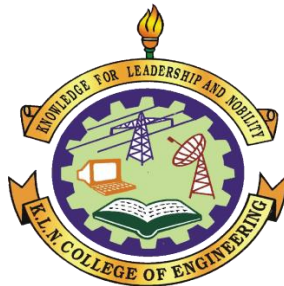


# **K.L.N.COLLEGE OF ENGINEERING**

**Pottapalayam-630612, Sivagangai District**

**(An Autonomous Institution, Affiliated to Anna University, Chennai)**



**Estd: 1994**

## **FIRST AND SECOND YEAR CURRICULUM AND SYLLABUS**

**REGULATIONS 2024**

**For under Graduate Program**

## **B.E. MECHANICAL ENGINEERING**

**CHOICE BASED CREDIT SYSTEM**

**(For the students admitted from the Academic Year 2025 - 2026 onwards)**

Dr.P.Udhayakumar,  
Professor & Head,  
Department of Mechanical Engineering,  
K.L.N. College of Engineering,  
Pottapalayam, Sivaganga – 630612.



**K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM**  
(An Autonomous Institution, Affiliated to Anna University, Chennai)



### **VISION OF THE INSTITUTION**

To become a Centre of Excellence in Technical Education and Research in producing Competent and Ethical professionals to the society

### **MISSION OF THE INSTITUTION**

To impart Value and Need based curriculum to the students with enriched skill development in the field of Engineering, Technology, Management and Entrepreneurship and to nurture their character with social concern and to pursue their career in the areas of Research and Industry.

### **VISION OF THE DEPARTMENT**

To become a centre of excellence for Education and Research in Mechanical Engineering.

### **MISSION OF THE DEPARTMENT**

- Attaining academic excellence through effective teaching learning process and state of the art infrastructure.
- Providing research culture through academic and applied research.
- Inculcating social consciousness and ethical values through co-curricular and extra-curricular activities.



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### **PROGRAM EDUCATIONAL OBJECTIVES(PEOs)**

- PEO1** Graduates will have successful career in Mechanical Engineering and service industries.
- PEO2** Graduates will contribute towards technological development through academic Research and industrial practices.
- PEO3** Graduates will practice their profession with good communication, leadership, ethics And social responsibility.
- PEO4** Graduates will adapt to evolving technologies through life-long learning.

### **PROGRAM SPECIFIC OUTCOMES(PSOs)**

- PSO1** Derive technical knowledge and skills in the design, develop, analyze and manufacture of mechanical systems with sustainable energy, by the use of modern tools and techniques and applying research based knowledge.
- PSO2** Acquire technical competency to face continuous technological changes in the field of mechanical engineering and provide creative, innovative and sustainable solutions to complex engineering problems.
- PSO3** Attain academic and professional skills for successful career and to serve the society needs in local and global environment.



### **Knowledge and Attitude Profile (WK)**

**WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

**WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

**WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

**WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

**WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

**WK6:** Knowledge of engineering practice(technology)in the practice is as in the engineering discipline.

**WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

**WK8:**Engagement with selected knowledge in the current research hliterature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

**WK9:** Ethics, inclusive behavior and conduct - Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes



### Program Outcomes (POs)

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

**PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

**PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

**PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

**PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

**PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)

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

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

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

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

#### **PO11: Life-Long Learning:**

Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adapt ability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)



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**REGULATIONS 2024**  
**For Under Graduate Program**  
**B.E.MECHANICAL ENGINEERING**  
**CHOICE BASED CREDIT SYSTEM**

**CATEGORY OF COURSES**

- i. **Humanities Social Sciences and Management (HSM) courses** include Technical English, Foreign Language, Engineering Ethics and Human Values, Communication skills, Entrepreneurship, Physical Education and Environmental Sciences and Sustainability
- ii. **Basic Sciences (BS) courses** include Mathematics, Physics, Chemistry, etc.
- iii. **Engineering Sciences (ES) courses** include Industrial Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, Instrumentation etc.
- iv. **Professional Core (PC) courses** include the core courses relevant to the chosen specialization/branch.
- v. **Professional Elective (PE) courses** include the elective courses relevant to the chosen specialization / branch.
- vi. **Open Elective (OE) courses** include the courses from other branches which a student can choose from the list specified in the curriculum of B.E. / B. Tech. Programmes.
- vii. **Employability Enhancement Courses (EEC)** includes Project Work, Internship, Creative and Innovative Project, Seminar, Professional Practices, Industrial/Practical Training.
- viii. **Mandatory Courses (MC)** include Personality and Character development and the courses recommended by the regulatory bodies such as AICTE, UGC, etc



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**REGULATIONS 2024**  
**CHOICE BASED CREDIT SYSTEM**  
**B.E. MECHANICAL ENGINEERING**

**SEMESTER I**

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

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>Induction program</b>								
<b>THEORY</b>								
1	24HS101	Professional English – I	HS	2	2	0	0	2
2	24BS101	Engineering Mathematics	BS	4	3	1	0	4
3	24BS102	Engineering Physics	BS	3	3	0	0	3
4	24BS103	Engineering Chemistry	BS	3	3	0	0	3
5	24GE101	Problem solving and C Programming	ES	3	3	0	0	3
6	24GE102	Engineering Graphics	ES	3	2	1	0	3
7	24HST01	தமிழர்மரபு /Heritage of Tamils	HS	1	1	0	0	1
<b>PRACTICAL</b>								
8	24BS1L1	Basic Science Laboratory	BS	4	0	0	4	2
9	24GE1L1	C Programming laboratory	ES	4	0	0	4	2
10	24HS1L1	English Laboratory	HS	2	0	0	2	1
<b>TOTAL</b>				<b>29</b>	<b>17</b>	<b>2</b>	<b>10</b>	<b>24</b>

**SEMESTER II**

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	24BS201	Advanced Calculus (Common to B.E. Mech, EEE & ECEprogrammes)	BS	4	3	1	0	4
2.	24HS202	Environmental Sciences and Sustainability	HS#	2	2	0	0	2
3.	24GE201	Python Programming	ES#	3	3	0	0	3
4.	24GE202	Basic Electrical and Electronics Engineering	ES@	3	3	0	0	3
5.	24ME201	Engineering Mechanics	PC	4	3	1	0	4
6.	24HST02	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS#	1	1	0	0	1
7.		Foreign Language	HS#	2	2	0	0	-
<b>THEORY CUM PRACTICAL</b>								
8.	24HS201	Professional English–II	HS#	4	2	0	2	3
<b>PRACTICAL</b>								
9.	24GE2L1	Python Programming Laboratory	ES#	3	0	0	3	1.5
10.	24GE2L2	Industrial Practices Workshop	ES#	3	0	0	3	1.5
11.	24HS2L1	Aptitude and Soft Skills–I	EEC#	2	0	0	2	1*
12.	24HS2L2	Physical Education - I	HS#	2	0	0	2	1*
<b>TOTAL</b>				<b>33</b>	<b>19</b>	<b>2</b>	<b>12</b>	<b>23</b>

#Common to all B.E. / B.Tech programmes

@Common to B.E. Mech., CSE,CSE (CS), CSE(IoT), B.Tech. IT, AI&DS programmes

\*The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA

**KLNCE UG MECH R2024 (AY 2025 – 2026 admitted)**

**SEMESTER III**

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	24BS301	Transforms and Partial Differential Equations (Common to B.E.MECH & B.E. EEE programmes)	BS	4	3	1	0	4
2.	24ME301	Strength of Materials	PC	3	3	0	0	3
3.	24ME302	Fluid Mechanics and Machinery	PC	3	3	0	0	3
4.	24ME303	Manufacturing Processes	PC	3	3	0	0	3
5.	24ME304	Engineering Thermodynamics	PC	4	3	1	0	4
6.	24HS301	Human Values and Ethics (Common to all B.E./B.Tech. programmes)	HS	2	2	0	0	2
<b>PRACTICAL</b>								
7.	24ME3L1	Computer Aided Machine Drawing	PC	3	0	0	3	1.5
8.	24ME3L2	Strength of Materials and Fluid Machinery Laboratory	PC	3	0	0	3	1.5
9.	24HS3L1	Aptitude And Soft Skills–II (Common to all B.E./B.Tech. programmes)	EEC	2	0	0	2	1*
10.	24HS3L2	Physical Education – II (Common to all B.E./B.Tech. programmes)	HS	2	0	0	2	1*
<b>TOTAL</b>				29	17	2	10	22

**SEMESTER IV**

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	24BS401	Probability, Statistics and Numerical Methods (Common to B.E Mech & EEE programmes)	BS	4	3	1	0	4
2.	24ME401	Kinematics and Dynamics of Machines	PC	4	3	1	0	4
3.	24ME402	Machine Tool Technology	PC	3	3	0	0	3
4.	24ME403	Thermal Engineering	PC	4	3	1	0	4
5.	24ME404	Engineering Materials and Metallurgy	PC	3	3	0	0	3
<b>THEORY</b>								
<b>THEORYCUMPRACTICAL</b>								
6.	24ME405	Metrology and Measurement Practices	PC	5	3	0	2	4
<b>PRACTICAL</b>								
7.	24ME4L1	Machine Tool Technology Laboratory	PC	3	0	0	3	1.5
8.	24ME4L2	Thermal Engineering Laboratory	PC	3	0	0	3	1.5
9.	24HS4L1	Aptitude and Soft Skills –III (Common to all B.E./B.Tech. programmes)	EEC	2	0	0	2	1*
<b>TOTAL</b>				31	18	3	10	25

\*The grades earned by the students will be recorded in the mark sheet, however the same shall not be considered for the computation of CGPA

<b>24HS101</b>	<b>PROFESSIONAL ENGLISH – I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**OBJECTIVES:**

- To improve the communicative competence of learners.
- To learn to apply basic grammatical structures in appropriate contexts.
- To acquire lexical competence, use them appropriately in sentences, and comprehend their meaning in a text.
- To help learners use language effectively in professional contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals.

**UNIT-I Introduction to Effective Communication 6**

Exploring the Elements of Effective Communication through various Activities - Unveiling the Significance of Effective Communication in Academic, Research, and Professional Achievements -Dissecting the Seven Components Integral to Effective Communication - Analyzing the Characteristics of Effective Writing - Enhancing English Language and Communication Skills for Optimal Course Outcome

**Introduction to Fundamentals of Communication**

**Reading** – Reading Brochures (Technical Context) – Telephone Messages / Social Messages. **Writing** – Email to MNC's (Requesting for IV, Internship, and Requesting HR for College Function, Internal & External Business Communication) - Letter to the Principal (Requesting Bona-fide Certificate, Getting Original Certificate, etc.,) **Grammar** – Present Tense – Questions Types. **Vocabulary** – Technical Vocabulary.

**UNIT-II Narration and Summation 6**

**Reading** – Biographies. **Writing** – Guided Writing – Paragraph Writing – Travel & Technical Blogs – Report on Events. **Grammar** – Simple Past Tense – Concord. **Vocabulary** – Word Formation – Prefix, Suffix and Roots

**UNIT-III Description of a Process / Product 6**

**Reading** – Project Reviews – User Manuals. **Writing** – Definitions – Instructions – Process Description. **Grammar** – Modals. **Vocabulary** – Compound Nouns – Voices

**UNIT- IV Classification and Recommendations 6**

**Reading** – Newspaper Articles, Note Taking. **Writing** – Inference – Charts, Diagrams, Tables – Note Making – Recommendations. **Grammar** – Articles – Possessive & Relative Pronouns – Degrees of Comparison.

**UNIT-V Expression 6**

**Reading** – Opinion Blogs. **Writing** – Essay Writing – Descriptive Writing - Social Issues (Public Transportation, Drinking Water) - Narrative Writing (Cyber Crime, Experience of First Semester). **Grammar** – Future Tense – Punctuation – Cause & Effect – Discourse Markers.

**CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021. Authored by Dr. VeenaSelvam, Dr. SujathaPriyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Juevani, Department of English, Anna University.

**REFERENCES:**

1. Technical Communication – Principles And Practices By Meenakshi Raman &Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English for Technical Communication (With CD) By AyshaViswamohan, Mcgraw Hill Education, ISBN: 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.
6. A Course in Technical English by Mr. D. Praveen Sam, KN Shoba, Cambridge University Press, 2020, India.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :PROFESSIONAL ENGLISH – I</b>		<b>COURSE CODE : 24HS101</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K – CO</b>
<b>C101.1</b>	Remember and use appropriate words in a professional context in precise and efficient way on technological contexts	I-V	AD
<b>C101.2</b>	Form situational conversations and technical writing styles for interpersonal and effective communication	I-V	AD
<b>C101.3</b>	Gain understanding of basic grammatical structures and use them in right context	I-V	AD
<b>C101.4</b>	Read and infer the denotative and connotative meanings of technical texts	I-V	AD
<b>C101.5</b>	Write definitions, descriptions, narrations and essays on various topics	I-V	AD



Dr.P.Udhayakumar,  
Professor & Head,  
Department of Mechanical Engineering,  
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<b>24BS101</b>	<b>ENGINEERING MATHEMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To relate various methods of Matrix Algebra to handle practical problems arising in the field of engineering.
- To achieve conceptual understanding and to retain the best traditions of Calculus.
- To provide the basic tools of Calculus of Single and Multivariable, mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.

**UNIT - I MATRICES 9+3**

Introduction to Matrices-Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton Theorem(without proof) – Diagonalization of matrices – Reduction of a Quadratic form to Canonical form by Orthogonal transformation – Nature of Quadratic forms.

**UNIT - II DIFFERENTIAL CALCULUS 9+3**

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Differentiation of Polynomials, Exponential, Trigonometric, Hyperbolic, Logarithmic and Implicit functions- Maxima and Minima of functions of single variable.

**UNIT - III FUNCTIONS OF SEVERAL VARIABLES 9+3**

Partial differentiation – Homogeneous functions and Euler’s theorem(without proof) – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Maxima and Minima of functions of two variables – Lagrange’s method of undetermined multipliers.

**UNIT - IV INTEGRAL CALCULUS 9+3**

Definite and Indefinite integrals - Substitution rule - Techniques of integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

**UNIT - V ORDINARY DIFFERENTIAL EQUATIONS 9+3**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

**CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS**

**TEXT BOOKS:**

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44<sup>th</sup> Edition, 2017.
2. Veerarajan. T., “Engineering Mathematics I”, The Tata McGraw Hill Publication-New Delhi, First Edition, 2018.

**REFERENCES:**

1. James Stewart, “Calculus, Early Transcendental”, Cengage Learning, 7th Edition, New Delhi, 2015. [For units II & III].
2. Kreyszig Erwin, “Advanced Engineering Mathematics”, John Wiley and Sons, 9th Edition, New Delhi, 2006.
3. Wiley, “Calculus- International Student version”, 10th Edition, Wiley India Pvt. Ltd, New Delhi 2017.
4. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5<sup>th</sup> Edition, 2016.
5. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics II”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 9th Edition, 2014.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME : ENGINEERING MATHEMATICS</b>		<b>COURSE CODE : 24BS101</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K – CO</b>
<b>C102.1</b>	Determine the Eigen values, Eigen vectors to diagonalize a matrix and reduce quadratic form to canonical form.	I	K3
<b>C102.2</b>	Apply the concepts of Concavity, Convexity to determine the critical points, point of Inflection, Maxima and Minima of Single variable functions.	II	K3
<b>C102.3</b>	Compute the derivatives of functions of two variables and apply them to calculate the maxima and minima.	III	K3
<b>C102.4</b>	Determine integrals using techniques of integration, such as substitution, partial fractions and integration by parts.	IV	K3
<b>C102.5</b>	Apply the various techniques to solve higher order differential equations with constant and variable	V	K3



**REFERENCES:**

1. D. K. Bhattacharya and T. Poonam, "Engineering Physics", Oxford University Press 2017.
2. R. Wolfson, "Essential University Physics", Volume 1 & 2, Pearson Education (Indian Edition), 2009.
3. K.Thyagarajan and A.Ghatak, "Lasers: Fundamentals and Applications", Laxmi Publications (Indian Edition), 2019.
4. D. Halliday, R. Resnick and J. Walker, "Principles of Physics", Wiley (Indian Edition), 2015.
5. P. A. Tipler and G. Mosca W. H. Freeman, "Physics for Scientists and Engineers with Modern Physics", 2007.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :ENGINEERING PHYSICS</b>		<b>COURSE CODE: 24BS102</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K-CO</b>
<b>C103.1</b>	Demonstrate the properties of elasticity and measure the different moduli of elasticity	I	K3
<b>C103.2</b>	Discuss the characteristics of electromagnetic waves.	II	K2
<b>C103.3</b>	Examine the characteristics of laser and optical fiber.	III	K2
<b>C103.4</b>	Explain black body radiation, properties of matter waves and Schrodinger equation.	IV	K2
<b>C103.5</b>	Classify Bravais lattices, different types of crystal structures and crystal growth techniques	V	K3

24BS103

ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

**OBJECTIVES:**

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.
- To introduce the basic concepts and applications of corrosion and alloys.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To impart knowledge on the basic principles and preparatory methods of nano materials.

**UNIT - I WATER AND ITS TREATMENT 9**

Water: Sources and impurities, Water quality parameters: Estimation of hardness by EDTA method (Problems). Desalination of brackish water: Reverse Osmosis, Electro dialysis. Waste water treatment. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment: phosphate, colloidal, sodium aluminate and calgon conditioning and External treatment: Ion-exchange demineralization and zeolite process.

**UNIT - II ENERGY SOURCES AND STORAGE DEVICES 9**

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials, Wind energy. Batteries- Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles - working principles; Fuel cells: H<sub>2</sub>-O<sub>2</sub> fuel cell, microbial fuel cell.

**UNIT - III CORROSION AND ALLOYS 9**

Corrosion-causes-factors-types-chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control-material selection and design aspects-electrochemical protection-sacrificial anode method and impressed current cathodic method. Alloys – introduction, definition, properties of alloys, significance of alloying; Functions and effects of alloying elements; Heat treatment of steel - annealing, hardening, tempering, carburizing, nitriding; Ferrous alloys- nichrome and stainless steel (18/8); Non-ferrous alloys – brass and bronze.

**UNIT - IV FUELS AND COMBUSTION 9**

Fuels: Introduction: Classification of fuels; Coal proximate analysis of coal and manufacture of metallurgical coke (Otto Hoffmann method). Petrol characteristics, knocking - octane number, diesel oil characteristics, cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method.

**UNIT - V NANOCHEMISTRY****9**

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties: optical, electrical, mechanical and magnetic; Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXT BOOKS:**

1. P. C. Jain and Monica Jain, *“Engineering Chemistry”*, 17th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2018.
2. Sivasankar B., *“Engineering Chemistry”*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3. S.S. Dara, *“A Text book of Engineering Chemistry”*, S. Chand Publishing, 12th Edition, 2018

**REFERENCES:**

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, *“Text book of nanoscience and nanotechnology”*, Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, *“Engineering Chemistry”* McGraw Hill Education (India) Private Limited, 2<sup>nd</sup> Edition, 2017.
3. Friedrich Emich, *“Engineering Chemistry”*, Scientific International PVT, LTD, New Delhi, 2014.
4. Shikha Agarwal, *“Engineering Chemistry-Fundamentals and Applications”*, Cambridge University Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, *Applied Chemistry-A Text Book for Engineers and Technologists*, Springer Science Business Media, New York, 2nd Edition, 2013.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME : ENGINEERING CHEMISTRY</b>		<b>COURSE CODE: 24BS103</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K-CO</b>
<b>C104.1</b>	Infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.	I	K2
<b>C104.2</b>	Describe the different forms of energy resources, apply them in suitable energy sectors and illustrate the working of various batteries.	II	K2
<b>C104.3</b>	Explain the principles, various type of corrosion, corrosion control methods and alloys.	III	K2
<b>C104.4</b>	Categorize various fuels for Engineering processes and describe about applications.	IV	K2
<b>C104.5</b>	Identify basic concepts of nano science and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.	V	K2

<b>24GE101</b>	<b>PROBLEM SOLVING AND C PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the basic C programming constructs
- To learn about usage of arrays and strings
- To understand the concepts of functions and pointers
- To understand structures and unions
- To expose to file handling operations in C

**UNIT - I PROBLEM SOLVING USING C PROGRAMMING 9**

Introduction to computer system – Block Diagram of Computer, Types of Memory, I/O Devices, Application Programs and System Programs – Loader, linker, assembler, compiler, interpreter, Programming process – source code to executable code, Problem Solving Strategies – Problem analysis, Algorithms, Flow Charts, Pseudo Code, Overview of C : Features of C, structure of C program, data types, variables, Constants, Keywords, Operators–Precedence and Associativity, Expressions, statements, Control structures-Branching and Looping , Illustrative problems: odd or even number, Leap year, Biggest of three numbers, square root of a number, Sum of n numbers, Armstrong number, Palindrome, Fibonacci Series, Prime number

**UNIT - II ARRAYS AND STRINGS 9**

Arrays– Declaration and Initialization of one dimensional array , Example Programs– Insertion sort, Selection sort, Linear search, Binary search, Declaration and Initialization of two dimensional array, Example programs- Matrix Addition and Multiplication, Determinant and Transpose of a matrix

Strings- Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, String-handling Functions, Example Programs- with and without using built-in string functions

**UNIT - III FUNCTIONS AND POINTERS 9**

Introduction to functions – need of Function, Function prototype, function definition, function call, Return Values and their Types, Category of Functions, Built- in functions (string functions, math functions), Passing Arrays to Functions, Recursion, Scope, Visibility and Lifetime of variables, Example Program – Computation of Sine series, Scientific calculator using built-in functions. Pointers- Declaration and Initialization of pointer, Pointer operators, Pointer arithmetic, Pointer Increments and Scale Factor, Array of pointers, Example Program – Sorting of names, Parameter passing – Pass by value, Pass by reference, Example Program – Swapping of two numbers using pass by reference

**UNIT - IV STRUCTURES AND UNIONS 9**

Structure – Defining a structure, declaring structure variables, accessing structure members, structure initialization, Nested structures, Pointer and Structures, Array of structures, Example Program – using structures and pointers, typed of, Self-referential structures, Union, Dynamic memory allocation, Illustrative programs – allocating block of memory, sum of n numbers using malloc, calloc.

**UNIT - V FILE PROCESSING**

**9**

Files – File operations, Types of file processing– Sequential access and Random access, Error Handling on Files - Example Program– Finding average of numbers stored in sequential access file, Random access file -Example Program– Transaction processing using random access files, Command line arguments.

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXT BOOKS:**

1. Balagurusamy E, “Programming in ANSI C”, Eighth Edition, Tata Mcgraw-Hill,2019.
2. YashavantKanetkar, “Let Us C”, BPB Publications, 17<sup>th</sup> Edition,2020.
3. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education,2015.

**REFERENCES:**

1. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Education India, 2015.
2. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd.,2011
3. PradiDey, ManasGhosh, “Computer Fundamentals and Programming in C”, Second Edition, Oxford University Press,2013.
4. Byron Gottfried, “Schaum’s outlines- Programming with C”, McGraw-Hill Education, Fourth edition, 2018.
5. ReemaThareja, “Programming in C”, Oxford University Press, Second Edition,2016.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :PROBLEM SOLVING AND C PROGRAMMING</b>		<b>COURSE CODE: 24GE101</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K-CO</b>
<b>C105.1</b>	Explain the basic concepts of computer system and develop simple C programs.	I	K3
<b>C105.2</b>	Apply one dimensional and two dimensional arrays for implementing matrix operations and string operations.	II	K3
<b>C105.3</b>	Make use of function concept and develop programs to implement pointer arithmetic and arrays with pointers for solving simple mathematical problems.	III	K3
<b>C105.4</b>	Illustrate simple programs for structures and unions.	IV	K3
<b>C105.5</b>	Apply various file operations and develop programs to implement file access procedures.	V	K3

<b>24GE102</b>	<b>ENGINEERING GRAPHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand the importance of the drawing in engineering applications
- To develop graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to existing national standards related to technical drawings.
- To improve their visualization skills so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings

**CONCEPTS AND CONVENTIONS (Not for Examination)**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning

**UNIT-I PROJECTION OF POINTS AND LINES 9**

Orthographic projection – Principles - Principal planes - Projection of points in all quadrants - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method.

**UNIT-II PROJECTION OF PLANE SURFACES 9**

Projection of planes (Polygonal and Circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT-III PROJECTION OF SOLIDS 9**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

**UNIT- IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 9**

Sectioning of simple solids in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section - Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone.

**UNIT-V ISOMETRIC PROJECTION 9**

Principles of Isometric Projection – Isometric scale – Isometric projections of simple solids – Frustum and truncated Prisms and Pyramids.  
Introduction to Perspective projections. (Not for Examination)

**DEMONSTRATION ON DRAFTING PACKAGES**(For Internal Evaluation Weightage only)

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXT BOOKS:**

1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 33<sup>rd</sup> Edition, 2020.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 17<sup>th</sup> Multicolor Edition, 2021.
3. N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 54<sup>th</sup> Edition, 2023.

**REFERENCES:**

1. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson Education, 5<sup>th</sup> Edition, 2022
2. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2019
3. Luzadder and Duff, Fundamentals of Engineering Drawing, 11<sup>th</sup> edition, Pearson Education, 2015
4. BasantAgarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2019
5. M.S.Kumar, “Engineering Graphics”, DD Publications, 2018
6. <http://nptel.ac.in/courses/112103019/>
7. <https://archive.nptel.ac.in/courses/112/102/112102304/>

**BUREAU OF INDIAN STANDARDS:**

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001: Technical drawings - General principles of presentation.
4. IS 11669 – 1986: General principles of dimensioning on technical drawings.
5. SP 46 (2003): Engineering Drawing Practice for Colleges.
6. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

**SPECIAL POINTS APPLICABLE TO EXAMINATIONS ON ENGINEERING GRAPHICS:**

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :ENGINEERING GRAPHICS</b>		<b>COURSE CODE : 24GE102</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K-CO</b>
<b>C106.1</b>	Build the orthographic projections of points and lines.	I	K3
<b>C106.2</b>	Sketch the projection of polygonal and circular planes.	II	K3
<b>C106.3</b>	Project simple solids like prisms, pyramids, cylinder and cone.	III	K3
<b>C106.4</b>	Construct the section and develop lateral surfaces of solids.	IV	K3
<b>C106.5</b>	Apply the concept of isometric projection to sketch 3D views.	V	K3

<b>24HST01</b>	<b>HERITAGE OF TAMILS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>UNIT-I</b>	<b>LANGUAGE AND LITERATURE</b>				<b>3</b>
<p>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&amp; Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry- Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.</p>					
<b>UNIT-II</b>	<b>HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE</b>				<b>3</b>
<p>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 - Mridhngam, Parai, Veenai, Yazh and Nadhaswaram-Role of Temples in Social and Economic Life of Tamils.</p>					
<b>UNIT-III</b>	<b>FOLK AND MARTIAL ARTS</b>				<b>3</b>
<p>Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam,Valari, Tiger dance - Sports and Games of Tamils.</p>					
<b>UNIT-IV</b>	<b>THINAI CONCEPT OF TAMILS</b>				<b>3</b>
<p>Flora and Fauna of Tamils &amp;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.</p>					
<b>UNIT-V</b>	<b>CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE</b>				<b>3</b>
<p>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 &amp; Manuscripts – Print History of Tamil Books.</p>					
<p><b>CLASS HOURS: 15 PERIODS    TERM HOURS: 15 PERIODS    TOTAL: 30 PERIODS</b></p>					

24HST01	தமிழர்மரபு	L	T	P	C
		1	0	0	1

**அலகு -I மொழிமற்றும்இலக்கியம் 3**

இந்தியமொழிக் குடும்பங்கள் - திராவிட மொழிகள்-தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் சங்கஇலக்கியத்தின் சமயச் சார்பற்றதன்மை-சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க்காப்பியங்கள், தமிழகத்தில் சமண பௌத்தவ சமயங்களின் தாக்கம்-பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள்-தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி-தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு

**அலகு -II மரபு - பறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை- 3**  
சிற்பக்கலை

நடுகல் முதல் நவீன சிற்பங்கள் வரை- ஐம்பொன் சிலைகள்-பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள்-தேர் செய்யும் கலை-சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள்-குமரிமுனையில் திருவள்ளூர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம்-தமிழர்களின்சமூகபொருளாதாரவாழ்வில்கோவில்களின்பங்கு.

**அலகு -III நாட்டுப்புறகலைகள்மற்றும்வீரவிளையாட்டுகள் 3**

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கனியான்கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்

**அலகு -IV தமிழர்களின்திணைக்கோட்பாடுகள் 3**

தமிழகத்தின்தாவரங்களும், விலங்குகளும் தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள்-தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும்,கல்வியும்-சங்ககாலநகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி- கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**அலகு -V இந்தியதேசியஇயக்கம்மற்றும்இந்தியபண்பாட்டிற்குத்தமிழர் 3**  
களின்பங்களிப்பு

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு-இந்தியாவின் பிற்ப்பகுதிகளில் தமிழ்பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப் படிகள்-தமிழ் புத்தகங்களின் அச்சுவரலாறு

**TEXT & REFERENCE BOOKS:**

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை ( வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்)
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். ( விகடன்பிரசுரம்)
3. கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு)
4. பொருளந - ஆற்றங்கரை நாகரீகம். ( தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, TamilNadu
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text BookAnd Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

24BS1L1

**BASIC SCIENCE LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**PHYSICS LABORATORY**

**OBJECTIVES:**

- To inculcate the proper usage of various physics laboratory equipments and interpretation of experimental data.
- To stimulate problem solving skills related to physics principles.
- To make the student as an active participant in each part of all lab exercises.

**LIST OF EXPERIMENTS: (ANY SIX)**

1. Torsion Pendulum – determination of moment of inertia of a disc and rigidity modulus of wire.
2. Uniform Bending – determination of Young’s modulus of a given material.
3. Determination of band gap of a semiconductor.
4. Air wedge – determination of thickness of a thin wire / sheet.
5. Newton’s ring – determination of radius of curvature of plano convex lens.
6. Ultrasonic interferometer – determination of velocity of sound and compressibility of liquid.
7. a. Optical fiber – determination of Numerical aperture and acceptance angle.  
b. Diode laser – determination of width of groove in compact disc.
8. Spectrometer grating – determination of wavelength of mercury spectrum.
9. Spectrometer hollow prism – determination of refractive index of a given liquid.

**TOTAL: 30 PERIODS**

**LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<b>S.No.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Quantity</b>
1	Torsion pendulum set	6
2	Travelling microscope & accessories	6
3	Air wedge set up	6
4	Ultrasonic interferometer	6
5	Laser kit	6
6	Spectrometer & hollow prism	6
7	Spectrometer & grating	6
8	Semiconductor band gap kit	6
9	Newton's ring set up	6

**CHEMISTRY LABORATORY**

**OBJECTIVES:**

- To inculcate experimental skills to test basic understanding of water quality parameters through volumetric analysis.
- To have hands on experience in using instruments like pH meter, conductivity meter, potentiometer.
- To determine the amount of metal ions in alloys & molecular weight of polymer.
- To acquaint the students with the determination of molecular weight of polymer by viscometer

**LIST OF EXPERIMENTS:(ANY SIX)**

1. Determination of types and amount of alkalinity in a water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Estimation of copper content of the brass solution by EDTA.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Determination of strength of acids in a mixture of acids using conductivity meter.
7. Conduct metric titration of barium chloride against sodium sulphate.  
(precipitation titration)
8. Estimation of iron content of the given solution using potentiometer.
9. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
10. Estimation of Nickel in steel.

**TOTAL: 30 PERIODS**

**LIST OF APPARATUS AND EQUIPMENT FOR A BATCH OF 30 STUDENTS**

S.No.	NAME OF THE EQUIPMENT	Quantity
1	Burette (50ml)	30
2	Pipette(20ml)	30
3	Beaker (100ml)	30
4	Conical Flask (250ml)	30
5	Conductivity meter	10
6	Potentiometer	10
7	pH meter	10
8	Viscometer	14
9	Electronic Balance	1

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :BASIC SCIENCE LABORATORY</b>		<b>COURSE CODE: 24BS1L1</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>EXP</b>	<b>K-CO</b>
<b>PHYSICS LABORATORY</b>			
<b>C107.1</b>	Calculate rigidity modulus, Young's modulus of a given material and band gap of a semiconductor diode	1,2, 3	K3
<b>C107.2</b>	Predict the thickness of a given thin object, radius of curvature of Plano convex lens and velocity of ultrasound, compressibility of liquid	4,5,6	K3
<b>C107.3</b>	Determine the basic parameters of optical fiber, width of groove in CD, wavelength of the prominent spectral lines and refractive index of a given liquid	7,8,9	K3
<b>CHEMISTRY LABORATORY</b>			
<b>C107.4</b>	Estimate the chemical quality of a water sample by volumetric analysis.	1,2, 3, 4	K3
<b>C107.5</b>	Determine the molecular weight of polymer and amount of metal ions and impurities in solution through volumetric and electro analytical techniques.	5,6,7,8,9,10	K3

24GE1L1	C PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

**OBJECTIVES:**

- To develop programs in C using basic constructs.
- To develop applications in C using strings, pointers, functions, structures.
- To develop applications in C using file processing.

**LIST OF EXPERIMENTS:**

1. Programs using I/O statements, expressions and decision-making constructs.
2. Program for finding given year is leap year or not and finding given number is Armstrong number or not.
3. Design a calculator to perform the operations namely, addition, subtraction, multiplication, division and square of a number.
4. Given a set of numbers like <10, 36, 54, 89, 12, 27>, find sum of weights based on the following conditions.
  - a. if it is a perfect cube.
  - b. if it is a multiple of 4 and divisible by 6.
  - c. if it is a prime number.
5. Sort the numbers based on the weight in the increasing order as shown below <10,its weight><36,its weight><89,its weight>
6. Matrix addition and subtraction
7. Matrix multiplication and transpose of a matrix
8. Program using string with and without using string functions: string copy and Reverse the String.
9. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
10. From a given paragraph perform the following using built-in functions:
  - a. Find the total number of words.
  - b. Capitalize the first word of each sentence.
  - c. Replace a given word with another word.
11. Program using recursion – factorial and Fibonacci series
12. Sort the list of numbers using pass by reference.
13. Generate salary slip of employees using structures and pointers.
14. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
15. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
16. **Mini project (Any one project : Maximum 4 per Team)**
  - Railway reservation system
  - Library Management System
  - University Result Publication System
  - Hospital Management System
  - Student Automation System
  - Payroll System
  - Banking System
  - Inventory System

PLATFORM NEEDED: Turbo C++ Compiler

**TOTAL: 60 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**Laboratory requirements for a batch of 30 students** - Systems with Linux Operating System with gnu compiler.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :C PROGRAMMING LABORATORY</b>		<b>COURSE CODE : 24GE1L1</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>EXP</b>	<b>K-CO</b>
<b>C108.1</b>	Develop simple programs using decision making and looping statements.	1-5	K3
<b>C108.2</b>	Utilize array concepts to perform matrix addition, subtraction and multiplication.	6-7	K3
<b>C108.3</b>	Develop programs using user defined functions, built-in functions and recursion and utilize string operations to show string copy and reverse	8-12	K3
<b>C108.4</b>	Develop applications using sequential and random access files.	14-15	K3
<b>C108.5</b>	Develop simple real time projects using the concepts of structures and union.	13,16	K3

24HS1L1

ENGLISH LABORATORY

L	T	P	C
0	0	2	1

**OBJECTIVES:**

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities which are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

**UNIT-I Introduction to Fundamentals of Communication 6**

Listening for General Information - Specific Details - Conversation: Introduction to Classmates - Audio / Video (Formal & Informal); Telephone Conversation; Listening to Voicemail & Messages; Listening and Filling a Form. Speaking - Making Telephone Calls - Self Introduction; Introducing a Friend; Politeness Strategies - Making Polite Requests, Making Polite Offers, Replying to Polite Requests and Offers - Understanding Basic Instructions (Filling Out a Bank Application for Example).

**UNIT-II Narration and Summation 6**

Listening - Listening to Podcasts, Anecdotes / Stories / Event Narration; Documentaries and Interviews with Celebrities. Speaking - Narrating Personal Experiences / Events - Talking about Current and Temporary Situations & Permanent and Regular Situations - Describing Experiences and Feelings Engaging in Small Talk - Describing Requirements and Abilities.

**UNIT-III Description of a Process / Product 6**

Listening - Listen to Product and Process Descriptions; a Classroom Lecture; and Advertisements about Products. Speaking – Picture Description & Video Description - Describing Locations in Workplaces - Giving Instruction to Use the Product - Explaining Uses and Purposes - Presenting a Product - Describing Shapes and Sizes and Weights - Talking about Quantities (Large & Small) - Talking about Precautions; Tips to Create YouTube Channel.

**UNIT- IV Classification and Recommendations 6**

Listening – Listening to TED Talks; Listening to Various Online Video Repository. Speaking – SMALL Talk; Discussing and Making Plans - Talking about Tasks - Talking about Progress - Talking about Positions and Directions of Movement - Talking about Travel Preparations - Talking about Transportation.

**UNIT-V Expression 6**

Listening – Listening to Debates / Discussions; Different View Points on an Issue; and Panel Discussions. Speaking – Making Predictions - Talking about a Given Topic - Giving Opinions Understanding a Website - Describing Processes.

**TOTAL: 30 PERIODS**

**REFERENCES:**

1. Learn English with Cambridge - <https://www.youtube.com/channel/UC9-5oT15dxc81MI-pUui3Ww>
2. <https://www.oxfordonlineenglish.com/>
3. Oxford Online English - <https://www.youtube.com/channel/UCNbeSPp8RYKmHUIiYBUDizg>
4. British Council | Learn English - <https://www.youtube.com/channel/UCOtnu-KKoAbN47IuYMeDPOg>
5. <https://tcesrenglish.blogspot.com/>

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :ENGLISH LABORATORY</b>		<b>COURSE CODE: 24HS1L1</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K –CO</b>
<b>C109.1</b>	Listen to and comprehend general as well as complex academic information	I - V	AD
<b>C109.2</b>	Listen to and understand different points of view in a discussion	I – V	AD
<b>C109.3</b>	Speak fluently and accurately in formal and informal communicative contexts	I – V	AD
<b>C109.4</b>	Describe products and processes and explain their uses and purposes clearly and accurately	I – V	AD
<b>C109.5</b>	Express their opinions effectively in both formal and informal discussions	I - V	AD

<b>24HS201</b>	<b>PROFESSIONAL ENGLISH - II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		2	0	2	3

**OBJECTIVES:**

- To engage learners in meaningful language activities to improve their reading and writing skills.
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

**UNIT-I Making Comparisons 12**

Reading - Reading New Product Features, Invitations – Technical Seminar, Conferences, Workshops, Inter-College Functions; Writing – Safety Instructions - Compare and Contrast Essay; Grammar – Preposition – Position, Movement, Direction - Prepositional Phrases – Connectives, Common Errors in Technical Writing.

**LAB COMPONENT**

**Speaking** – Self Introduction -Role Play Exercises Based on Workplace Contexts – Discussion on Goal Setting. **Listening** – about Important Events – Experts Talks

**UNIT-II Expressing Causal Relations in Speaking and Writing 12**

Reading - Reading Longer Technical Texts – Technological Inventions – Flaws – Rectifications Writing - Cause and Effect Essays, and Letters to Companies - Product Enquiry – Service Information - Emails of Complaint - Writing Responses to Complaints. Grammar - Voice Transformations – Impersonal Passive Voice, Infinitive and Gerunds, Smileys & Abbreviations for Email Writing - Resume Preparation

**LAB COMPONENT**

**Speaking** – Technical Presentations (TED Talk) - Recent Media Updates – Travel Experiences – Devising Plans and Making Decisions. **Listening** – FAQ on Technological Contexts – Making Itineraries

**UNIT-III Problem Solving 12**

Reading - Journal Abstracts, Case Studies, Excerpts from Literary Texts, News Reports etc. Writing – Letter to the Editor, Checklists, Problem Solution Essay / Argumentative Essay. Grammar – Present Perfect Tense, If conditional Sentences, Digital Vocabulary, Spell Check, Tips to Create Technical Blogs - Introduction to Word Processing Online Tools (Quillbot, Grammarly, etc.)

**LAB COMPONENT**

**Speaking** – Group Discussions-Likes & Dislikes – Climate Conditions – Narrating Imaginary Situations. **Listening** – Talks on Purchase and TRADES – Merits and Demerits – Advantages & Disadvantages.

**UNIT- IV Reporting of Events and Research 12**

**Reading** – Newspaper Archives; **Writing** – Suggestions, Transcoding - Flow Charts, Pie / Bar Diagrams, Accident Report, Survey Report. Grammar – Reported Speech; **Vocabulary** (Social Media Platforms) – Coherence Markers - Use of Prepositions.

**LAB COMPONENT**

**Speaking** – Discussion on Environments –Socio Political Systems, Mandatory Systems.

**Listening** – Technical Instructions – Positions and Challenges of Higher Officials

**UNIT-V The Ability to Put Ideas or Information Cogently 12**

Reading – Technical Articles / Papers, Company Profiles, Statement of Purpose (SOP), an Excerpt of Interview with Professionals; Writing – Job / Internship Application – Cover Letter & Resume - Letter of Recommendation (To the Principal from NRI); Grammar – Numerical Adjectives - Relative Clauses – .PPT Preparation Tips

**LAB COMPONENT**

**Speaking** – Job Interview Practice - Describing Personal Outlook, Grooming, Safety Issues.

**Listening** – Instructions about Electrical Devices, Timely Remedial Measures, Precautionary Measures

**CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 90 PERIODS**

**TEXT BOOKS:**

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.
3. Authored by Dr. VeenaSelvam, Dr. SujathaPriyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

**REFERENCES:**

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Developing Communication Skills by Krishna Mohan, MeeraBannerji- Macmillan India Ltd. 1990, Delhi.
6. A Course in Technical English by Mr. D. Praveen Sam, KN Shoba, Cambridge University Press, 2020, India.

**Lab Component References:**

**Free, Authentic Online Repositories for English Proficiency and General Aptitude Practice for Higher Studies and Placement.**

- <https://www.examenglish.com>
- <https://www.apititude-test.com/verbal-aptitude.html>
- <https://www.edudose.com>
- <https://www.fresherslive.com/online-test/apititude-test/questions-and-answers>
- <https://www.indiabix.com/>
- <https://www.oxfordonlineenglish.com/english-level-test>
- <https://learnenglish.britishcouncil.org/english-levels/online-english-level-test>
- <https://www.ted.com>
- <https://tcesenglish.blogspot.com/>

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name : PROFESSIONAL ENGLISH - II</b>		<b>Course Code : 24HS201</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K –CO</b>
<b>C111.1</b>	Compare and contrast ideas in technical texts, identify and report cause and effects in events, industrial processes	I - V	AD
<b>C111.2</b>	Analyze problems, feasible solutions and communicate them in the written format.	I – V	AD
<b>C111.3</b>	Present their ideas, opinions, discuss, analyze concepts and problems by effective speaking in group discussions.	I – V	AD
<b>C111.4</b>	Draft effective emails, official letters and job applications, effective resumes in a planned and logical manner.	I – V	AD
<b>C111.5</b>	Write critical reports from inferred data and information with clarity and precision	I - V	AD

24BS201

**ADVANCED CALCULUS**

**L T P C**  
3 1 0 4

**OBJECTIVES:**

- To make the student familiar with topics such as Multiple Integrals, Vector Calculus, Analytic Functions, Complex Integration and Laplace Transform.
- To learn the concept of basic Vector Calculus which can be widely used for Modeling the various laws of Physics.
- To understand the various methods of Complex Analysis and Laplace Transform can be used for efficiently solving the problems that occur in various branches of Engineering disciplines.

**UNIT - I LAPLACE TRANSFORM 9+3**

Existence Conditions – Transforms of Elementary Functions – Transform of Unit Step Function and Unit Impulse Function – Basic Properties – Shifting Theorems -Transforms of Derivatives and Integrals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Transform of Periodic Functions – Application to Solution of Linear Second Order Ordinary Differential Equations with Constant Coefficients.

**UNIT - II MULTIPLE INTEGRALS 9+3**

Double integrals – Change of order of integration – Double integrals in Polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of Solids – Change of Variables in Double and Triple integrals.

**UNIT - III VECTOR CALCULUS 9+3**

Gradient and Directional Derivative – Divergence and Curl - Vector Identities – Irrotational and Solenoidal Vector fields – Line Integral over a Plane curve – Surface Integral - Area of a Curved Surface - Volume Integral – Green’s, Gauss divergence and Stoke’s theorems (without proof) – Verification and Application in evaluating Line, Surface and Volume Integrals.

**UNIT - IV ANALYTIC FUNCTIONS 9+3**

Analytic functions – Necessary and Sufficient Conditions for Analyticity in Cartesian and Polar Coordinates – Properties – Harmonic Conjugates – Construction of Analytic Function – Conformal Mapping – Mapping by Functions  $w = z+c$ ,  $cz$ ,  $1/z$ ,  $z^2$  - Bilinear transformation.

**UNIT - V COMPLEX INTEGRATION 9+3**

Line integral – Cauchy’s Integral Theorem (without proof) – Cauchy’s Integral Formula – Taylor’s and Laurent’s Series – Singularities – Residues – Residue Theorem (without proof) – Application of Residue Theorem for Evaluation of Real Integrals – Use of Circular Contour.

**CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS**

**TEXT BOOKS:**

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44<sup>th</sup> Edition, 2017.
2. Veerarajan.T“Engineering Mathematics I”, the Tata McGraw Hill Publication-New Delhi, First Edition 2018.

**REFERENCES:**

1. Kreyszig Erwin, “Advanced Engineering Mathematics”, John Wiley and Sons, 9<sup>th</sup> Edition, NewDelhi, 2006.
2. James Stewart, “Calculus, Early Transcendental”, Cengage Learning, 7<sup>th</sup> Edition, New Delhi, 2015.
3. Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics II”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 9<sup>th</sup> Edition, 2014.
4. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics II”, Narosa Publications, New Delhi, 5<sup>th</sup> Edition, 2016.
5. Robert C.Wrede, Murray R.Spiegel, “Advanced Calculus”Schaum’s outline series, McGraw Hill, New Delhi, Second Edition, 2002.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name :ADVANCED CALCULUS</b>		<b>Course Code : 24BS201</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K –CO</b>
<b>C112.1</b>	Apply Laplace transform and inverse transform to solve the initial value problems.	I	K3
<b>C112.2</b>	Solve the multiple integrals and apply the concept to find areas, volumes.	II	K3
<b>C112.3</b>	Determine the line, surface and volume integrals using Green’s, Gauss and Stokes theorems	III	K3
<b>C112.4</b>	Determine Analytic functions, Bilinear Transformations and apply the concept of conformal mapping to find the images of given curves.	IV	K3
<b>C112.5</b>	Determine the Contour Integrals using Cauchy’s Integral and Residue theorems.	V	K3

<b>24HS202</b>	<b>ENVIRONMENTAL SCIENCES AND SUSTAINABILITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		2	0	0	2

**OBJECTIVES:**

- To study the scope and significance of environment, understand the interrelationship between living organism and environment.
- To get a concept knowledge on various types of pollution and its effects.
- To gain knowledge on various renewable energy sources and its applications.
- To provide knowledge on solid waste disposal methods and natural disasters and its management.
- To development goals and protocol- sustainability and gain knowledge on carbon credit and carbon footprint.

**UNIT – I ENVIRONMENT AND BIODIVERSITY 6**

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

**UNIT - II ENVIRONMENTAL POLLUTION 6**

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Climate change, Global warming, Acid rain, Ozone layer depletion. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection.

**UNIT - III RENEWABLE SOURCES OF ENERGY 6**

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Solar, Wind, Tidal, Geothermal, H<sub>2</sub> energy & Ocean energy. Applications of Hydrogen energy, Ocean energy resources.

**UNIT - IV SOLID WASTE AND DISASTER MANAGEMENT 6**

Solid waste management - Introduction, types, e-waste, effects on human beings and disposal management. Disaster management - Introduction, causes, effects and management of flood, cyclone, earthquake, landslide disasters, case studies – roles and responsibilities of Government and community.

**UNIT - V SUSTAINABILITY AND MANAGEMENT 6**

Development, GDP, sustainability – concept, needs and challenges- economic, social and aspects of sustainability –from unsustainability to sustainability – millennium development goals, and protocols – Sustainable Development Goals-targets, indicators and intervention areas. Climate change – Global Regional and local environmental issues and possible solutions – case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry – A case study.

**CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. AnubhaKaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

**REFERENCES:**

1. Dr.A.Ravikrishnan, 'Environmental Science & Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd. Revised Edition 2023-2024.
2. Dr.V.Veeraiyan and Dr.L.Devaraj Steohen, 'Environmental Science & Engineering', VRB Publishers Pvt.Ltd. Reised & Updated Edition 2018-19.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name :</b> ENVIRONMENTAL SCIENCES AND SUSTAINABILITY		<b>Course Code :</b> 24HS202	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K –CO</b>
<b>C113.1</b>	Describe the environment, ecosystem and their significances and explain the threats to biodiversity.	I	K2
<b>C113.2</b>	Describe the sources, effects, and control methods of environmental pollution.	II	K2
<b>C113.3</b>	Explain the knowledge on various renewable sources and its applications.	III	K2
<b>C113.4</b>	Describe the disposal techniques of solid waste and record the consequences of natural disasters.	IV	K2
<b>C113.5</b>	Outline the different goals of sustainable development and apply them for suitable technology and societal	V	K2

24GE201

PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

**OBJECTIVES:**

- To understand Python basics and programs with conditional and looping constructs.
- To understand Python functions and strings.
- To understand various operations using Python data structures– lists, tuples, sets and dictionaries.
- To understand exception handling and modules, packages in Python
- To understand usage of data base in python

**UNIT - I PYTHON BASICS AND PROGRAM FLOW 9**

**Introduction to python** - Features of python, python syntax compared to other programming languages, python installation, python interpreter and interactive mode, values and types – int, float, boolean, string and list, variables, expressions, statements, comments, operators and precedence of operators, control flow statements – conditionals – conditional (if), alternative (if-else), chained conditional (if-elif-else), iteration – state, while, for, break, continue, pass ,illustrative programs – exchange the values with and without using temporary variables, circulate the values of n variables, distance between two points.

**UNIT - II FUNCTIONS, STRINGS 9**

Functions – function definition and use, flow of execution, parameters and arguments, function composition, Fruitful functions – return values, parameters, local and global scope, recursion , Illustrative programs- Decimal binary conversion, Tower of Hanoi , Strings – string slices, immutability, string functions and methods, string module, Illustrative programs – square root, GCD, exponentiation, Factorial of a number, linear search, binary search.

**UNIT - III LISTS, TUPLES, SETS AND DICTIONARIES 9**

**Lists** – list operations, list slices, list loop, mutability, aliasing, cloning lists, list parameters, Lists as arrays, list methods, List comprehension, **Tuples** – Tuple operations (create, access, modify, delate, append, membership test, concatenation and repeat), tuple assignment, tuple as return value, Iterating a tuple, Built-in functions with tuple, **Sets** – Creating, Modifying a set, Removing elements from a set, Set operations- Set Union, Set intersection, Set difference, Set membership test, Iterating through a set, Built-in functions and methods with set, **Dictionaries** – creation, accessing elements, operations and methods, Illustrative programs – selection sort, insertion sort, Matrix addition and subtraction, sum an array of numbers.

**UNIT - IV FILES HANDLING, MODULES, PACKAGES 9**

Files and exception – text files, reading and writing files, format operator, command line arguments, errors and exceptions, handling exceptions, modules, packages – Math and Rand, Illustrative programs – word count, copy file, merge two files

**UNIT - V DATA BASES INPYTHON 9**

**Python SQL database:** Installation, DB connection, create table, Data Manipulation operations (Insert, read, update, delete, commit and rollback), **Additional topics:** Lambda function, filter, map, reduce, decorators, Frozenset – creation, accessing elements, operations, collections (Counters, Ordered Dict, Default Dict ,Chain Map ,NamedTuple, DeQue, User Dict,UserList, UserString)

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXT BOOKS:**

1. E. Balagurusamy, “Problem solving and Python Programming”, First edition, McGraw Hill Education (India) Private Limited, 2017.
2. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016  
(<http://greenteapress.com/wp/think-python/>)

**REFERENCES:**

1. Yashavant Kanetkar, Aditya Kanetkar, “Let Us Python”, 2<sup>nd</sup> Edition, BPB Publications, 2020.
2. John V Guttag, “Introduction to Computation and Programming Using Python: With Application to Understanding Data”, 2<sup>nd</sup> Edition, PHI Publisher, 2017.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, “Exploring Python”, Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Paul Gries, Jennifer Campbell and Jason Montojo, “Practical Programming: An Introduction to Computer Science using Python 3.6”, 3<sup>rd</sup> edition, Shroff/O’ Reilly Publishers, 2018.
6. Dr.A.Kannan, Dr.L.SaiRamesh, “Problem Solving and Python Programming”, Updated Edition, United Global Publishers Pvt. Ltd., April 2018.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME :PYTHON PROGRAMMING</b>		<b>Course Code : 24GE201</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K –CO</b>
<b>C114.1</b>	Explain the basic concepts of python programming like python installation, data types, expression and control statements.	I	K2
<b>C114.2</b>	Apply Python functions, recursive functions and string functions to solve simple problems and perform linear and binary search.	II	K3
<b>C114.3</b>	Illustrate the various operations of lists, tuples, sets, dictionaries and arrays and develop programs to solve various sorting and matrix operations.	III	K3
<b>C114.4</b>	Explain file handling operations, exception handling, modules and packages and develop programs for word count, file copy, merge operations and exception handling.	IV	K3
<b>C114.5</b>	Apply python SQL database and additional functions like Lambda function and Frozenset to solve real world applications.	V	K3

<b>20GE202</b>	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING</b>	<b>L T P C</b> <b>3 0 0 3</b>
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**OBJECTIVES:**

- To learn the fundamental laws, theorems of electrical circuits and also to analyze them.
- To study the basic principles of electrical machines and their performances.
- To study the different energy sources and their utilizations.
- To study the fundamentals of electronic circuits.
- To understand the principles and operations of operational amplifiers.

**UNIT - I ELECTRICAL CIRCUITS ANALYSIS 9**

Ohms Law, Kirchhoff's Law - Instantaneous power - series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis - network theorems – DC circuit theorems – Thevenin's theorem, Norton theorem. Star-Delta conversion

**UNIT - II ELECTRICAL MACHINES 9**

DC and AC Rotating Machines: DC Generator, DC Motor, Alternator, single phase and three phase induction motor, Construction, principle, emf and torque equation, Basics of Stepper Motor- Transformers-Introduction- types and construction.

**UNIT - III UTILIZATION OF ELECTRICAL POWER 9**

Renewable energy sources - wind energy and solar panels. Fluorescent tube. Domestic refrigerator - Electric circuit, construction and working principle. Protection-need for earthing. Energy Tariff calculation for domestic loads.

**UNIT - IV ELECTRONIC CIRCUITS 9**

Semi-conductors, Types - PN Junction - VI Characteristics of Diode, zener diode, Rectifiers- BJT- operations of PNP and NPN transistors - Transistors configurations – Common Base, Common Emitter & Common Collector configurations – Common Emitter Amplifier.

**UNIT - V OPERATIONAL AMPLIFIERS AND DIGITAL ELECTRONICS 9**

Op amp: inverting and non-inverting Amplifier-summer-differential amplifier-differentiator, integrator, Successive Approximation ADC, R-2R Ladder DAC, Number Systems, Basic Digital Logic gates, Universal gates - NAND and NOR Implementation.

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXT BOOKS:**

1. D.P.Kothari and, I.J.Nagarath, "Basic Electrical and Electronics Engineering", McGrawHill, 2019, Fourth Edition.
2. M.S.Sukhija and, T.K.Nagsarkar, "Basic Electrical and Electronic Engineering", Oxford, 2019

**REFERENCES:**

1. S.B.LalSeksena and KaustuvDasgupta, “Fundamentals of Electrical Engineering”, Cambridge, 2017
2. B.LTheraja, “Fundamentals of Electrical Engineering and Electronics”, Chand&Co, 2018
3. S.K.Sahdev, “Basic of Electrical Engineering”, Pearson, 2019.
4. John Bird, “Electrical and Electronic Principles and Technology”, Sixth Edition, Elsevier, 2017.
5. Mittle, Mittal, “Basic Electrical Engineering”, 2<sup>nd</sup> Edition, Tata McGraw-Hill Edition 2017
6. C.L.Wadhwa, “Generation, Distribution and Utilisation of Electrical Energy”, New Age international Pvt. Ltd., Revised 4<sup>th</sup> Edition 2018.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME:</b> BASIC ELECTRICAL AND ELECTRONICS ENGINEERING		<b>Course Code :</b> 24GE202	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K-CO</b>
<b>C115.1</b>	Solve the electrical circuits by using nodal analysis, mesh analysis and Network theorems.	I	K3
<b>C115.2</b>	Explain the Construction, working principle of Transformers, DC and AC Rotating Machines.	II	K2
<b>C115.3</b>	Describe the working principle of wind energy and solar panels. Compile the need for earthing. Explain the Energy Tariff for domestic loads.	III	K2
<b>C115.4</b>	Summarize the operation and characteristics of PN Junction Diode, Zener diode and BJT configurations. Explain the operation of Rectifiers and Common Emitter Amplifier circuits with its response.	IV	K2
<b>C115.5</b>	Explain the operation of op-amp applications. Review of number systems and verify the truth table of Basic Digital Logic gates.	V	K2

<b>24ME201</b>	<b>ENGINEERING MECHANICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	1	0	4

**OBJECTIVES:**

- To determine the resultant forces for composition of forces and applying equilibrium concepts.
- To understand the scalar representation of forces & moments and the static equilibrium of particles and rigid bodies.
- To understand the properties of surfaces and solids.
- To learn the concepts of frictional forces at the contact surfaces of various Engineering systems.
- To enhance skills to carry out kinematic and kinetic analyses for system of particles.

**UNIT-I      STATICS OF PARTICLES      9+3**

Introduction - Units and Dimensions - Laws of Mechanics - Vectorial representation of forces – Resolution and Composition of forces -Equilibrium of a particle –Forces in space – Equilibrium of a particle in space.

**UNIT-II      EQUILIBRIUM OF RIGID BODIES AND TRUSSES      9+3**

Principle of transmissibility – Equivalent systems of forces – Single equivalent force - Free body diagram – Types of supports and their reactions – Moments and Couples – Moment of a force about a point and about an axis, Vectorial representation of moments and couples – Scalar components of a moment - Varignon’s theorem – Equilibrium of Rigid bodies in two dimensions - Analysis of Trusses - Method of joints and Method of sections.

**UNIT-III      PROPERTIES OF SURFACES AND SOLIDS      9+3**

First moment of area and the Centroid of sections- Rectangle, circle, triangle from integration- T section, I section, Hollow section by using standard formula Pappus and Guldinus theorems - moment of inertia of plane areas - Parallel and perpendicular axis theorem - radius of gyration.

**UNIT- IV      FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS      9+3**

Frictional force - Laws of friction – Coefficient of friction- Angles of friction- Simple contact friction--Ladder friction– Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies. Case study in friction.

**UNIT-V      DYNAMICS OF PARTICLES      9+3**

Displacements -Velocity and acceleration, their relationship – Rectilinear and Curvilinear motion –Newton’s second law and its applications – Work Energy Equation of particles – Impulse and Momentum.

**CLASS HOURS: 60 PERIODS      TERM HOURS: 60 PERIODS      TOTAL: 120 PERIODS**

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

- Illustrate the vectorial and scalar representation of forces and moments.
- Evaluate the reaction force for bodies under equilibrium and Predict the support reaction and internal forces of the members of truss
- Determine the centroid and moment of inertia of plane lamina.
- Calculate the friction and the effects by the laws of friction
- Investigate the fundamental principles to solve problems in dynamics of particles.

**TEXT BOOKS:**

1. Beer, F.P., Johnston Jr. E.R., Mazurek D.F., Cornwell P.J. and Sanghi S, “Vector Mechanics for Engineers: Statics and Dynamics”, 12<sup>th</sup> Edition, McGraw-Companies, Inc. New York 2019.
2. Hibbeler RC, “Engineering Mechanics: Statics & Dynamics”, Pearson India Education Services Private Limited, 14<sup>th</sup> Edition, 2017.
3. Murugaperumal P, “Engineering Mechanics – Sri Krishna Hitech Publishing Company Private Limited., 2013.

**REFERENCES:**

1. Meriam J.L and Kraige L.G ‘Engineering Mechanics, Volume I - Statics, Volume II - Dynamics, SI version 9<sup>th</sup> Edition, John Willey & Sons, New York 2018.
2. N.H. Dubey, “Engineering Mechanics – Statics and Dynamics”, Tata McGraw Hill, New Delhi 2017.
3. Bhavikatti, S.S, and Rajashekarappa, K.G., “Engineering Mechanics”, New Age International (P) Limited Publishers, 2019.
4. Palanichamy M.S and Nagan S, “Engineering Mechanics – Statics and Dynamics”, Tata McGraw Hill, 5<sup>th</sup> Edition, 2012.
5. Timoshenko, S. Young, D. Rao . J “Engineering Mechanics”. Tata McGraw Hill, Fifth edition 2017.
6. <https://nptel.ac.in/courses/112103108> - Engineering Mechanics - Prof. U. S. Dixit Dr. G. Saravanakumar - Indian Institute of Technology, Guwahati.
7. <https://archive.nptel.ac.in/courses/112/106/112106180/> - Statics and Dynamics – Dr. Mahesh V. Panchagnula – Indian Institute of Technology, Madras.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name :ENGINEERING MECHANICS</b>		<b>Course Code : 24ME201</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K –CO</b>
<b>C116.1</b>	Illustrate the vectorial and scalar representation of forces and moments.	I	K3
<b>C116.2</b>	Evaluate the reaction force for bodies under equilibrium and Predict the support reaction and internal forces of the members of truss	II	K3
<b>C116.3</b>	Determine the centroid and moment of inertia of plane lamina.	III	K3
<b>C116.4</b>	Calculate the friction and the effects by the laws of friction	IV	K4
<b>C116.5</b>	Investigate the fundamental principles to solve problems in dynamics of particles.	V	K4



24HST02

தமிழரும் தொழில்நுட்பமும்

L T P C  
1 0 0 1

**அலகு -I நெசவு மற்றும் பாளை தொழில்நுட்பம்: 3**

பொருள் பொருள்பெயர் பொருள் பொருள் - பொருள் பொருள்பெயர்  
பொருள்பெயர்-பொருள் பொருள்பெயர் - பொருள்பெயர் பொருள்  
பொருள்பெயர்.

**அலகு-II வடிவமைப்பு மற்றும் கட்டிடத்தொழில் நுட்பம் 3**

பொருள் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் & பொருள்  
பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் - பொருள் பொருள்பெயர்  
பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் - பொருள்பெயர்பெயர்பெயர் பொருள்  
பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் -  
பொருள்பெயர்பெயர்பெயர் பொருள்பெயர்பெயர்பெயர் - பொருள் பொருள்பெயர்  
பொருள்பெயர்பெயர்பெயர் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர்பெயர் பொருள்பெயர் -  
பொருள்பெயர் பொருள்பெயர்பெயர் - பொருள்பெயர் பொருள்பெயர்பெயர்பெயர் பொருள்பெயர்  
பொருள்பெயர் - பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர்  
பொருள்பெயர் பொருள்பெயர் - பொருள்பெயர்பெயர்பெயர் பொருள்பெயர் - பொருள்பெயர்பெயர்  
பொருள்பெயர்பெயர்பெயர் பொருள்பெயர்-பொருள்பெயர்பெயர்பெயர் பொருள்பெயர்பெயர்

**அலகு-III உற்பத்தி தொழில்நுட்பம் 3**

கப்பல்கட்டும்கலை - உலோகவியல் - இரும்புதொழிற்சாலை - இரும்பைஉருக்குதல், எஃகு-  
வரலாற்றுச் சான்றுகளாக செம்பு மற்றும்  
தங்கநாணயங்கள்-நாணயங்கள்அச்சடித்தல்- மணி உருவாக்கும் தொழிற்சாலைகள் -  
கல்மணிகள், கண்ணாடிமணிகள் - சுடுமண்மணிகள்-சங்குமணிகள்-எலும்புத்துண்டுகள் -  
தொல்லியல்சான்றுகள்-சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

**அலகு- IV வேளாண்மை மற்றும் நீர்பாசன தொழில்நுட்பம் 3**

பொருள், பொருள், பொருள்பெயர், பொருள் - பொருள் பொருள்பெயர் பொருள்பெயர்  
பொருள்பெயர்பெயர்பெயர் - பொருள்பெயர் பொருள்பெயர்பெயர் - பொருள்பெயர்பெயர்பெயர்  
பொருள்பெயர்பெயர்பெயர் பொருள்பெயர் - பொருள்பெயர் பொருள்பெயர் பொருள்பெயர்  
பொருள்பெயர் பொருள்பெயர்பெயர் - பொருள் பொருள்பெயர் பொருள்பெயர் - பொருள் பொருள் -  
பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் - பொருள்பெயர்பெயர் பொருள்பெயர்  
பொருள்பெயர் பொருள்பெயர், பொருள்பெயர்பெயர் பொருள்பெயர்.

**அலகு-V அறிவியல்தமிழ்மற்றும்கணிதத்தமிழ்: 3**

பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் - பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் - பொருள்பெயர்  
பொருள்பெயர் பொருள்பெயர்பெயர்பெயர் பொருள்பெயர் - பொருள்பெயர் பொருள்பெயர்பெயர்பெயர்  
பொருள்பெயர்பெயர்பெயர்  
பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் - பொருள்பெயர் பொருள்பெயர் பொருள்பெயர் - பொருள்பெயர்பெயர்  
பொருள்பெயர் பொருள்பெயர்பெயர் - பொருள்பெயர்பெயர்பெயர் பொருள்பெயர்

**TEXT BOOKS & REFERENCES BOOKS:**

1. தமிழகவரலாறு-மக்களும்பண்பாடும் - கே. கே. பிள்ளை ( வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2. கணினித்தமிழ் - முனைவர்இல. சுந்தரம். ( விகடன்பிரசுரம்)
3. கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரீகம் ( தொல்லியல் துறை வெளியீடு)
4. பொருளந-ஆற்றங்கரைநாகரீகம். ( தொல்லியல்துறைவெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Publishedby: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, TamilNadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

**24HS203**

**JAPANESE - I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>-</b>

**OBJECTIVE:**

1. To impart fundamentals of the Japanese language, including reading, writing systems, pronunciation.
2. Develop basic communicative competence in everyday Japanese
3. Enable learners to understand and use fundamental grammar pattern

**Module- I Japanese Writing System & Basic Sentence Structure**

**6**

Introduction to Japanese writing systems: Hiragana, Katakana, basic Kanji (introduction), Pronunciation and sound patterns, Greetings and self-introduction.

**Module- II Basic Sentence Structure & Vocabulary 4**

Sentence pattern: **A は B です**, Question formation using **か**, Particles: **は, の**, Basic vocabulary: nationality, occupations, majors, Subject pronouns, Family.

**Module -III Demonstratives, Numbers & Daily Objects 6**

Demonstratives: **これ, それ, あれ, どれ**, Demonstratives with noun: **この, その, あの, どの**, Location words: **ここ, そこ, あそこ**, Numbers, time, prices, counters, Particles: **も, ね, よ**, Classroom and daily-use vocabulary.

**Module- IV Verbs, Actions , Time Expressions & Present Tense 8**

Verb classification: Group I, II, III, Verb **ます** form (present & negative), Time expressions and frequency adverbs, Particles: **を, で**, Making invitations: **～ませんか**, Word order, Days, Weeks, Months, and Years.

**Module-V Past Tense & Movement Expressions 6**

Past tense forms: **ました/ませんでした** form (past & negative), Location and direction particles: **に, へ, で**, Means of transport, Talking about past events, Basic movement-related expressions.

**TOTAL:30PERIODS**

**Text Books**

1. GENKI I – An Integrated Course in Elementary Japanese (3rd Edition)
2. Minna no Nihongo Shokyu I – Main Text
3. Minna no Nihongo I – Translation & Grammatical Notes (English)

**Reference Books**

1. GENKI I Workbook (3rd Edition)
2. Minna no Nihongo I Workbook
3. JLPT N5 Official Practice Workbook

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name: JAPANESE-I	
CO	Course Outcomes
CO1	Understand simple spoken Japanese in everyday contexts.
CO2	Communicate with widely used Japanese words effectively.
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.

**24HS204**

**DEUTSCH-I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>-</b>

**OBJECTIVE:**

- To impart fundamentals of the German language, including reading, writing systems, pronunciation, and speaking.

**Module- I Basic Communication - Sprechen 10**

Basics & Introduction: German alphabet and pronunciation, Vowels (long & short), consonants, Umlauts (ä, ö, ü) and ß. Greetings and farewells (formal & informal), Polite expressions (Bitte, Danke, Entschuldigung). Numbers 1–100 and days of the week, Months, Seasons, Personal pronouns (ich, du, er, sie...), Telling time (Wie spät ist es?)

– Official timings and Unofficial timings. Grammar Essentials & Everyday Vocabulary: Present tense of regular verbs (spielen, arbeiten, machen...)

Activities: Self- Introduction and Talking about hobbies

**Module -II Basic German grammar 10**

Common irregular verbs: sein (to be), haben (to have), gehen, kommen, Artikel and gender (der, die, das; ein, eine), Modal verbs, and its conjugations. Nouns- Rules for Artikel (Masculine gender, Feminine gender and Neutram gender) Artikel - Nominativ Case. (Was oder Wer, kein oder nicht)

Activities: Conversation in the office, Hotel Reception, composition of simple texts giving information about person, daily routine, family members etc.,

**Module- III German grammar-II 10**

Artikel-Akkusativ case (e.g., einen, keinen, doch), Akkusativ case- Pronomen, Possessivartikel, Präpositionen, Es gibt. Describing people and things: adjectives and colors, Family, food, furniture, and common vocabulary with gender.

Activities: Food culture in Germany, Ordering food and drinks at a café or Listening to short conversations and responding appropriately. History, geography and aspects of German culture as group task / project work.

**TOTAL:30 PERIODS**

**REFERENCES:**

1. Funk, H., Kuhn, C., & Demme, S. (2015). Menschen A1: Deutsch als Fremdsprache Kursbuch. Hueber Verlag
2. Studio d A1: Deutschals Fremdsprache, Hermann Funk and Christina Kuhn Cornelsen Verlag publication (2005).
3. Evans, S., & Pude, A. (2012). Menschen A1. HueberVerlag.
4. Niebisch, D., Penning-Hiemstra, S., et al. (2016). Schritte International Neu A1.1. HueberVerlag.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: DEUTSCH-I</b>	
<b>CO</b>	<b>Course Outcomes</b>
<b>CO1</b>	Communicate with widely used German words effectively
<b>CO2</b>	Understand German grammar and German culture
<b>CO3</b>	Understand German civilization and Translation

24HS2L1

**APTITUDE AND SOFT SKILLS – I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Module I Aptitude Skills I 15**

Quantitative Aptitude Modules : Number System, square root and cube root, average, problems on numbers, Ages, Percentages, Profit and Loss, Ratio and Proportion, Partnership, Chain rule, time and work, time and distance.

**Module II Soft Skills I 15**

Self-Introduction - Self analysis, Attitude, perceptions, Positive approach to challenges, Change management –ideas and approach, Goal setting vision, Time management, Planning, Entrepreneurial skills - Leadership skills, presentation and performance giving and receiving

feedback, setting expectations and exhibiting professional behavior – Group Discussion.

**TOTAL: 30 PERIODS**

**REFERENCES:**

1. Quantitative aptitude for competitive examinations , R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – AbijithGuha, TMH
3. Quantitative Aptitude for Cat – ArunSharma, TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan, A Handbook of Spotting Errors, Mcgraw Hill Education, 2010

**24GE2L1**

**PYTHON PROGRAMMING LABORATORY**

L	T	P	C
0	0	3	1.5

**OBJECTIVES:**

- To write, test, and debug simple Python programs using conditional statements.
- To implement Python programs using loops.
- To use functions for structuring Python programs.
- To implement Python programs using lists.
- To write Python programs for implementing file operations and data manipulation on data base.

**LIST OF EXPERIMENTS**

1. Biggest of three numbers, odd or even number, Leap year.
2. GCD, Armstrong Number, Palindrome, Fibonacci Series, Prime number
3. Find the square root and exponentiation of a number with and without built-in functions
4. Linear search and Binary search using Recursion.
5. Find the maximum of a list of numbers
6. Selection sort, Insertion sort
7. First n prime numbers
8. Transpose of a Matrix
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Merge two files
13. Data Manipulation operations using python SQL database access

**PLATFORM NEEDED:** Python 3 interpreter for Windows/Linux

**TOTAL: 45 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Systems with Linux or Windows 7 or later Operating System with Python versions: 2.7.X, 3.6.X.,3.8.X, MySQL software.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME:PYTHON PROGRAMMING LABORATORY</b>		<b>Course Code: 24GE2L1</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>EXP</b>	<b>K-CO</b>
<b>C119.1</b>	Develop simple Python programs using conditional and iterative constructs	1,2,7	K3
<b>C119.2</b>	Construct simple Python programs using built-in functions, user-defined functions and recursion functions.	3,4	K3
<b>C119.3</b>	Make use of array concepts to develop programs for solving various sorting and matrix operations.	5,6,8,9	K3
<b>C119.4</b>	Apply command line arguments and file handling methods to implement programs to read word from text file and merging files.	10, 11,13	K3
<b>C119.5</b>	Make use of python SQL database to implement and solve data Manipulation operations.	13	K3

**24GE2L2**

**INDUSTRIAL PRACTICES WORKSHOP**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**OBJECTIVES:**

- To understand various pipe fittings used in common household plumbing work and wood work.
- To know about arc welding and machining processes.
- To gain knowledge on sheet metal work.
- Wiring various electrical joints in common household electrical wire work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

**GROUP A (CIVIL AND MECHANICAL)**

**PART I CIVIL ENGINEERING PRACTICE**

**CARPENTRY PRACTICE:**

1. Sawing, Planning and making T-Joint / Cross lap joint / Dovetail joint

**PLUMBING PRACTICE:**

2. Providing basic water line connection for a residential house using plumbing components and household utilities like water heater, wash basin etc.,

**PART II MECHANICAL ENGINEERING PRACTICE**

**SHEET METAL PRACTICE:**

3. Preparation of a Model of Rectangular Tray/ Conical Funnel.

**WELDING PRACTICE:**

4. Joining two metal plates by single butt joint / T fillet joint / lap joint using arc welding.
5. Demonstration on Gas welding

**BASIC MACHINING PRACTICE:**

6. Exercise on Simple turning, Facing / Taper turning / Drilling and Tapping. Simple model development using above practices

**GROUP-B(ELECTRICALELANDELECTRONICS)**

**PART- III ELECTRICAL ENGINEERING PRACTICES**

1. Residential house wiring using switches, fuse, indicator, Fluorescent lamp and Energy Meter
2. Staircase wiring
3. Fluorescent Lamp wiring.
4. Energy meter wiring and related calculations
5. Study of Iron Box wiring and assembly
6. Study of Fan Regulator/ emergency lamp wiring

**PART - IV ELECTRONIC ENGINEERING PRACTICES**

1. Resistor Colour coding and verification of series parallel connections.
2. Measurement of AC signals parameters. (Amplitude and Frequency)
3. Verification of logic gates.
4. Soldering simple electronic circuits and checking continuity.
5. PN Diode as a switch.
6. Study of Lap Top

**TOTAL: 45 PERIODS**

<b>EQUIPMENT FOR A BATCH OF 30 STUDENTS:</b>		
<b>CIVIL</b>		
1.	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, coupling, unions, elbows, plugs and other fittings	15 Sets
2.	Carpentry Vice (fitted to work bench)	15 Nos.
3.	Standard wood working tools	15 Sets
4.	Models of industrial trusses, door joints, furniture joints	5 Each
5.	Power Tools a. Rotary Hammer	2 Nos.

	b. Demolition Hammer c. Circular Saw d. Planer e. Hand Drilling Machine f. Jigsaw	2 Nos. 2 Nos. 2 Nos. 2 Nos. 2 Nos.
<b>MECHANICAL</b>		
6.	Arc welding transformer with cables and holders	5 Nos.
7.	Welding booth with exhaust facility	5 Nos.
8.	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets
9.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
10.	Centre Lathe	2 Nos.
11.	Power Tool: Angle Grinder	2 Nos.
12.	Standard Sheet metal working tools	15 Sets
<b>ELECTRICAL</b>		
1.	Assorted electrical components for house wiring	5 Sets
2.	Electrical measuring instruments (Energy meter, ammeter, voltmeter)	2 Nos. Each
3.	Study purpose items: Iron box, fan and regulator, emergency lamp	1 Each
<b>ELECTRONICS</b>		
1.	Assorted electronic components for making circuits. (Resistor, Capacitor, Diode)	20 Nos. Each
2.	Small PCBs	10 Nos.
3.	Multi meter	5 Nos.
4.	CRO, AFO, Transformer	3 Nos. Each
5.	Soldering guns	5 Nos.
6.	IC Trainer kit	5 Nos.
7.	AND, OR, NAND, NOR, NOT, XOR Gate ICs	5 Nos. Each
8.	Used Lap top ( for demo purpose)	1 No


**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name:</b> INDUSTRIAL PRACTICES WORKSHOP		<b>Course Code:</b> 24GE2L2	
<b>GROUP A (Civil &amp; Mechanical)</b> <b>GROUP B (Electrical &amp; Electronics)</b>			
<b>CO</b>	<b>Course Outcomes</b>	<b>EXP</b>	<b>K-CO</b>
<b>C120.1</b>	Apply the knowledge of engineering fundamentals to the professional engineering practice.	1-18	K3
<b>C120.2</b>	Identify, formulate and analyze engineering problems	1-18	K3

**KLNCE UG MECH R2024 (AY 2025 – 2026 admitted)**

	reaching conclusions using engineering sciences		
<b>C120.3</b>	Design solutions for societal and environmental considerations.	1-18	K3
<b>C120.4</b>	Apply reasoning informed by the contextual knowledge relevant to the professional engineering practice.	1-18	K3
<b>C120.5</b>	Function effectively as an individual, as a leader and write effective reports and documentation.	1-18	K3



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24HS2L2

PHYSICAL EDUCATION –I

L	T	P	C
0	0	2	1

**OBJECTIVES:**

- To impart the fundamentals of physical education for development of students' physical, mental, and social well-being.
- To instill a lifelong appreciation for physical activity towards the development of positive attitude and fostering values of team work and sportsmanship.

**Introduction to physical education:** Exercise for Good Posture – Conditioning and Calisthenics for Before start, Jogging, Bending, Twisting, Standing, Sitting and Relaxation, Training on First Aid practices. **Participation of athletic events:** Rules and regulations of important athletic events, Sprint, Jumps, Throws and Hurdles. **Skill development in any one of the following outdoor games:** Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis. **Skill development in any one of the following indoor games:** Shuttle Badminton, Chess and Table Tennis.

**REFERENCES:**

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). Psychology of sports performance. Sports Publication.

**E-resources:** 1. <https://www.who.int/health-topics/physical-activity>

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name : PHYSICAL EDUCATION - I	
CO	Course Outcomes
CO1	Understand and explain the importance of physical activity for mental and physical health.
CO2	Apply basic principles of exercise science in the routine life
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively
CO4	Demonstrate independent learning in health, nutrition, and fitness-related topics.

<b>24BS301</b>	<b>TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS</b>	<b>L T P C</b>
		3 1 0 4

**OBJECTIVES:**

- To learn the formation of partial differential equations and the solution of first-order and higher order partial differential equations.
- To apply Fourier series to solve one-dimensional wave, one- and two-dimensional heat equations which occur frequently in various branches of engineering disciplines.
- To make the students familiar with topics such as Fourier transforms, Z-transforms, and Fourier series.

**UNIT- I PARTIAL DIFFERENTIAL EQUATIONS 9+3**

Formation of partial differential equations–Singular integrals –Solutions of standard types of first order partial differential equations - Lagrange’s linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

**UNIT- II FOURIERSERIES 9+3**

Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic analysis.

**UNIT- III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3**

Classification of PDE – Method of separation of variables - Fourier Series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

**UNIT- IV FOURIERTRANSFORMS 9+3**

Statement of Fourier integral theorem –Fourier transform pair –Fourier sine and cosine transforms–Properties – Transforms of simple functions – Convolution theorem – Parseval’s identity.

**UNIT- V Z-TRANSFORMS AND DIFFERENCE EQUATIONS 9+3**

Z-transforms -Elementary properties – Inverse Z-transform (using partial fraction and residues)–Initial and final value theorems – Convolution theorem – Formation of difference equations – Solution of difference equations using Z - transforms.

**CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS**

**TEXTBOOKS:**

1. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44<sup>th</sup> Edition, 2017.
2. Bali.N.P. and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi publications Pvt.Ltd, 9<sup>th</sup> Edition, 2014.

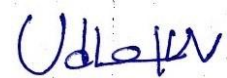
**REFERENCES:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley, India, 8<sup>th</sup> Edition, 2016.
2. James G., "Advanced Modern Engineering Mathematics", Pearson Education, 3<sup>rd</sup> Edition, 2007.
3. Paul DuChateau, David W. Zachmann, "Schaum's Outline of Partial Differential Equations", 3<sup>rd</sup> Edition, 2011.
4. Narayanan S., Manicavachagom Pillay T.K. and Ramanaiah G., "Advanced Mathematics for Engineering Students", S. Viswanathan Publishers Pvt. Ltd, Chennai, Vol. II 2003 & Vol. III 2002.
5. Ramana B.V., "Higher Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd, New Delhi, 2016.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>COURSE NAME:</b> TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS		<b>Course Code:</b> 24BS301	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K- CO</b>
C201.1	Solve linear partial differential equations, second and higher order with constant coefficients.	I	K3
C201.2	Solve partial differential equations using Fourier series analysis.	II	K3
C201.3	Solve one, two dimensional heat flow problems and one dimensional wave equation problems.	III	K3
C201.4	Compute the Fourier transforms of various functions.	IV	K3
C201.5	Apply Z-transforms techniques to solve difference equation.	V	K3



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24ME301

**STRENGTH OF MATERIALS**

**L T P C**  
3 0 0 3

**OBJECTIVES:**

- To study the concepts of simple stresses, strains, and strain energy due to external loads.
- To understand the two dimensional stress systems, stresses and deformations induced in thin and thick shells.
- To compute stresses and deformation in circular shafts and helical spring due to torsion.
- To understand the concept of shearing force and bending moment due to external loads in beams and their effect on stresses.
- To determine the deflection of beams by various methods and crippling load of columns under various conditions.

**UNIT- I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9**

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses. Stress-Strain Diagram for ductile and brittle materials, True stress, True strain. Deformation of simple and compound bars, Thermal stresses, Elastic constants, Poisson's ratio, Volumetric strain, Relation between elastic constant and poisson ratio, Strain energy and unit strain energy, Strain energy in Uniaxial loads.

**UNIT- II ANALYSIS OF STRESSES IN TWO DIMENSIONS 9**

Stresses in thin cylindrical shells - circumferential and longitudinal stresses. Deformation in thin and thick cylinders, compound cylinders - stresses in spherical shells - deformation in spherical shells. Stresses on inclined planes - principal stresses and principal planes. Mohr's circle for plane stress.

**UNIT- III TORSION 9**

Torsion formulation, stresses and deformation in circular and hollow shafts, Stepped shafts. Deflection in shafts fixed at the both ends. Stresses in helical springs, Deflection of helical springs.

**UNIT- IV BEAMS 9**

Beams – types, Standard Rolled sections, transverse loading on beams, Shear force and bending moment in beams - Cantilever, Simply supported and over hanging. Theory of simple bending, bending stress distribution, Load carrying capacity, Proportioning of sections, Flitched beams, Shear stress distribution. Deflections of beams by Double Integration method, Macaulay's method.

**UNIT- V COLUMNS 9**

Columns – Long and short columns, Euler's formula for crippling load with different end conditions, eccentric loading, Rankine formulae.

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXTBOOKS:**

1. Ferdinand P. Beer, E. Russell Johnston, John T. DeWolf, David F. Mazurek, Sanjeev Sangh, Mechanics of Materials, 2020, 8th Edition McGraw-Hill Education, India.
2. Bansal R.K, "A Textbook of Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 6th Edition, 2019.
3. Khurmi R.S, Khurmi N, "Strength of Materials", S.Chand, New Delhi, 2015.

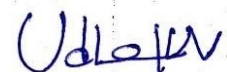
**REFERENCES:**

1. R.C.Hibbeler, "Mechanic sof Materials", 9<sup>th</sup> Edition, Pearson Education., 2018
2. Popov E.P, Nagarajan S, Lu Z. A : "Mechanics of Materials", Prentice-Hall of India, New Delhi, SI Edition, 2015.
3. Rajput, RK, "Strength of Materials", S.Chand & Co, New Delhi, 2015.
4. S.S.Bhavikatti, "Strength of Materials", Vikas Publishing House-Pvt.Ltd., 4<sup>th</sup> Edition. 2013.
5. Singh D.K, "Mechanics of Solids" Pearson Education, 2008.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

COURSE NAME: STRENGTH OF MATERIALS		Course Code: 24ME301	
CO	Course Outcomes	Unit	K- CO
C202.1	Determine the deformation of bars while applying loads.	I	K3
C202.2	Compute stresses due to internal pressure in cylinders and spherical shells	II	K3
C202.3	Calculate the shear stress induced in shafts and springs.	III	K3
C202.4	Construct Shear force diagram, Bending moment diagram and deflection of beam for different beam configurations	IV	K3
C202.5	Calculate crippling load of columns under various conditions.	V	K3



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<b>24ME302</b>	<b>FLUID MECHANICS AND MACHINERY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	0	0	3

**OBJECTIVES:**

- To understand the properties of fluids
- To understand the flow characteristics.
- To gain knowledge about the dynamics of fluids and boundary layer concepts.
- To study about dimensional analysis and model analysis
- To understand the working principle and performance of hydraulic machines

**UNIT- I FLUID PROPERTIES 9**

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Compressible and incompressible fluid, Pressure measurement, Buoyancy and floatation.

**UNIT- II FLOW CHARACTERISTICS 9**

Flow characteristics –Eulerian and Lagrangian Approach-concept of control volume and system-Reynold’s transportation theorem-Application of continuity equation, energy equation and momentum equation.

**UNIT- III FLOW THROUGH PIPES AND BOUNDARY LAYER 9**

Reynold’s Experiment -Laminar flow through circular conduits - Darcy Weisbach equation – friction factor-Moody diagram-Major and minor losses- Hydraulic and energy gradient lines- Pipes in series and parallel-Boundary layer concepts-Types of boundary layer thickness

**UNIT- IV DIMENSIONAL ANALYSIS 9**

Need for dimensional analysis, methods of dimensional analysis. Similitude–types of similitude. Dimensionless parameters, application of dimensionless parameters. Model analysis.

**UNIT- V HYDRAULIC MACHINES 9**

Classification of pumps-Centrifugal pumps-Working principle-Heads and efficiencies–. Velocity triangles - Work done by the impeller - Performance curves – Specific speed- Reciprocating pump working principle. Introduction-Classification of turbines -Working principle (Not for Examination).

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXTBOOKS:**

1. R. K.Bansal, “Textbook of fluid mechanics and hydraulic machine: SI units” 10th Edition, Laxmi Publication, 2019.
2. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics including Hydraulics machines", Standard Book House, 23<sup>rd</sup> Edition, 2022.
3. Kumar K.L., "Engineering Fluid Mechanics", Eurasia Publishing House Pvt.Ltd., New Delhi, 2016

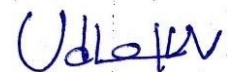
**REFERENCES:**

1. Frank White, "Fluid Mechanics", 8<sup>th</sup> Edition, McGraw Hill Education (India) Pvt. Ltd 2017.
2. Streeter, V.L. and Wylie E.B., "Fluid Mechanics", 9<sup>th</sup> Edition, McGraw Hill Publishing Co. 2017
3. Yunus A. Cengel and John A. Cimbala, Fluid Mechanics-Fundamentals & Applications, 4<sup>th</sup> Edition, Tata McGraw Hill, 2017
4. S.K. Som, Gautam Biswas, Suman Chakraborty, Introduction to Fluid Mechanics and Fluid Machines, 3<sup>rd</sup> Edition, Tata McGraw-Hill Education, 2012
5. Jain A.K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name: FLUID MECHANICS AND MACHINERY		Course Code: 24ME302	
CO	Course Outcomes	Unit	K- CO
C203.1	Determine the properties of fluid for the fluid applications	I	K3
C203.2	Discuss the flow characteristics of the fluid and its applications.	II	K3
C203.3	Compute losses in pipes, bends and fittings using conservation laws.	III	K3
C203.4	Predict the performance of prototype by model studies and solve dimensional analysis	IV	K3
C203.5	Analyze the performance characteristics of hydraulic machines.	V	K3



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<b>20ME303</b>	<b>MANUFACTURING PROCESSES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	0	0	3

**OBJECTIVES:**

- To provide knowledge on the working principles, process parameters, and equipment of metal casting and metal joining.
- To identify defects and interpret the causes for defects in products of metal casting, metal joining, and metal forming processes.
- To provide knowledge about various bulked formation processes.
- To understand the working principles of moulding of plastic components.
- To understand the concepts of additive manufacturing processes.

**UNIT- I METALCASTINGPROCESSES 9**

Pattern –Types, Materials, allowances. Molding sand –Types and Properties, Design of, Moulds, Riser and gating design Basic steps in sand casting, Cupola furnace, Special casting processes (Shell, Investment, Pressure die casting, Centrifugal Casting), Defects in Sand casting process

**UNIT– II BULKDEFORMATIONPROCESSES 9**

Hot working and cold working of metals – Forging processes–Open, impression and closed die forging, Typical forging operations. Rolling of metals –Types of Rolling mills – Flat strip rolling, Defects in rolled parts- Wire and Rod - Tube drawing

**UNIT– III FABRICATIONPROCESSES 9**

Fusion welding: Oxy-fuel Welding, Arc welding- Electrodes, Coating and specifications, MIG welding, TIG welding, CO<sub>2</sub>Welding, , Plasma arc welding, Laser Beam welding, Thermite welding

Solid State welding: Resistance welding, friction stir welding, ultrasonic welding, electron beam welding. Defects, causes and remedies in welding -Brazing and soldering.

**UNIT– IV SHEETMETALPROCESSES 9**

Sheet metal Characteristics -shearing, bending and drawing–Stretch forming–Formability of sheet metal , Bending force calculations – Test methods

Working principle and applications of special forming processes -Hydroforming –Rubber pad forming – Metal spinning –Explosive forming - Magnetic pulse forming -Super plastic forming.

**UNIT– V PROCESSINGOFPLASTICSANDADDITIVEMANUFACTURING 9**

Plastics and its classification , working principles- processing of plastics such as Injection molding, Compression molding, Transfer Molding, Blow molding, Rotational molding, Film blowing, Extrusion, Thermoforming.

Additive Manufacturing: Classification – Fused Deposition Modeling, Selective Laser Sintering, Stereo lithography, Metal additive Manufacturing, Benefits, Applications.

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXTBOOKS:**

1. Kalpakjian.S,“Manufacturing EngineeringandTechnology”,PearsonEducationIndia9<sup>th</sup> Edition, 2023.
2. HajraChoudharyS.K.andHajraChoudhury.A.K.,ElementsofWorkshopTechnology,Volume I , Media Promoters and Publishers Pvt. Limited, Mumbai, 16th Reprint 2017
3. Anupgoel,“Manufacturing processess”,Technical publications,3<sup>rd</sup>edition2024.

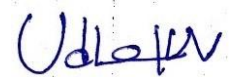
**REFERENCES:**

1. GoshA, Mallik, A.K., Manufacturing Science, East-West Press Pvt Ltd, 2010.
2. Rajput R.K, "A text book of Manufacturing Technology", Lakshmi Publications, 2018.
3. Rao. P.N., "Manufacturing Technology Foundry, Forming and Welding", 5<sup>th</sup> Edition, Tata McGraw Hill, 2018.
4. Shaikh Ubaid  
, Palaskar Ravikiran, "Additive manufacturing", Technical publications, 3<sup>rd</sup> edition 2021.
5. Roy. A. Lindberg, "Processes and materials of manufacture:", PHI/Pearson education, 2015

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: MANUFACTURING PROCESSES</b>		<b>Course Code: 24ME303</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K- CO</b>
C204.1	Explain the various applications of the casting process.	I	K2
C204.2	Illustrate the different bulked formation processes	II	K2
C204.3	Describe about various welding techniques.	III	K2
C204.4	Apply the various sheet metal forming process.	IV	K2
C204.5	Choose a suitable plastic molding process and additive manufacturing process for producing a given part	V	K2



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<b>24ME304</b>	<b>ENGINEERING THERMODYNAMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		3	1	0	4

**OBJECTIVES:**

- To understand the first law of thermodynamics for various systems.
- To understand the second law of thermodynamics and Entropy.
- To understand the properties of pure substance.
- To understand behavior of ideal and real gas.
- To understand Psychometric properties.

**UNIT- I BASIC CONCEPT AND FIRST LAW 9+3**

Thermodynamic systems, Properties and processes - Thermodynamic Equilibrium - Displacement work - P-V diagram - Thermal equilibrium - Zeroth law – Concept of temperature and Temperature Scales-First law–application to closed and open systems– steady flow energy equation (SFEE) and its application to nozzle, diffuser, compressor, turbine, heat exchanger.

**UNIT- II SECOND LAW AND ENTROPY 9+3**

Heat engine – Refrigerator – Heat pump. Statements of Second law of thermodynamics. Carnot cycle – reversed Carnot cycle – Performance. Clausius Inequality. Concept of Entropy – T-S diagram - Entropy change for pure substances – Principle of increase of entropy. Availability and irreversibility.

**UNIT- III PROPERTIES OF PURE SUBSTANCE 9+3**

Steam – formation and its properties- property diagrams (PV, PT, TV, TS& HS). Latent heat, Dryness fraction of steam. Heat transfer and work done in Non-Flow and flow Processes using Steam Tables and Mollier chart

**UNIT- IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS 9+3**

Properties of Ideal gas, real gas. Equations of state for real gases – Vanderwaal’s equation of state. Reduced properties-Law of corresponding states- Generalized Compressibility chart. Thermodynamic relations: Partial derivatives - Maxwell relations – Joule -Thomson experiment Clausius - Clapeyron equation.

**UNIT- V GAS MIXTURES AND PSYCHROMETRY 9+3**

Mixture of non-reacting gases - Dalton's and Amagat's model - Calculation of changes in properties (Cp, Cv, R, u, h and s) for gas mixtures. Psychrometry- dry and atmospheric air, Psychrometric properties of moist air specific and relative humidity, dew point temperature - Psychrometric chart.

**CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS**

**TEXTBOOKS:**

1. Nag.P.K., Engineering Thermodynamics, 6<sup>th</sup> Edition, McGrawHill Education, 2017.
2. R.K.Rajput, “A Text Book of Engineering Thermodynamics”, 5<sup>th</sup> Edition, 2017.
3. Cengel.Y and M.Boles, "Thermodynamics-An Engineering Approach", 9<sup>th</sup> Edition, McGrawHill, 2019.

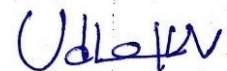
**REFERENCES:**

1. Sonntag, R.E., Borgnakke, C., and Van Wylen, G., Fundamentals of Thermodynamics, 7th Edition, Wiley Eastern Ltd, 2009.
2. Michael J. Moran, Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 8th Edition, 2003
3. Prasannakumar, "Thermodynamics", Pearson–Dorling Kindersley (India) Pvt. Ltd., 2013.
4. Single, O.P., Engineering Thermodynamics, Macmillan Publishers India Limited, 2000
5. William C. Reynolds, Henry C. Perkins, Engineering thermodynamics, McGraw Hill, 2009

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: ENGINEERING THERMODYNAMICS</b>		<b>Course Code: 24ME304</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K- CO</b>
C205.1	Calculate energy exchange in closed systems and flow process	I	K3
C205.2	Determine the performance limits of thermo dynamic cycles and entropy change during thermo dynamic processes	II	K3
C205.3	Compute heat transfer and work done during non-flow and flow Processes using Steam.	III	K3
C205.4	Derive simple thermo dynamic relations of ideal gases	IV	K3
C205.5	Calculate properties of v gas mixtures and moist air using thermodynamic relations and psychometric chart.	V	K3



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<b>24HS301</b>	<b>HUMAN VALUES AND ETHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>1</b>	<b>0</b>	<b>2</b>

**OBJECTIVES:**

- To create an awareness on Engineering Ethics and Human Values.
- To understand social responsibility of an engineer.
- To appreciate ethical dilemma while discharging duties in professional life.

**UNIT- I INTRODUCTION TO VALUE EDUCATION 3+3**

Value Education – Definition - Concept and Need for Value Education - Natural acceptance, Self exploration - Fundamentals of value education - Happiness and Prosperity as parts of Value Education- fulfilling human aspirations.

**Practice Session:** Sharing about Oneself, Exploring Human Consciousness – self exploration, Exploring Natural Acceptance.

**UNIT– II HARMONY IN THE HUMAN BEING 3+3**

Understanding Myself as Co-existence of the Self and the Body - I' and Body synchronization - Realization of Self, Body needs - Self-regulation and Health.

**Practice Session:** Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self, Harmony of Self with the Body - program for ensuring health vs dealing with disease.

**UNIT– III HARMONY IN THE FAMILY, SOCIETY AND NATURE 3+3**

Family as a basic unit of Human Interaction-Values in Relationships - The Basics for Trust and Respect in today's Crisis: Affection, e-Guidance, Reverence, Glory, Gratitude and Love – Harmony in society: Resolution, Prosperity, Fearlessness and Co-existence as Comprehensive Human Goal- Harmony in Nature: The Four Orders in Nature - The Holistic Perception of Harmony in Existence.

**Practice Session:** Exploring the Feelings of Trust, Respect and Gratitude, Exploring Systems to fulfil Human Goals considering society and nature - Co-existence in Existence

**UNIT– IV SOCIAL ETHICS 3+3**

The Basics for Ethical Human Conduct - Defects in Ethical Human Conduct - Holistic Alternative and Universal Human Order and Ethical Conduct- Human Rights violation and Social Disparities. **Practice Session:** Exploring Ethical Human Conduct, Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order.

**UNIT– V PROFESSIONAL ETHICS 3+3**

Value based Life and Profession - Professional Ethics and Right Understanding - Competence in Professional Ethics - Issues in Professional Ethics – The Current Scenario - Vision for Holistic Technologies.

**Practice Session:** Holistic Technologies - Production Systems and Management Models, Holistic vision of life - Socially responsible behaviour and environmentally responsible work

**CLASS HOURS: 30 PERIODS TERM HOURS: 30 PERIODS TOTAL: 60 PERIODS**

**TEXTBOOKS:**

1. R.R.Gaur,R.Asthana,G.P.Bagaria, A Foundation Course in Human Values and Professional Ethics, 2<sup>nd</sup> revised edition, Excel Books, New Delhi, Reprint 2019.
2. ANTripathy,HumanValues,NewAgeInternationalPublishers,NewDelhi,2003.

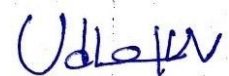
**REFERENCES:**

1. E G Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
2. M Govindrajan, S Natrajan & V. S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd, Reprint 2011.
3. Mike Martin and Roland Schinzinger "Ethics in Engineering" McGraw Hill, New York, 4<sup>th</sup> edition, Reprint 2017.
4. Charles E. Harries, Michael S. Protchard and Michael J. Rabins, "Engineering Ethics- concepts and Cases", Thomson Learning, 2000.
5. S.K. Chakraborty and Dabangshu Chakraborty, "Human Values and Ethics: Achieving Holistic Excellence", ICFAI University Press, 2006.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name : HUMAN VALUES AND ETHICS		Course Code :24HS301	
CO	Course Outcomes	Unit	K-CO
C206.1	Explain the significance of value inputs and start applying them in their life and profession to ensure happiness and prosperity.	I	AD
C206.2	Differentiate between Thyself & the Body to ensure competency of an individual.	II	AD
C206.3	Explain the role of a human being in ensuring harmony in family, society, and nature.	III	AD
C206.4	Develop an awareness of human values to appreciate the rights of others and to enable social balance.	IV	AD
C206.5	Differentiate between ethical and unethical professional practices, and apply suitable strategy to actualize a harmonious working environment.	V	AD



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<b>24ME3L1</b>	<b>COMPUTER AIDED MACHINE DRAWING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**OBJECTIVES:**

- To gain the skills and practical experience in handling 2D drafting
- To gain knowledge in 3D modeling software systems
- To have standard drawing practices using fits and tolerances.
- To prepare assembly drawings both manually and using standard CAD packages.
- To prepare standard drawing layout for modeled parts, assemblies with BoM.

**LIST OF EXPERIMENTS**

**Part -I DRAWING STANDARDS & FITS AND TOLERANCES**

Code of Practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to handbook for the selection of standard components like bolts, nuts, screws, keys, etc. – Limits, fits – Tolerancing of individual dimensions (IS 919) – Specification of fits – Preparation of production drawings and reading of part and assembly drawings – Basic principles of Geometric Dimensioning and Tolerancing.

**PART-II 2D DRAFTING**

Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed Drawing of the Components

**Manual Drawing:**

1. Sleeve & Cotter Joint
2. Knuckle Joint
3. Universal Joint
4. Flange Coupling

**Drawing with Software:**

1. Piston
2. Connecting Rod
3. Screw Jack
4. Machine Vice

**Total:** 20% of classes for theory classes and 80% of classes for practice

**Note:** 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D CAD software

**TOTAL: 45 PERIODS**

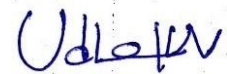
**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

S. No.	Name of the equipment	Quantity
1	Computer Work Station	30
2.	Printer	1
3.	Drafting Software	30 License

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: COMPUTER AIDED MACHINEDRAWING</b>		<b>Course Code: 24ME3L1</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Expt.</b>	<b>K- CO</b>
C207.1	Sketch the given part drawing with fits and tolerances	1-12	K3
C207.2	Prepare standard drawing layout for modeled assemblies with BoM	1-12	K3
C207.3	Model orthogonal views of machine components	1-12	K3
C207.4	Prepare standard drawing layout for modeled parts	1-12	K3
C207.5	Draw the given parts and assembly using 2D CAD software	1-12	K3



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<b>24ME3L2</b>	<b>STRENGTH OF MATERIALS AND FLUID MACHINERY LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**OBJECTIVES:**

- To study the mechanical properties of materials when subjected to different types of loading and to measure loads, displacements, and strains.
- To determine the stiffness properties of structural elements and to understand the hardening and tempering process.
- To determine the coefficient of discharge for an orifice meter / venturi meter.
- To study the performance characteristics of various hydraulic pumps and hydraulic turbines.
- To gain practical knowledge about friction factor and flow measurement.

**LIST OF EXPERIMENTS**

**STRENGTH OF MATERIALS LABORATORY**

1. Tensile test on mild steel rod
2. Torsion test on mild steel rod
3. Impact test – Izod / Charpy
4. Hardness test – Brinell and Rockwell hardness number
5. Effect of hardening – Improvement in hardness and impact resistance of steels
6. Compression test on helical springs

**FLUID MACHINERY LABORATORY**

1. Determination of coefficient of discharge for orifice meter / venturi meter.
2. Performance characteristics of centrifugal pump / submersible pump.
3. Performance characteristics of reciprocating pump / gear pump.
4. Performance characteristics of Francis / Pelton turbine.
5. Performance characteristics of Kaplan turbine.
6. (a) Determination of friction factor for flow through pipes.  
(b) Determination of rate of flow using rotameter and its calibration.

**TOTAL: 45 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

**STRENGTH OF MATERIALS LABORATORY**

<b>S. No.</b>	<b>Name of the equipment</b>	<b>Quantity</b>
1.	Universal Tensile Testing machine	1
2.	Torsion Testing Machine	1
3.	Impact Testing Machine	1
4.	Brinell Hardness Testing Machine	1
5.	Rockwell Hardness Testing Machine	1
6.	Muffle Furnace	1
7.	Metallurgical Microscope	1

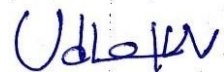
**FLUIDMACHINERYLABORATORY**

S. No	Name of the equipment	Quantity
1.	Orifice meter/Venturi meter	1
2.	Centrifugal pump /Submersible Pump	1
3.	Reciprocating pump/Gear Pump	1
4.	Francis turbine/Pelton turbine	1
5.	Kaplan turbine.	1
6.	Pipe friction apparatus	1
7.	Rotameter	1

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name: STRENGTH OF MATERIALS AND FLUID MACHINERY LABORATORY		Course Code: 24ME3L2	
CO	Course Outcomes	Unit	K- CO
C208.1	Determine the mechanical properties of metals by testing	1,2,3,4,5	K3
C208.2	Determine the stiffness properties of helical spring	6	K3
C208.3	Determine the coefficient of discharge for Orifice meter/ Venturi meter	1	K3
C208.4	Predict performance characteristics of pump and turbines	2,3,4,5	K3
C208.5	Determine the friction factor for flow through pipes and measure the rate of flow using rotameter	6	K3



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<b>24HS3L1</b>	<b>APTITUDE AND SOFT SKILLS – II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		0	0	2	1

**Module I Aptitude Skills II** **15**

Pipes and cisterns, boats and streams, Problems on trains, Alpha Numeric Puzzles, Simple Interest, Compound Interest, Mixtures and Allegations, calendar, clock, permutation and combination, probability, height and distance.

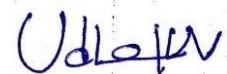
**Module II Soft Skills II** **15**

Introduction to Soft skills – Non-Verbal Communication - Role play - Learning styles – Writing Bio-data and Process description - Peak Life Moment / Challenging moment - People management – team work, leadership, Decision making – problem identification - Email and Essay writing - Just a minute (JAM).

**TOTAL: 30 PERIODS**

**REFERENCES:**

1. Quantitative aptitude for competitive examinations , R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – AbijithGuha, TMH
3. Quantitative Aptitude for Cat – ArunSharma, TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan, A Handbook of Spotting Errors, Mcgraw Hill Education, 2010



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24HS3L2

PHYSICAL EDUCATION – II

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
0	0	2	1

**OBJECTIVE:**

To impart knowledge on gymnastic exercises and pressing needs for up skilling in a particular game.

**Basic gymnastics exercises:** Warming up, Suitable exercise, Lead up games, Safety education, Movement education, Balanced Walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, horizontal bar exercise, flic-flac-walk

**Upskilling in any one of the athletics:** Broad Jump, High Jump, Triple Jump, Relay Sprints, Javelin Throw, Discuss Throw, Shot Put, Short and Long-distance Running.

Advance skills in any one of the indoor/outdoor games, which has been opted by the student in the previous semester.

**TOTAL: 30 PERIODS**

**REFERENCES:**

1. Singh, A. (2008). Essentials of physical education. Kalyani Publishers.
2. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co.
3. Mangal, S. K. (2009). Psychology of sports performance. Sports Publication.
4. Kandappan, K. (2004). Foundations of physical education. Friends Publications.

**E-resources:** 1. <https://www.who.int/health-topics/physical-activity>

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name :PHYSICAL EDUCATION – II</b>	
<b>CO</b>	<b>Course Outcomes</b>
CO1	Understand and explain the importance of physical activity for mental and physical health.
CO2	Apply safety principles and methods during sports activities.
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.
CO4	Demonstrate the advanced technical skills and strategic understanding in the game of their interest.

<b>24BS401</b>	<b>PROBABILITY, STATISTICS AND NUMERICAL METHODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To understand the basic concepts of Probability and Statistics.
- To introduce the numerical methods for solving algebraic and transcendental equations and interpolation in various intervals.
- To acquaint the knowledge of various Numerical methods of solving ordinary differential equations.

**UNIT - I PROBABILITY AND RANDOM VARIABLES 9+3**

Probability–Axioms of probability- conditional probability – Baye’s theorem (Without Proof).Discrete and continuous random variables- Moments-Moment generating function – Binomial, Poisson and Normal distributions (Except derivations).

**UNIT - II INTRODUCTION TO STATISTICS, CORRELATION AND REGRESSION 9+3**

Measures of Central tendency- Mean-Median-Mode- Measures of Dispersion- Standard deviation -Coefficient of Variation- Correlation – Coefficient of correlation –Rank Correlation- Regression –Estimation of Regression line.

**UNIT - III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3**

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method -Solution of linear system of equations - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel-Eigen values of a matrix by Power method.

**UNIT - IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3**

Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolations–Approximation of derivatives using interpolation polynomials– Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

**UNIT - V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3**

Single step methods: Taylor’s series method-Euler’s method – Modified Euler’s method- Fourth order Runge -Kutta method for solving first order equations - Multi step methods : Milne’s and Adams - Bash forth predictor corrector methods for solving first order equations

**CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS**

**TEXT BOOKS:**

1. Gupta.S.C., Kapoor.V.K., "Fundamental of Mathematical Statistics", Sultanchand & Sons Educational Publishers, New Delhi, Reprint 2013
2. Grewal.B.S., "Numerical Methods in Engineering and Science", Khanna Publishers, New Delhi, 10<sup>th</sup> Edition, 2015.

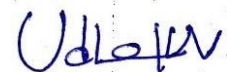
**REFERENCES:**

1. Johnson.R.A.,Miller,IandFreundJ.,"MillerandFreund'sProbabilityandStatistics forEngineers",PearsonEducation,Asia,8<sup>th</sup>Edition,2015.
2. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw Hill,NewDelhi,2006.
3. Sastry. S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5th Edition, 2018.
4. SankaraRao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall ofIndia Pvt.Ltd,5<sup>th</sup>Edition,NewDelhi,2007.
5. Veerarajan.T,Ramachandran.T,"Numerical Methods With Programs In C", Tata McGraw Hill Publishing Company Limited,8<sup>th</sup>Edition,Reprint2011.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name: PROBABILITY, STATISTICS AND NUMERICAL METHODS		Course Code: 24BS401	
CO	Course Outcomes	Unit	K- CO
C209.1	Build the parameters of statistical distributions using basic probability theory concepts.	I	K3
C209.2	Compute the measures of central tendency, measures of dispersion to locate the central points and to know the amount of diversity in the distribution.	II	K3
C209.3	Solve algebraic and transcendental equations.	III	K3
C209.4	Solve numerical differentiation and integration using numerical techniques.	IV	K3
C209.5	Apply numerical techniques to solve the ordinary differential equations with initial and boundary conditions with engineering applications.	V	K3



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<b>24ME401</b>	<b>KINEMATICS AND DYNAMICS OF MACHINES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To study the basic components of mechanisms, analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism and design cam mechanisms for specified output motions.
- To study the basic concepts of toothed gearing and kinematics of gear trains.
- To understand the cam mechanisms for specified output motions.
- To analyze the force-motion relationship in components subjected to external forces and analyzing of standard mechanisms.
- To Analyzing the undesirable effects of unbalances resulting from prescribed motions in mechanism and the effect of dynamics of undesirable vibrations

**UNIT-I KINEMATICS OF LINKAGE MECHANISMS 9+3**

Classification of mechanisms-Kinematic link, pair and chain , classification of Kinematic pairs, Degrees of freedom, Spatial relations Degrees of Freedom Velocity and acceleration analysis of four bar mechanism and slider crank mechanism by vector polygons: Angular velocity and angular acceleration of links

**UNIT-II KINEMATICS OF CAM MECHANISMS 9+3**

Classification of cams and followers, Terminology and definitions. Displacement diagrams, Uniform velocity, parabolic, simple harmonic and cycloidal motions.

**UNIT-III GEARS AND GEAR TRAINS 9+3**

Gear – Types and profile – nomenclature of gears – laws of gearing, Gear trains, Speed ratio, train value, Parallel axis gear trains, Epicyclic Gear Trains - algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear train

**UNIT- IV STATIC AND DYNAMIC FORCE ANALYSIS 9+3**

Applied and Constrained Forces, Free body diagrams – Static Equilibrium conditions , Static Force analysis in simple machine members , Dynamic Force Analysis , Inertia Forces and Inertia Torque, D’Alembert’s principle, superposition principle, Dynamic Force Analysis in simple machine members

**UNIT -V BALANCING AND VIBRATION 9+3**

Static and Dynamic balancing, Balancing of revolving and reciprocating masses, Balancing machines, Free vibrations, Equations of motion, natural Frequency, Damped Vibration, bending critical speed of simple shaft, Torsional vibration, Forced vibration, Modal analysis for Vibration

**CLASS HOURS: 60 PERIODS TERM HOURS: 60 PERIODS TOTAL: 120 PERIODS**

**TEXT BOOKS:**

1. Dr. R. K. Bansal , “Theory of Machines”, Laxmi Publications Pvt Ltd., New Delhi, 5<sup>th</sup> edition,2023.
2. Rattan, S.S, “Theory of Machines”, 5th Edition, Tata McGraw-Hill, 2019.

**REFERENCES:**

1. Ramamurthi. V, “Mechanics of Machines”, Narosa Publishing House, 3<sup>rd</sup> edition 2019.
2. Robert Norton., “Kinematics and Dynamics of machinery” 1st Edition., McGraw Hill India., 2009
3. Rao and Dukkupati, R.V, “Mechanism and Machine Theory”, New Age International Pvt. Ltd., 2010.
4. Thomas Bevan, “Theory of Machines”, CBS – 3<sup>rd</sup> Edition, 2010.
5. Amitabha Ghosh, Asok Kumar Mallik, “Theory of Mechanisms and Machines” East West Press, 2020.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: KINEMATICS AND DYNAMICS OF MACHINES</b>		<b>Course Code: 24ME401</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K- CO</b>
C210.1	Calculate Degrees of Freedom and determine the velocity and acceleration for simple mechanisms.	I	K3
C210.2	Develop the cam profile for various types of followers.	II	K3
C210.3	Determine the speed, torque, tooth load and contact ratio of gear pair and gear trains.	III	K3
C210.4	Calculate static and dynamic forces of mechanisms using free body diagram and D’Alembert’s principle.	IV	K3
C210.5	Calculate the balancing masses and compute the frequency of free vibration and forced vibration using Modal analysis	V	K3



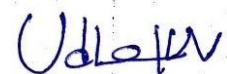
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1. Chapman, W.A.J., Workshop Technology, Vol - II, Oxford & IBH Publishing Co. Ltd., 2019
2. HMT, "Production Technology", Tata McGraw Hill, 28th Reprint, 2008.
3. Philip F. Oswald, and Jairo Munoz, "Manufacturing Process and Systems", John Wiley India Edition, 11<sup>th</sup> Edition, Reprint 2016.
4. MikellP.Groover, "Fundamentals of Modern Manufacturing", Wiley India Edition, 5<sup>th</sup> Edition, Reprint, 2016.
5. Milton C.Shaw, —Metal Cutting PrinciplesII, Oxford University Press, 4<sup>th</sup> Edition, 2016.

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: MACHINE TOOL TECHNOLOGY</b>		<b>Course Code: 24ME402</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K- CO</b>
C211.1	Describe the theories of metal cutting and calculate cutting tool life, machining time and cutting forces in metal machining.	I	K3
C211.2	Identify accessories and tools required to perform a particular operation in centre and semi-automatic lathes.	II	K3
C211.3	Describe the constructional and operational features of various special purpose machine tools.	III	K3
C211.4	Discuss the process of grinding and other surface finishing operations.	IV	K3
C211.5	Discuss the need and process of CNC machines.	V	K3



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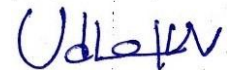
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1. Cengel. Y and M.Boles, "Thermodynamics - An Engineering Approach", 7<sup>th</sup> Edition, Tata McGraw Hill, 2010
2. Sonntag, R.E., Borgnakke, C., and Van Wylen, "Fundamentals of Thermodynamics", 7<sup>th</sup> Edition, Wiley Eastern Ltd, 2009.
3. Michael J. Moran, Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 8<sup>th</sup> Edition, 2003.
4. Sarkar, B.K, "Thermal Engineering" Tata McGraw-Hill Publishers, 2007
5. Rudramoorthy, R, "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2003

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name: THERMAL ENGINEERING		Course Code: 24ME403	
CO	Course Outcomes	Unit	K- CO
C212.1	Calculate efficiency of gas and vapour power cycles.	I	K3
C212.2	Determine the performance of IC Engines.	II	K3
C212.3	Calculate performance of refrigeration cycles.	III	K3
C212.4	Compute cooling load using Psychrometric chart.	IV	K3
C212.5	Determine the performance of Reciprocating Air Compressors.	V	K3



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<b>24ME404</b>	<b>ENGINEERING MATERIALS AND METALLURGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To learn the constructing the phase diagram and using of iron-iron carbide phase diagram for microstructure formation.
- To learn selecting and applying various heat treatment processes and its microstructure formation.
- To illustrate the different types of ferrous and non-ferrous alloys and their uses in engineering field.
- To illustrate the different polymer, ceramics and composites and their uses in engineering field.
- To learn the various testing procedures and material characterization in engineering field.

**UNIT - I CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 9**

Constitution of alloys – Solid solutions, substitutional and interstitial, phase Iron – Iron carbide equilibrium diagram, Isothermal transformation diagrams, cooling curves superimposed on I.T. diagram, continuous cooling Transformation (CCT) diagram Classification of steel and cast-Iron microstructure, properties and application.

**UNIT - II HEAT TREATMENT 9**

Full annealing, normalizing, hardening and tempering of steel. carburizing, Nitriding, cyaniding, Flame and Induction hardening

**UNIT - III FERROUS AND NON-FERROUS METALS 9**

Effect of alloying additions on steel , stainless and tool steels, HSLA, Maraging steels, alloy cast irons, Copper and its alloys, Aluminium and its alloys; Al-Cu – precipitation strengthening treatment – Titanium alloys, Mg-alloys, Ni-based super alloys, shape memory alloys, Properties and Applications

**UNIT - IV NON-METALLIC MATERIALS 9**

Polymers, Ceramics, Composites- Matrix and reinforcement Materials-applications of Composites - Nano composites, Bio materials, Semiconductors.

**UNIT - V MECHANICAL PROPERTIES AND MATERIAL CHARACTERIZATION 9**

Testing of materials under tension, compression and shear loads – Hardness tests, Impact test fatigue and creep failure mechanisms.

Introduction to Material characterization: Macroscopic and Microscopic observations, Principles of Optical and Electron microscopy (SEM and TEM)

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 90 PERIODS**

**TEXT BOOKS:**

1. Kenneth G.Budinski and Michael K. Budinski, “Engineering Materials”, Prentice Hall of India Private Limited, 9th edition ,2018.
2. Sydney H.Avner, “Introduction to Physical Metallurgy”, McGraw Hill Book Company, 1994.

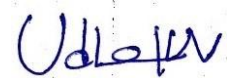
**REFERENCES:**

1. A.Alavudeen, N. Venkateshwaran, and J. T.WinowlinJappes, A Textbook of Engineering Materials and Metallurgy, Laxmi Publications, 2006.
2. Am andeep Singh Wadhwa, and Harvinder Singh Dhaliwal, A Textbook of Engineering Material and Metallurgy, University Sciences Press, 2008.
3. G.S .Upadhyay and AnishUpadhyay, “Materials Science and Engineering”, VivaBooksPvt.Ltd, New Delhi, 2020.
4. Raghavan.V, “Materials Science and Engineering”, Prentice Hall of India Pvt.Ltd. 6<sup>th</sup> edition, 2019.
5. George Dieter, Mechanical Metallurgy, Tata McGraw-Hill, 3rd Edition, New Delhi,2013

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: ENGINEERING MATERIALS AND METALLURGY</b>		<b>Course Code: 24ME404</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K- CO</b>
C213.1	Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.	I	K3
C213.2	Explain different heat treatment processes.	II	K3
C213.3	Clarify the effect of alloying elements on ferrous and non-ferrous metals.	III	K3
C213.4	Summarize the properties and applications of non-metallic materials.	IV	K3
C213.5	Explain the testing of mechanical properties and material characterization.	V	K3



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<b>24ME405</b>	<b>METROLOGY AND MEASUREMENT PRACTICES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**OBJECTIVES:**

- To make the students, familiar with characteristics of generalized measurement system limits, fits and tolerances.
- To relate various types of comparators, linear and angular measurement of part.
- To understand the principles of interference, principles of form measurement.
- To understand the methods of measurements of power, flow, temperature, speed, acceleration.
- To gain practical knowledge on dimensional measurement techniques such as linear and angular measurement of part, and physical measurement techniques such as force, torque, temperature, surface finish measurements and inspection methods using calipers, comparators, gauges and measuring machines.

**UNIT - I      BASICS OF METROLOGY      9**

Basics of Measurement- significance, generalized measuring system, Standards, Precision, Accuracy, Sensitivity, Repeatability, Reproducibility, Linearity, Calibration, Errors-Systematic and Random, Uncertainty of Measurement,

**LAB COMPONENT      6**

1. Calibration and use of Vernier caliper, Micrometer.
2. Calibration and use of Vernier height gauge.

**UNIT - II      LINEAR AND ANGULAR MEASUREMENT      9**

Linear Measuring Instruments –Internal/ External calipers, vernier caliper, vernier height gauge, depth gauge Comparators - mechanical, optical, electrical/electronic and pneumatic comparators, advantages, limitations and field of applications.

Angular measuring instruments – Types – Bevel protractor clinometers, angle gauges, spirit levels, sine bar

**LAB COMPONENT      6**

1. Measurement of linear dimensions using comparators.
2. Measurement of angles using Bevel protractor and Sine bar.

**UNIT - III      FORM MEASUREMENT      9**

Principles and methods of straightness, flatness, roundness and roughness measurement, Screw Thread Measurement, Gear Measurement. Principles of measurement using Tool Maker’s microscope, profile projector.

**LAB COMPONENT      6**

1. Measurement of screw thread parameters using Three wire method(floating carriage micrometer).
2. Measurement of screw thread parameters using Profile Projector, Tool Maker’s Microscope.
3. Measurement of gear parameters using Gear tooth Vernier caliper.

**UNIT - IV      ADVANCED METROLOGICAL MEASUREMENTS      9**

Angle dekkor, Autocollimator optical flats, optical interferometer and laser interferometer, Coordinate Measuring Machine (CMM) Machine vision for metrology

**LAB COMPONENT**

**6**

1. Testing of straightness of a machine tool guide way using Autocollimator.
2. Measurement of features in a prismatic component using Coordinate Measuring Machine (CMM)

**UNIT - V INSPECTION USING GAUGES**

**9**

GO and NO GO gauges, limit gauge, plug gauge, ring gauge, slip gauges, snap gauge, Radius gauges, feeler gauge, Taylor’s principle, design of GO and NO GO gauges,

**LAB COMPONENT**

**6**

1. Measurement of force
2. Measurement of temperature
3. Measurement of torque

**CLASS HOURS: 45 PERIODS TERM HOURS: 45 PERIODS TOTAL: 120 PERIODS**

**TEXT BOOKS:**

1. R. K. Jain, “Engineering Metrology”, Khanna Publishers, 2015
2. Gupta, I.C., Engineering Metrology, DhanpatRai& Sons, 2019.

**REFERENCES:**

1. J.P.Holman, “Experimental Methods for Engineers”,Tata McGrawHill,2012
2. Galyer.J.F.W.Shotbolt,C.R.,“Metrology for Engineers”,ELBS with CasellLtd., UK, 5<sup>th</sup>Edition, 1990.
3. ThomasG.Beckwith,RoyD.Marangoni,JohnH.Lienhard V,“Mechanical Measurements”, Pearson Learning Solution, 2011.
4. ErnestO.Doebelin,“Measurement Systems: Application and Design” McGrawHill Education, 2017
5. AlanSMorris,RezaLangari,“MeasurementandInstrumentation”,Academic Press, 2012

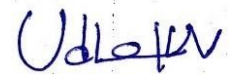
**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

<b>Course Name: METROLOGY AND MEASUREMENT PRACTICES</b>		<b>Course Code: 24ME405</b>	
<b>CO</b>	<b>Course Outcomes</b>	<b>Unit</b>	<b>K- CO</b>
C214.1	Design tolerances and fits for a selected product quality.	I	K3
C214.2	Select a suitable comparator/ angular measuring device for inspecting the products in a given industry.	II	K3
C214.3	Choose appropriate method and instruments for inspection of various forms.	III	K3
C214.4	Select suitable advanced measuring instruments for special requirement in the industries and design GO and NOGO gauges for the given specification.	IV	K3
C214.5	Conduct experiments on various dimensional/physical measuring instruments and determine the parameters like diameter, angle, straightness, force, temperature, torque etc.,	V	K3

KLNCE UG MECH R2024 (AY 2025 – 2026 admitted)

S.No.	Name of the Equipment	Quantity
1.	Micrometer	5Nos.
2.	Vernier Caliper	5Nos.
3.	Vernier Height Gauge	2Nos.
4.	Vernier depth Gauge	2Nos.
5.	Slip Gauge Set	1No.
6.	Gear Tooth Vernier	1No.
7.	Sine Bar	1No.
8.	Floating Carriage Micrometer	1No.
9.	Profile Projector/Tool Makers Microscope	1No.
10.	Mechanical/Electrical/Pneumatic Comparator	1No.
11.	Autocollimator	1No.
12.	Temperature Measuring Setup	1No.
13.	Force Measuring Setup	1No.
14.	Torque Measuring Setup	1No.
15.	Coordinate measuring machine	1No.
16.	Surface finish measuring equipment	1No.
17.	Bore gauge	1No.
18.	Telescope gauge	1No.



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24ME4L1

MACHINE TOOL LABORATORY

L T P C  
0 0 3 1.5

**OBJECTIVES:**

- To practice the various operations that can be performed in Lathe.
- To gain practical knowledge about shaper and milling machines.
- To understand the various grinding processes.
- To practice gear cutting methods
- To write CNC programs for Machining processes.

**LIST OF EXPERIMENTS**

1. External Thread cutting in lathe
2. Eccentric Turning in lathe
3. Square Head Shaping
4. Spur gear cutting in milling machine
5. Helical gear cutting in milling machine
6. Contour milling in vertical milling machine
7. Gear generation in gear hobbing machine
8. Gear generation in gear shaping machine
9. Surface grinding and Cylindrical grinding
10. Simple CNC Programming – Lathe and Milling

**TOTAL: 45 PERIODS**

S. No.	Name of The Equipment	Quantity
1.	Centre Lathes	7
2.	Shaper	1
3.	Horizontal Milling Machine	1
4.	Vertical Milling Machine	1
5.	Surface Grinding Machine	1
6.	Cylindrical Grinding Machine	1
7.	Centerless grinding machine	1
8.	Gear Hobbing Machine	1
9.	Gear Shaping machine	1
10.	CNC Lathe	1
11.	CNC Milling machine	1

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name: MACHINE TOOL LABORATORY		Course Code: 24ME4L1	
CO	Course Outcomes	Unit	K- CO
C215.1	Perform various operations in Lathe.	I	K3
C215.2	Perform shaping and milling operations.	II	K3
C215.3	Generate gear profile using milling, gear hobbing and gear shaping machines.	III	K3
C215.4	Use grinding machine for surface finishing operations on simple parts.	IV	K3
C215.5	Develop CNC programming for the simple components produced in CNC lathe and CNC milling.	V	K3

24ME4L2

THERMAL ENGINEERING LABORATORY

L T P C  
0 0 3 1.5

**OBJECTIVES:**

- To understand the working and performance of I.C.Engines.
- To measure properties of lubricants
- To measure COP of refrigerator.
- To determine COP of an air conditioner.
- To understand the working of air compressor.

**LIST OF EXPERIMENTS**

1. Valve Timing diagrams of four stroke diesel engine and Port Timing diagrams of two stroke petrol engine.
2. Determination of Flash Point, Fire Point and viscosity of various fuels / lubricants.
3. Determination of p-v diagram of IC engine using Data acquisition system.
4. Performance Test on 4 – stroke Diesel Engine.
5. Heat Balance Test on 4 – stroke Diesel Engine.
6. Retardation Test on a Diesel Engine.
7. Morse Test on Multi-cylinder Petrol Engine.
8. Determination of COP of a refrigeration system.
9. Determination of COP of an air conditioning system.
10. Performance test on a reciprocating air compressor

**TOTAL: 45 PERIODS**

S.No.	Name of the equipment	Quantity
1	I.C Engine – 2 stroke and 4 stroke model	1
2	Apparatus for Flash and Fire Point	1
3	Viscometer	1
4	Engine with data acquisition system	1
5	4-stroke Diesel Engine	3
5	Multi-cylinder Petrol Engine	1
6	Refrigeration test rig	1
7	Air-conditioning test rig.	1
8	Reciprocating air compressor.	1

**OUTCOMES:**

**AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:**

Course Name: THERMAL ENGINEERING LABORATORY		Course Code: 24ME4L2	
CO	Course Outcomes	Unit	K- CO
C216.1	Draw the Valve Timing and Port Timing diagrams by using I.C Engine – 2 stroke and 4 stroke models.	I	K3
C216.2	Measure the value of Flash and Fire Point and viscosity of fossil fuels/lubricants.	II	K3
C216.3	Determine the performance of I.C. engines.	III	K3
C216.4	Determine the Coefficient of Performance (COP) of refrigeration and Air conditioning systems.	IV	K3
C216.5	Calculate the volumetric efficiency of reciprocating air compressor	V	K3

<b>24HS4L1</b>	<b>APTITUDE AND SOFT SKILLS – III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Module I LOGICAL REASONING SKILLS 10**

Logical Reasoning, Letter and Symbol series, Number series, Analyzing arguments, Making judgments, Logical Reasoning, Direction Sense test, Venn diagrams, Seating arrangements, Cause and effect, Blood relation test, Dice Logical, verbal puzzles, Analytical puzzles and sudoku.

**Module II BEHAVIOURAL SKILLS 5**

Interview Etiquettes - Body language, Dress code, Eye contacts, Handshakes for Interview - Interview handling – Mock Interview Videos - High Frequency words in resume and interviews - Visual Interpretation – HR Interview question – Sell yourself -Interpersonal and intrapersonal communication

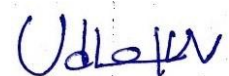
**Module III VERBAL SKILLS 15**

Vocabulary basics, Grammar basics, Critical Reasoning, Reading comprehension, Synonyms, Antonyms, Idioms and phrases - sentence completion, Spotting errors, Error correction, Sentence correction, Writing Resume, Letter writing, Official mail correspondence -Ways to communicate in different scenarios-job interview, business meeting, project proposal submission, informal gathering, speech for a large audience and debate.

**TOTAL: 30 PERIODS**

**REFERENCES:**

1. Quantitative aptitude for competitive examinations , R.S.Agarwal, S.Chand publications
2. Quantitative Aptitude – AbijithGuha, TMH
3. Quantitative Aptitude for Cat – ArunSharma, TMH
4. Gulati. S., (2006) “Corporate Soft Skills”, New Delhi, India: Rupa& Co.
5. Prasad, HariMohan,A Handbook of Spotting Errors, Mcgraw Hill Education, 2010



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