khanna Publishers, New Delhi, 2018.
5.	Multivariable Calculus and Complex Analysis 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	Compute the total derivatives and extreme values of multivariable functions.	Applying (K3) Manipulation (S2)
CO2	Apply multiple integrals to compute the area and volume of the regions.	Applying (K3) Manipulation (S2)
CO3	Apply the concepts of derivatives and line integrals of point functions in engineering problems.	Applying (K3) Manipulation (S2)
CO4	Construct analytic functions and bilinear transformations and determine the image of given region under the given conformal mapping.	Understanding (K2) Manipulation (S2)
CO5	Apply the techniques of complex integration to evaluate real and complex integrals over closed curves.	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	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)

Signature of the Chairman
of Studies - s 4 H

24PHT24 - PHYSICS FOR FOOD TECHNOLOGY

Programme& Branch	B.Tech- Food Technology	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, select crystal growth techniques, quantum physics, ultrasonic waves, microwaves, magnetic materials, dielectric materialsand select materials characterization techniques. It also describes the applications of aforementioned topics in food technology.	
Unit – I	**Crystal Physics:**	**9**

Classification of solids – Space lattice – Unit cell – Crystal structure – Crystal imperfections: line, surface and volume imperfections – Supersaturation – Nucleation – Classical theory of nucleation – Homogeneous and heterogeneous nucleation – Free energy formation of critical nucleus – Crystal growth techniques: Melt growth – Bridgman method (Vertical) – Solution growth: High temperature solution growth – Low temperature solution growth – Examples in food processing.

Unit – II	**Quantum Physics and Applications:**	**9**

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	**Ultrasonics and Microwaves:**	**9**

Ultrasonics– Properties – Magnetostrictive generator – Piezoelectric generator – Determination of velocity of ultrasonics in a liquid using acoustic grating – Non-destructive testing – Flaw detection – Applications of ultrasonics in food industry – Microwaves – Conversion of microwaves into heat – Penetration depth – Applications of microwaves in food industry.

Unit – IV	**Magnetic and Dielectric materials:**	**9**

Ferromagnetism – Domain theory of ferromagnetism – Hysteresis – Soft and hard magnetic materials – Applications: Metal detector and magnetic inductive flow meter – Dielectric materials – Dielectric constant – Types of polarization (qualitative) – Frequency and temperature dependence of polarization – Dielectric loss – Dielectric breakdown – Uses of dielectric materials in ohmic heating.

Unit – V	**Materials characterization:**	**9**

Importance of materials characterization – X-ray diffraction (powder method) – Scanning electron microscope – Transmission electron microscope – UV-visible spectroscopy – Raman spectroscopy – Nuclear Magnetic Resonance – Thermo gravimetric analysis.

TEXT BOOK:

1.	Katiyar A.K, Pandey C.K, "Engineering Physics: Theory and Practical", 2nd edition, Wiley, 2015 (Unit I, II).
2.	Tamilarasan K and Prabu K, "Physics for Engineering I", 1st Edition, McGraw Hill Education Pvt. Ltd., New Delhi, 2023 (Unit III, IV, V).

REFERENCES:

1.	Avadhanulu M.N, Kshirsagar P.G and Arun Murthy T.V.S, "A Textbook of Engineering Physics", 11th edition, S Chand, 2021.
2.	Ludger O. Figura , Arthur A. Teixeira, "Food Physics", Springer, 2007.
3.	Euth Ortiz Ortega, HamedHosseinian, 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: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	explore seven crystal systems, types of crystal imperfections and utilize appropriate crystal growth techniques to grow crystals.	Analyzing (K4)
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.	Analyzing (K4)
CO3	examine the production techniques of ultrasonic wave, working of acoustic grating and non-destructive testing using ultrasonic waves and also to explain microwaves and their applications in food industries.	Analyzing (K4)
CO4	analyze the concepts of ferromagnetism to comprehend the working of metal detector, magnetic inductive flow meter and also to describe the phenomena related to dielectric polarization, dielectric loss and dielectric breakdown and the application of dielectrics in ohmic heating.	Analyzing (K4)
CO5	inspect the concepts of Raman effect, X-ray diffraction, matter waves and thermogram to describe the principle and working of select material characterization techniques.	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	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)

Signature of the Chairman
Board of Studies - S&H, Physics

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:	9

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:	9

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:	9

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:	9

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:	9

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

LISTOF 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.	ReemaThareja.,"PythonProgrammingusingproblemsolvingapproach",3rdimpression, Oxford University Press., NewDelhi, 2017.

REFERENCES:

1.	Nageswara Rao, "Core Python Programming", 2ndEdition, DreamTech Press, New Delhi, 2018.
2.	Jake Vander Plas, " Python Data Science Handbook Essential Tools for Working with Data", O'Reilly Publishers, 1stEdition,2016.

*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 basic python constructs to build simple programs	Applying(K3), Precision(S3)
CO2	apply list, tuple and dictionary to handle variety of data.	Applying(K3), Precision(S3)
CO3	apply strings and regular expression for searching and retrieval	Applying(K3), Precision(S3)
CO4	solve the problems using functions and modules.	Applying(K3), Precision(S3)
CO5	apply object oriented concepts and perform data science operations using python	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	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)

Signature of the Chairman
Board of Studies - IT

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 pointsin 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", 1st Edition, Cambridge Ubiversity Press, 2021

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

#sem1: Cvil, 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)

Signature of the Chairman
of Studies - Mechanical

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**	3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		
UNIT – II	**DESIGN AND CONSTRUCTION TECHNOLOGY**	3
Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) – Thirumalai Nayakar Mahal – Chetti Nadu Houses, Indo – Saracenic architecture at Madras during British Period.		
UNIT – III	**MANUFACTURING TECHNOLOGY**	3
Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel – Copper and gold – Coins as source of history – Minting of Coins – Beads making – industries Stone beads – Glass beads –Terracotta beads –Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.		
UNIT – IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY**	3
Dam, Tank, ponds, Sluice, Significance of 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**	3
Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		

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 தமிழாராய்ச்சி நிறுவனம், சென்னை, 2002
2.	கணினித்தமிழ் முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2016
3.	கீழடி 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)(Puplished by International Institute of Tamil Studies).
7.	Keeladi – 'Sangam City Civilzation 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

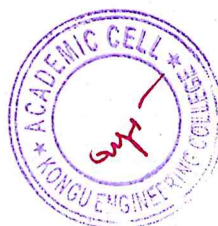| COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						3		3	2	2			
CO2						3		3	2	2			
CO3						3		3	2	2			
CO4						3		3	2	2			
CO5						3		3	2	2			

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)

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

24TAM02 - தமிழரும் தொழில்நுட்பமும்										
(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	

முன்னுரை	தமிழ் கலாச்சாரத்தோடு ஒன்றிய தொழில் நுட்பங்களை பற்றிப் எடுத்துரைத்தல்	
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 – பிரிட்டிஷ் காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடக் 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 நீர்ப்பாசனத் 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:

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

REFERENCES:

1.	கீழடி-வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்.(தொல்லியல் துறை வெளியீடு)
2.	பொருநை-ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
3.	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
4.	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
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 Tamil to Indian Culture (Dr.M.Valarmathi) (Puplished by International Institute of Tamil Studies).
7.	Keeladi – 'Sangam City Civilzation 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: படிப்பை முடித்தவுடன், மாணவர்கள்		BT Mapped (Highest Level)
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)

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

ACADEMIC CELL
KONGU ENGINEERING COLLEGE

24PHL24 - PHYSICS LABORATORY FOR FOOD TECHNOLOGY

Programme& Branch	B.Tech - Food Technology		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 physical parameters such as AC frequency, compressibility of a liquid, wavelength of laser, particle size, Young's modulus, rigidity modulus, specific resistance, thermal conductivity, viscosity, thickness of 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 frequency of alternating current using electrically vibrating tuning fork (Melde's apparatus).
2.	Determination of the wavelength of the given semiconductor laser.
3.	Determination of the particle size of the given powder using laser.
4.	Determination of the Young's modulus of the material of the given beam using uniform bending method.
5.	Determination of the rigidity modulus of the metallic wire using torsional pendulum.
6.	Determination of the specific resistance of the given metallic wire using Carey-Foster's bridge.
7.	Determination of the thermal conductivity of a bad conductor using Lee's disc.
8.	Determination of the coefficient of viscosity of liquid using Poiseuille's method.
9.	Determination of 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.

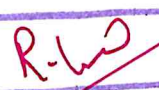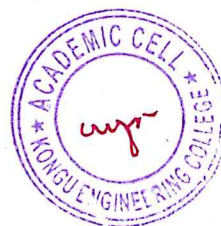| COURSE OUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	determine the frequency of an alternating current, the wavelength of a semiconductor laser and the particle size of a powder material.	Analyzing (K4), Precision (S3)
CO2	determine the Young's modulus of a material, the rigidity modulus of a wire and the specific resistance of a metallic wire.	Analyzing (K4), Precision (S3)
CO3	determine the thermal conductivity of a bad conductor, the coefficient of viscosity of a liquid, 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

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

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		BT Mapped (Highest Level)
CO1	develop the prototype model using mechanical operations like welding, forming and machining processes	Applying (K3), Precision (S3)
CO2	sketch 3D model and develop the prototype using 3D printer	Applying (K3), Precision (S3)
CO3	design and develop the autonomous robot for real-time applications	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	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

Signature of the Chairman
Board of Studies - Mechanical

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:**	**6**

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:**	**6**

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:**	**8**

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", 7th 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 - S 4 H

24VEC11 - YOGA AND VALUES FOR HOLISTIC DEVELOPMENT

(Common to All Engineering and Technology Branches)

rogramme & Branch	All B.E./B.Tech. Branches	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	1	HS	15	0	15	0	30	1

Preamble	Yoga or yogasanas are considered as art and science of healthy living by our ancient gurus. It is method to bring harmony of body and mind for general wellbeing. Yoga is considered as one of the greatest gifts to the world by Indians for healthy living. Students in particular are benefitted by learning yoga.

Unit – I	Introduction:	2

The Origins of Yoga – Definitions - Concepts - Aims and objectives of Yoga – Yoga is a Science and Art – Rules and Regulations of Asanas – Classifications of Yogasanas – Patanjali's Ashtanga Yoga – Pranayama – Mudras & Bandhas - Shatkarma (Cleansing Practice) - Streams of Yoga – Modern Trends in yoga.

Unit – II	Yoga and Mind:	2

The Nature of Mind - Five Elements and the Mind - Meditation and the Mind - Functions of the Mind - Role of Yoga in Psychological problems: Mood Disorders, Major Depressive Disorder, Cyclothymic Disorder.

Unit – III	Yoga and Values, Diet:	2

Human Values – Social Values – Role of Yoga in Personality Integration - Concepts of Natural Diet - Naturopathy Diet – Eliminative Diet – Soothing Diet – Constructive Diet.

Unit – IV	Asanas:	2

Prayer - Starting & Closing - Preparatory practices – Loosening Practices – Meaning, Definitions and Objectives of Asanas - Principles of Practicing Asanas. Asanas: Standing – Sitting – Prone – Supine – Suryanamaskar.

Unit – V	Pranayama and Meditation:	2

Breathing Practices for awareness - Definitions and Objectives of Pranayama - Principles of Practicing Pranayama. Pranayama: Nadi Shuddhi - Kapalabathi – Sitali – Sitkari – Bhranari – Ujjayi – Relaxation Techniques – Meditation.

TEXT BOOK:

1.	Swami satyananda saraswathi, "Asana pranayama mudra bandha", Bihar school of yoga, 4th Edition, 1969.
2.	Swami mukthi Bodhanandha, "Hatha yoga pradipika", Bihar school of yoga, 4th Edition, 1985.

REFERENCES:

1.	B.K.S. Iyenkar, "Yoga the path of holistic health", DK Limited, 2nd Edition, 1969.
2.	Selvarasu, "Kriya cleansing in yoga", Aruvi yoga, 3rd Edition, 2002.

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)

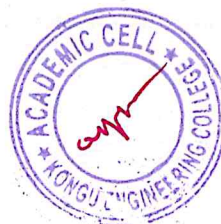Signature of the Chairman
Board of Studies - S & H (maths)

24FTC31 - ENGINEERING PROPERTIES OF FOOD MATERIALS

Programme & Branch	B.Tech & Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	3	PC	45	0	30	45	120	4

Preamble	To impart knowledge on physical, thermal, optical, electromagnetic, rheological and textural properties of food materials and its measurement methods

Unit- I	Physical Properties:	9

Importance of engineering properties, Physical properties of food materials- size, shape, volume, density, porosity and surface area – definitions and measurements, Frictional properties –coefficient of friction, angle of repose – types and its determination, rolling resistance and angle of internal friction – definition, Aerodynamic properties – Drag coefficient, Terminal Velocity and its application.

Unit – II	Thermal Properties:	9

Definition of specific heat, enthalpy, thermal conductivity, thermal diffusivity, surface heat transfer coefficient. Measurement of specific heat, thermal conductivity – steady state and unsteady state methods, thermal diffusivity – Dickerson's method, Calorific value of food, Bomb calorimeter, Boiling point elevation and freezing point depression - definition, Applications of thermal properties.

Unit – III	Optical and Electrical Properties:	9

Refractive index of food items, Abbe's refractometer, Optical activity, Polarimeter, Gloss and glossimeter, color, translucency – Definitions and applications. Electromagnetic Properties: Electrical properties- electrical conductivity and its measurement, dielectric properties - measurement methods, effect on moisture, temperature and composition, microwave heating and other applications.

Unit – IV	Rheological Properties:	9

Classification of rheology, Stress Strain behavior of Newtonian and Non- Newtonian fluids- Bingham and Non-Bingham. Stress- strain relationships in solids, liquids and viscoelastic behavior- stress relaxation test, creep test and dynamic test, stress-strain diagrams, Rheological models – Kelvin and Maxwell model. Viscosity – Types and its definitions, measurement methods - Capillary, Orifice, Falling and Rotational viscometers.

Unit – V	Textural Properties:	9

Types of food textures, Texture measuring instruments- Compression, Snap Bending, Cutting Shear, Puncture, Penetration and TPA, Properties of food powders. Color: Interaction of object with light, Measurement methods -Spectrophotometer and Colorimeter, Color order systems- Munsel color system, CIE color system, Hunter lab color space, Lovibond system.

LIST OF EXPERIMENTS / EXERCISES:

1.	Determination of size, roundness, sphericity and 1000 grain weight of food grains.
2.	Determination of bulk density, true density and porosity.
3.	Determination of angle of repose for grain sample.
4.	Determination of co-efficient of friction for grain sample.
5.	Determination of energy value of foods using bomb calorimeter.
6.	Determination of refractive index and viscosity of food materials.
7.	Experiment on drying characteristics of food material using microwave dryer.
8.	Determination of tensile strength of different packaging materials.
9.	Determination of texture profile analysis of food materials.
10.	Determination of colour analysis of food materials.

TEXT BOOK:

1.	Serpil Sahin and Servet Gulum Sumnu, "Physical Properties of Foods", 1st Edition, Springer, New York, 2006.

REFERENCES/ MANUAL / SOFTWARE:

1.	Sahay K.M. and Singh K.K., "Unit Operations of Agricultural Processing", 2nd Edition, Vikas Publishing, New Delhi, 2004.
2.	Rao M.A. and Rizvi S.S.H., "Engineering Properties of Foods", 4th Edition, CRC Press, New York, 2014.
3.	Laboratory Manual
4.	Sain, M., et al., "Practical Lab Manual: Engineering Properties of Food and Dairy Products," 1st Edition, Prakhar Goonj Publications, 2023.

*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 various physical properties in food process design	Applying (K3), Precision (S3)
CO2	outline the thermal properties of foods and its measurement methods	Understanding (K2), Precision (S3)
CO3	make use of optical and electromagnetic properties of food materials in food processes	Applying (K3), Precision (S3)
CO4	explain various rheological behavior of solid, liquid and viscoelastic food materials	Understanding (K2), Precision (S3)
CO5	choose suitable textural and color measurement techniques for food materials	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	1				1		1	3	3
CO2	3	3	2	1	1				1		1	2	3
CO3	3	3	2	1	1				1		2	2	3
CO4	3	3	3	2	2				1		2	3	3
CO5	3	3	3	2	2				1		2	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		75	35				100
CAT2		40	60				100
CAT3		50	50				100
ESE		40	60				100

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

Signature of the Chairman
Board of Studies - Food Technology

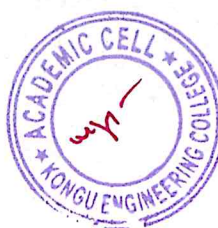| 24FTT31 - FOOD SCIENCE AND NUTRITION									
Programme & Branch	**BTech & Food Technology**	**Sem.**	**Category**	**L**	**T**	**P**	**SL***	**Total**	**Credit**
Prerequisites	**Nil**	3	PC	45	0	0	45	90	3

Preamble	This course will deal about the importance of nutrients and its assimilation, energy balance and nutrition for different age groups	
Unit – I	**Food Groups and Nutrition:**	**9**
Definition, six classes of nutrients, RDA, nutritional status and its assessment, nutritional requirement, malnutrition – over nutrition and under nutrition. Balanced diet: Diet planning principles, dietary guidelines; food groups; Anatomy and physiology of the digestive tract, mechanical and chemical digestion, absorption and transport of nutrients		
Unit – II	**Carbohydrates - Sugars, Starch and Fiber:**	**9**
Digestion and absorption of carbohydrates, lactose intolerance; Glycemic and Non-glycemic carbohydrates, recommendations of sugar intake for health, health effects of fiber and starch intake, artificial sweeteners; Nutrition and Diabetes, GTT		
Unit - III	**Lipids and Proteins:**	**9**
Food Sources, Lipid digestion, absorption, and transport; Functions of the triglycerides; essential fatty acids - omega-3 and omega-6 fatty acids; trans fatty acids, Medium Chain Triglycerides, phospholipids, and sterols; Health effects and recommended intakes of lipids. Digestion and absorption of proteins; Functions of proteins; amino acids; Protein quality, methods of assessing protein quality; Recommended intakes of proteins; protein and amino acid supplements; Protein Energy Malnutrition - Marasmus and Kwashiorkor.		
Unit - IV	**Energy Value, Energy Balance and Body Composition:**	**9**
Calorific value of foods; basal metabolism, specific dynamic action of foods, physiological energy value of foods. Energy balance – components – energy intake, energy expenditure, energy requirement. Body composition – Five levels of body composition – body composition techniques. Obesity- BMR and BMI calculations.		
Unit - V	**Nutrition for Different Age Groups:**	**9**
Factors to be considered in meal/menu planning. Pregnancy - nutrition requirements and food selection. Lactation - nutritional requirements. Infancy - nutritional requirements, breast feeding, infant formula. Introduction of supplementary foods. Early childhood. (Toddlers and Preschoolers) - Growth and nutrient needs, nutritional related problems, Feeding Pattern. School children - Nutritional requirements, Importance of snacks, school lunch. Adolescence - Growth, Nutrient needs, food choice, eating habits, factors influencing. Geriatic Nutrition - Factors affecting food intake and nutrients use, nutrient needs, nutrition related problems.		

TEXT BOOK:	
1.	Srilakshmi B, "Nutrition Science", 6th Edition, New Age International Publishers, New Delhi, 2018

REFERENCES:	
1.	Mann Jim and Stewart Truswell (Eds), "Essentials of Human Nutrition", 5th Edition, Oxford University Press, Oxford, 2017.
2.	Michael J. Gibney, Susan A. Lanham-New, Aedin Cassidy and Hester H. Vorster, "Introduction to Human Nutrition", 2ndEdition, Wiley Blackwell, UK, 2013.

*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	interpret the physiological and metabolic functions of nutrients	Understanding (K2)
CO2	discover appropriate carbohydrate diet based on their health effects	Analyzing(K4)
CO3	outline the lipids and proteins based on their nutritional value	Understanding (K2)
CO4	interpret the energy value of foods and body composition and explain the energy balance	Understanding (K2)
CO5	construct diet for different age groups based on nutritional requirements	Applying(K3)

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	1	1		3			1		1	1	1
CO2	3	3	1	1		3			1		1	1	2
CO3	3	3	1	1		3			1		1	1	2
CO4	3	3	1	1		3			1		1	1	1
CO5	3	3	1	1		3			1		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		60	20	20			100
CAT2		60	20	20			100
CAT3		70	30				100
ESE		60	20	20			100

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

Signature of the Chairman
Board of Studies - Food Technology

24FTT32- FOOD PROCESS CALCULATIONS

Programme & Branch	B. Tech & Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	3	ES	45	15	0	60	120	4

Preamble	The course helps the student to understand fundamental and the stoichiometric calculations, material and energy balance associated with unit operations.

Unit –I	Units and Dimensions, Fundamental Calculations:	9+3

Basic and derived units, unit conversions, use of model units in calculations, methods of expression, compositions of mixture and solutions, ideal and real gas laws –gas constant -calculations of pressure, volume and temperature using ideal and vander-Waals equation, use of partial pressure and pure component volume in gas mixture calculations.

Unit –II	Material Balance Calculation:	9+3

Stoichiometric principles, material balance without chemical reaction -application of material balance to unit operations: distillation, evaporation, crystallization, drying, blending of food ingredients and extraction.

Unit–III	Humidity and Saturation and Recycle Operations:	9+3

Humidity and Saturation: Calculation of absolute humidity, molal humidity, relative humidity and percentage humidity, wet and dry bulb temperature, dew point - Humidity chart usage. Bypass and Recycle Operations: Bypass operation, recycle operations - block diagram, purging operations, purge ratio, recycle ratio and purge stream.

Unit –IV	Energy Balance Calculation:	9+3

Heat capacity of solids, liquids, gases and solutions, use of mean heat capacity in heat calculations, problems involving sensible heat and latent heats, enthalpy changes in food. Standard heat of reaction, heats of formation, combustion, solution, mixing etc., calculation of standard heat of reaction - Effect of pressure and temperature on heat of reaction.

Unit –V	Combustion and Process Flow Sheet Calculation:	9+3

Combustion: Combustion of solids, liquid and gas, determination of NHV and GHV. Determination of composition by Orsat analysis - Calculation of excess air, theoretical oxygen requirement. Process Flow Sheet Calculation: Material and Energy Balance for selected food Process.

TEXT BOOK:

1.	Himmelblau D.M.," Basic Principles and Calculations in Chemical Engineering",8th Edition, Prentice Hall of India, New Delhi, 2013.

REFERENCES:

1.	Gavhane K.V., "Introduction to Process Calculations (Stoichiometry)", revised edition, Nirali Prakashan, 2012.
2.	Stavros Yanniotis,"Solving Problems in Food Engineering",3rd Edition Springer, New York,2008.
3.	Romeo T. Toledo, Rakesh K. Singh, Fanbin Kong, "Fundamentals of Food Process Engineering",4th Edition, Springer Publishers, New York, 2018.

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

COURSEOUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	make use of different systems of units and dimensions, calculate compositions of mixtures and solutions	Applying(K3)
CO2	outline the stoichiometry principles and apply material balance for different unit operations	Applying(K3)
CO3	Perform humidification calculations and apply material balance for bypass, recycle operations	Applying(K3)
CO4	make use of energy balance for system without chemical reactions	Applying(K3)
CO5	make use of material and energy balance in various process and determine the GHV, NHV and composition of fuels	Analyzing(K4)

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	1	1	1				1		1	1	1
CO2	3	3	2	2	2				1		1	3	3
CO3	3	3	2	2	2	1			1		1	3	3
CO4	3	3	2	2	2				1		1	2	2
CO5	3	3	3	3	2	1	1		1		2	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	60	20			100
ESE		5	75	20			100

*±3%may be varied (CAT1, 2 & 3 – 50 marks & ESE– 100 marks)

Signature of the Chairman
Board of Studies - Food Technology

24FTT33- PROCESS FLUID MECHANICS									

Programme & Branch	B. Tech & Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	3	PC	45	15	0	60	120	4

Preamble	This course provides an introduction to the properties and behaviour of fluids. It introduces dimensional analysis and equations of Fluid flow and enables the students to apply in mixing, pumping and metering.	
Unit –I	**Fluid Statics and Flow phenomena:**	**9+3**

Nature of fluids - Physical properties of fluids. Fluid statics -Hydrostatic equilibrium. Application of fluid statics: manometers - continuous gravity decanter- storage Tank. Types of fluids: Compressible and incompressible fluids, Newtonian and Non–Newtonian fluids. Flow of Fluids: Concept of flow rates, velocity and type of flows

Unit –II	**Equations of Fluid Flow:**	**9+3**

Continuity equation - Bernoulli equation - Correction of Bernoulli equation for fluid friction application of Bernoulli equation for pump work. Friction in pipes-Laminar and turbulent flow of fluids through closed conduits - Velocity profiles and friction factor for smooth and rough pipes- Friction loss due to sudden enlargement and contraction- Friction loss in fittings, valves and coils.

Unit –III	**Flow Past Immersed Bodies, Agitation**	**9+3**

Pressure drop for flow of liquids through porous media. Motion of particles through fluids: Equation for one dimensional motion of spherical particle through fluid, terminal velocity, Hindered settling. Agitation of Liquids: Agitation Vessels- Types of impellers - Flow pattern in agitated vessel- Estimation of Power consumption in agitated vessels.

Unit –IV	**Transportation of Fluids:**	**9+3**

Classification of Pumps. Positive displacement pumps: operation, capacity and characteristics. Centrifugal pump: Performance, losses and characteristics. Calculation of power and discharge. Working principle and applications of Gear pumps, Lobe pumps, Screw pumps, diaphragm pumps, progressive cavity pumps, vacuum pumps, metering pumps and peristaltic pumps. Fans, blowers and compressors–Selection, types and applications. Pipelines for the transportation–sanitary aspects and material of construction

Unit –V	**Metering of Fluids:**	**9+3**

Variable head meters: Orifice meter, Venturimeter, Pitot tube. Variable area meters: Rotameter. Working Principle and applications of Doppler Ultrasonic flow-meters, Transittime flowmeters, Magnetic flowmeters, Turbine flowmeters, Thermal flowmeters, Positive-displacement flowmeters, Coriolis flowmeter and Surface Acoustic Wave flowmeters. Notches and Weirs. Valves– Types, selection, and applications.

TEXT BOOK:

1.	McCabe W.L., Smith J.C. and Harriot P.,"Unit Operations of Chemical Engineering",7thEdition, McGraw Hill, New York, 2005.

REFERENCES:

1.	Gavhane K.A , " Unit Operations- I", revised edition, Nirali Prakashan, 2009.
2.	RomeoT.Toledo, "Fundamentals of Food Process Engineering",4th Edition, Springer, New York,2018.
3.	PaulSinghR., Dennis R. Heldman, "Introduction to Food Engineering",5th Edition, Academic Publisher,2013.

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

COURSEOUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Classify fluids and apply hydrostatic equilibrium	Applying(K3)
CO2	Derive and apply equations of fluid-flow	Applying(K3)
CO3	explain the working principle of mixers, pumps, flow meters and valves	understanding (K2)
CO4	Examine the performance of agitators, pumps and flowmeters	Analyzing(K4)
CO5	Select suitable agitators, pumps, flow measuring devices and valves	Applying(K3)

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	2	1				1		1	2	1
CO2	3	3	2	2	1				1		1	2	2
CO3	3	2	2	1					1		2	3	2
CO4	3	3	2	2	1	1	1		1		2	3	2
CO5	3	3	2	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		50	50				100
CAT2		50	50				100
CAT3		50	35	15			100
ESE		50	40	10			100

*±3%may be varied (CAT1, 2 & 3–50 marks & ESE– 100marks)

Signature of the Chairman
Board of Studies - Food Technology

24FTT34- FOOD CHEMISTRY									
Programme& Branch	B.Tech & Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	3	PC	45	0	0	45	90	3

Preamble	This course deals about the importance of micronutrients, food additives, modification of biomolecules and chemistry of muscle tissue

Unit –I	**Minerals and Vitamins:**	9

Minerals: Major minerals - Calcium, Potassium, Sodium, Phosphorus. Minor minerals - Iron, Zinc, Iodine, Copper, Selenium. Functional role and deficiency. Vitamins: Definition, water soluble and fat-soluble vitamins, sources, functions and deficiency symptoms.

Unit –II	**Changes during Processing:**	9

Cooking: objectives - methods – moist heat, dry heat and combination. Loss of nutrients and prevention-biochemical changes in carbohydrates - Gelatinization and retrogradation of starch - proteins and lipids. Parboiling of rice. Enzymatic browning reaction, non-enzymatic browning reactions - caramelization, Maillard reaction

Unit –III	**Modification of Biomolecules:**	9

Modified starches, resistant starch. Starch hydrolysates – Maltodextrin, cyclodextrin and dextrin. Modification of proteins–heat, chemical and enzymatic methods. Modification of fats - Hydrogenation - cis and trans isomers, interesterification, winterization. Biochemical changes during processing of foods – malting and baking.

Unit –IV	**Food Additives, Food colours and Flavours:**	9

Food additives: classification and purpose - Role of thickeners, stabilizers, sweeteners, emulsifiers, leaveners, colours, flavoring agents, flour improvers, anticaking agents, sequestrants, humectants, preservatives - examples. Food colours and Flavours: Natural and synthetic colourants - chlorophyll, carotenoids, betalains, anthocyanins and other phenols. Flavours – sensory perception of flavors, Molecular Mechanisms of Flavour Perception, specific and synthetic flavours, Taste and Other Saporous Substances, Vegetable, Fruit, and Spice Flavours, Flavours from Lactic Acid–Ethanol Fermentations

Unit –V	**Chemistry of edible muscle Tissues:**	9

Structure of muscle-conversion of muscle to meat – natural and induced postmortem biochemical changes affecting meat quality. Chemistry of processed meats – curing, hydration and water retention, formation of gel matrix, fat immobilization and stabilization

TEXT BOOK:

1.	Srinivasan Damodaran, Kirk L. Parkin (Eds), Fennema's "Food Chemistry", 5thEdition, CRC Press, Florida, 2017

REFERENCES:

1.	Belitz H.D., Grosch W. and Schieberle P., "Food Chemistry", 4th and revised Edition, Springer Berlin Heideberg, 2008.
2.	John M.deMan ,John Finley, W. Jeffrey Hurst, Chang Lee, "Principles of Food Chemistry", 4th Edition, Springer International Publishing, Switzerland, 2018.

*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 nutritional importance of vitamins and minerals	Understanding (K2)
CO2	analyze the changes in food components during cooking and processing.	Analyzing (K4)
CO3	Examine the role of modified carbohydrates, proteins and fats in food processing	Analyzing (K4)
CO4	identify the role of food additive, colours and flavors in food processing	Applying (K3)
CO5	infer the biochemical changes in meat during processing	Understanding (K2)

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	2	2
CO2	3	3	2	1	1	1			1		2	2	3
CO3	3	3	2	1	1	2	1		1		2	3	3
CO4	3	3	2	1	1	2	1		1		3	3	3
CO5	3	3	2	1		1			1		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		60	20	20			100
CAT2		40	40	20			100
CAT3		50	50				100
ESE		45	35	20			100

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

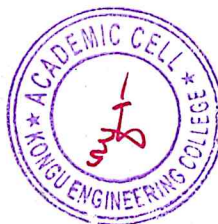Signature of the Chairman
Board of Studies - Food Technology

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	6

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	6

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	6

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	6

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	6

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", 1st 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", 1st 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)

Signature of the Chairman
Board of Studies -

24FTL31- FLUID FLOW LABORATORY

Programme& Branch	B.Tech & Food Technology	Sem.	Category	L	T	P	SL*	Total	Credit
Prerequisites	Nil	3	PC	0	0	30	0	30	1
Preamble	To impart practical knowledge required for handling Newtonian Fluids.								

LISTOF EXPERIMENTS / EXERCISES:

1.	Determination of discharge coefficient of Venturi meter
2.	Determination of discharge coefficient of Orifice meter
3.	Verifying relationship between friction factor and Reynolds number for flow through square ducts
4.	Determination of loss co-efficient of valves and pipe fittings
5.	Determination of critical Reynolds number for flow through helical coils
6.	Determination of discharge coefficient of V- notch
7.	Verifying relationship between friction factor and Reynolds number for flow through annular pipes
8.	Estimation of Power consumption in Agitation Vessel
9.	Estimation of performance characteristics of centrifugal pump
10.	Estimation of performance characteristics of reciprocating pump
11.	Virtual : a. Demonstration and estimation of discharge coefficient of Venturimeter b. Demonstration and determination of energy loss in pipe c. Demonstration and estimation of Co-efficient of Viscosity of fluid

REFERENCES/MANUAL /SOFTWARE:

1.	Laboratory Manual
2.	McCabe W.L., Smith J.C., and Harriot P., "Unit Operations of Chemical Engineering", 7th Edition, McGraw Hill, New York, 2005.
3.	Perry Robert, "Perry's Chemical Engineers Handbook",8th Edition, McGraw Hill, New York,2007.
4	Gavhane K.A., "Unit Operations –I",27th Edition, Nirali Prakashan Publications, Pune, 2018.

COURSEOUTCOMES: On completion of the course, the students will be able to		BT Mapped (Highest Level)
CO1	Estimate the discharge coefficient for variable area and head flow meters	Evaluating(K5), Precision (S3)
CO2	Measure and analyze the flow of fluids through valves and pipe fittings	Evaluating(K5), Precision (S3)
CO3	Evaluate the performance of pumps and power consumption of agitator.	Evaluating(K5), 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	3	2	1	1	3	3	2	2	3	2
CO2	3	3	3	3	2	1	1	3	3	2	2	3	2
CO3	3	3	3	3	1	1	1	3	3	2	2	3	2

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

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

R.oomy.
Signature of the Chairman
Board of Studies - Food technology

24FTL32 - FOOD CHEMISTRY LABORATORY										
Programme& Branch	**B.Tech & Food Technology**	**Sem.**	**Category**	**L**	**T**	**P**	**SL***	**Total**	**Credit**	
Prerequisites	Nil	3	PC	0	0	30	0	30	1	
Preamble	To deal about analysis and estimation of biomolecules.									

LISTOF EXPERIMENTS / EXERCISES:

1.	Qualitative tests for monosaccharide, disaccharides, polysaccharides
2.	Estimation of total carbohydrate and crude fiber in food product
3.	Extraction and analysis of oil (iodine number, saponification number, acid number)
4.	Estimation of protein by Lowry's method
5.	Determination of dextrose equivalent in modified starches
6.	Extraction and estimation of carotenoids and lycopene in fruits/vegetables
7.	Estimation of polyphenols/ flavanoids in fruits/vegetables
8.	Determination of swelling power and water-soluble index of starch
9.	Estimation of antioxidant activity and Vitamin C in fruits/vegetables
10.	Estimation of Iron in food samples
11.	Virtual Laboratory Experiments: a. Iso-electric precipitation of protein from milk

REFERENCES/MANUAL /SOFTWARE:

1.	Laboratory Manual
2.	Ranganna S., "Handbook of Analysis and Quality Control for Fruit and Vegetable Products",2nd Edition, Tata McGraw Hill, New Delhi, 2008.
3.	Sadasivam S.and ManickamA., "Biochemical Methods",3rd Edition, New Age International, New Delhi,2018.
4	http://vlab.amrita.edu/?sub=3&brch=63&sim=158&cnt=1

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	Analyze and estimate macro and micro-nutrients in food products	Evaluating(K5), Precision (S3)
CO2	Extract oil and analyze its properties	Evaluating(K5), Precision (S3)
CO3	Extract and estimate phytochemicals in food products	Evaluating(K5), 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	3	2	1	1	3	3	1	1	2	3
CO2	3	3	3	3	2	1	1	3	3	1	1	2	3
CO3	3	3	3	3	2	1	1	3	3	1	1	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 - Food Technology