JANSONS INSTITUTE OF TECHNOLOGY

(Autonomous)

Accredited by NAAC 'A Grade' and ISO 9001: 2015 Certified Institution
Approved by AICTE and Affiliated to Anna University
Coimbatore – 641 659, Tamil Nadu, India.

B.E. Mechanical Engineering

Curriculum and Syllabi (Semester I & II)

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Regulations 2024
Choice Based Credit System
B.E. Mechanical Engineering
Curriculum and Syllabi for Semesters I and II

Mandatory Induction Programme

Sl. No.	Course Code	Course Title	Category	Periods per Week			Contact Hours	Credits
				L	T	P		
1	U24IP0101	Induction Programme	-	-	-	-	-	-

Semester - I

Sl. No.	Course Code	Course Title	Category	Periods per Week			Contact Hours	Credits
				L	T	P		
Theory Course								
1	U24HS1101	Professional English - I	HS	3	0	0	3	3
2	U24MA2101	Matrices and Calculus	BS	3	1	0	4	4
3	U24PH2101	Engineering Physics	BS	3	0	0	3	3
4	U24CY2101	Engineering Chemistry	BS	3	0	0	3	3
5	U24GE3003	Engineering Graphics	ES	2	2	0	4	4
6	U24GE1101	தமிழர் மரபு /Heritage of Tamils	HS	1	0	0	1	1
Practical Courses								
7	U24GE3004	Engineering Practices Laboratory	ES	0	0	4	4	2
8	U24GE2101	Physics and Chemistry Laboratory	BS	0	0	4	4	2
9	U24GE7101	English Laboratory	EE	0	0	2	2	1
10	U24GE7102	Design Thinking for Innovation	EE	0	0	2	2	1
			Total	**15**	**3**	**12**	**30**	**24**

Semester – II

Sl. No.	Course Code	Course Title	Category	Periods per Week			Contact Hours	Credits
				L	T	P		
Theory Course								
1	U24HS1201	Professional English - II	HS	2	0	0	2	2
2	U24MA2202	Transforms and Partial Differential Equations	BS	3	1	0	4	4
3	U24PH2204	Materials Science	BS	3	0	0	3	3
4	U24ME3201	Engineering Mechanics	BS	3	0	0	3	3
5	U24GE1201	தமிழரும் தொழில்நுட்பமும் /Tamils and Technology	HS	1	0	0	1	1
Theory cum Laboratory Courses								
6	U24GE3201	Python Programming	ES	2	0	2	4	3
Practical Courses								
7	U24ME4201	Computer Aided Machine Drawing	PC	0	0	4	4	2
8	U24GE7201	Communication Laboratory	EE	0	0	4	4	2
9	U24GE7202	Fundamentals of Entrepreneurship and Startup	EE	0	0	2	2	1
			Total	**14**	**1**	**12**	**27**	**21**

U24IP0101 - INDUCTION PROGRAMME

1. Student Induction Programme - Purpose & Concept

This is a 3-week long induction programme for the UG students entering the institution, right at the start. Purpose of the Student Induction Programme is to help new students adjust and feel comfortable in the new environment, inculcate in them the ethos and culture of the institution, help them build bonds with other students and faculty members, and expose them to a sense of larger purpose and self-exploration.

The term induction is a well-planned event to educate the new entrants about the environment in a particular institution, and connect them with the people in it. The Student Induction Programme engages with the new students as soon as they come into the institution; regular classes start only after that.

The time during the Induction Programme is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. These are included under Proficiency Modules. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

2. Daily Activity

The following are the activities under the induction programme in which the student would be fully engaged throughout the day for the entire duration of the programme.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. There would be games in the evening or at other suitable times according to the local climate. These would help develop team work besides health.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts like painting, music, dance, pottery, sculpture etc. The student would pursue it every day for the duration of the programme. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Mentoring and Universal Human Values

Mentoring and connecting the students with faculty members is the most important part of student induction. Mentoring takes place in the context and setting of Universal Human Values. It gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer pressure and make decisions with courage, be aware of relationships and be sensitive to others, understand the role of money in life and experience the feeling of prosperity.

Students are educated in Universal human Values in 3 modules. First module comprises Basic Aspirations and Self-Management and the second module includes Harmony in the Family and Health. The last module preaches Harmony in the Society and Nature. It is best taught through group discussions and real-life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each.

2.4 Introduction to Sustainable Development Goals (SDG)

Students are encouraged to gain knowledge in accepting the need for Sustainable Development Goals. The students are enlightened on the SDGs which give a comprehensive framework of goals and targets with which students understand the complexity of the actions we must take to achieve development that is sustainable across social, environmental, economic aspects and over time.

3. Other Activity

Below activities are not there on a daily basis, but are conducted for 3-4 days.

3.1 Familiarization with College, Department/Branch

The incoming students will be told about the credit and grading system, and about the examinations. They would be informed about how study in college differs from study in school. They shall be taken on a tour of the college and shown important points such as the library, canteen, laboratories, workshops and other facilities.

They would be shown their respective department, and told what it means to get into the branch or department. Students would be described about what role the technology related to their department plays in society and after graduation what role the student would play in society as an engineer in that branch. A lecture by an alumnus of the department would be carried out which would be very helpful in this regard. The above activity would be done right in the first two days, and then over the afternoons thereafter, as appropriate.

3.2 Department Specific Activities

Activities such as games, quizzes, social interactions, small experiments, design thinking etc., that are relevant to the particular branch of Engineering are introduced to kindle interest in building things in that particular field. For example, CSE, CSBS and AI&DS students would be given activities that kindle computational thinking and ECE students would be introduced to build simple circuits as an extension of their knowledge in science and so on.

3.3 Literary Activity

Literary activity would encompass reading a book, writing a summary, debating, enacting a play etc.

3.4 Proficiency Modules

The induction programme period is used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These activities are run like crash courses, so that when normal courses start after the induction programme, the student would have overcome the lacunas substantially. The problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

3.5 Lectures & Workshops by Eminent People

Lectures by eminent people would be organized, once a week. It would give the students, exposure to people who are eminent, in industry or engineering, in social service, or in public life. Alumni would be invited as well. Motivational lectures about life, meditation, etc. would be organized.

3.6 Visits in Local Area

A couple of visits to the local landmarks including will be organized which would familiarize the students with the area together with bonding with each other, like in a picnic. Visits would also be organized to a hospital, orphanage or a village. These would expose them to people in suffering or to different lifestyles. This might also sensitize them to engineering needs in these areas.

3.7 Extra-Curricular Activities in College

The new students shall be introduced to the extra-curricular activities at the college/university. They would be shown the facilities and informed about activities related to different clubs etc. Selected senior students will be involved in leading these activities by giving presentations, under faculty supervision.

3.8 Feedback and Report on the Programme

Students would be asked to give their mid-programme feedback. They should write their opinions about the programme at the end of the first week or so. The feedback would be used to make any mid-course correction, if any. At the end of the programme, each group (of 20 students) would be asked to prepare a single report on their experiences of the programme. On the second last day, each group should present their report in front of other groups. Immediately after their presentation, they should submit their written report. This will also serve as a closure to the programme. Finally, online anonymous feedback would be collected at the end of the programme.

U24HS1101	PROFESSIONAL ENGLISH I	L	T	P	C
		3	0	0	3

Course Objectives:	To improve the basic grammar, lexical, communicative competence of learners and develop learners' ability to use language in professional context.

Unit - I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	9

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

Unit - II	NARRATION AND SUMMATION	9

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

Unit - III	DESCRIPTION OF A PROCESS / PRODUCT	9

Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

Unit – IV	CLASSIFICATION AND RECOMMENDATIONS	9

Reading – Newspaper articles; Journal reports and Nonverbal Communication (tables, pie charts etc). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from nonverbal (chart, graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.

Unit - V	EXPRESSION	9

Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.

	Total Periods:	45

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Relate appropriate words in a technical context.	K2
CO2	Interpret the fundamentals of basic grammatical structures.	K2
CO3	Infer the denotative and connotative meanings in professional context.	K2
CO4	Explain the information presented in tables, charts and other graphical representations.	K2
CO5	Outline editorials, narrations, and essays on various topics	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

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. Veena Selvam, Dr. Sujatha Priyadarshini, Dr.Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

Reference Books

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 Aysha Viswamohan, 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.

U24MA2101	MATRICES AND CALCULUS	L	T	P	C
		3	1	0	4

Course Objectives:	Integrate matrix algebra, calculus, and multivariable functions to address engineering challenges adeptly. Emphasize practical applications of integration techniques and multiple integrals. Equip students with indispensable mathematical proficiencies vital for engineering analysis.

Unit - I	**MATRICES**	**9+3**

Types of matrices – System of equations – Characteristic equation – Eigenvalues and Eigenvectors of real matrices – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.

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

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable.

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

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and 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 - Applications: Hydrostatic force and pressure, moments and centre of mass.

Unit - V	**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 integrals – Applications: Moments and centre of mass, moment of inertia

	Total Periods:	**60**

Course Outcomes

On completion of the course, the student can

CO	Statements	K-Level
CO1	Apply the matrix algebra methods for solving real time problems.	K3
CO2	Utilize the differential calculus tools to solve engineering problems.	K3
CO3	Apply the differential calculus ideas in functions of several variables.	K3
CO4	Choose the different methods of integration for solving engineering problems.	K3
CO5	Make use of the multiple integrals in solving real-world issues such as areas and volumes.	K3

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2	Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3	James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.

Reference Books

1	Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016.
2	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3	Jain. R. K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
4	Narayanan.S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5	Ramana. B. V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd,New Delhi, 2016.
6	Srimantha Pal and Bhunia. S.C, "Engineering Mathematics", Oxford University Press, 2015.
7	Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

U24PH2101	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

Course Objectives:	To enhance and apply the fundamental knowledge of Properties of matter, laser, optical fibre, thermal physics, Quantum physics, Optics and Ultrasonics and its applications relevant to various streams of Engineering and Technology.

Unit - I	PROPERTIES OF MATTER	7

Interatomic Forces & Intermolecular Forces - Solid - Elasticity – Stress & strain diagram and its uses – types of stress & strain - Hooke's Law - Young's modulus, Bulk modulus, modulus of rigidity, Poisson's Ratio, Relation between the Three Moduli of Elasticity– factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple – torsion pendulum: theory and experiment – bending of beams – bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment – I-shaped girders.

Unit - II	LASER AND FIBRE OPTICS	9

Theory of laser - characteristics – Spontaneous and stimulated emission - Einstein 's A and B coefficients - derivation – resonant cavity, optical amplification (qualitative) – population inversion - CO2 laser, Nd-YAG laser, semiconductor laser – Basic applications of lasers in industry - 3D profiling, laser drilling and laser welding. Principle, numerical aperture and acceptance angle – types of optical fibres (material, refractive index, mode) – losses associated with optical fibres –Fibre optic communication system (Block diagram) - fibre optic sensors: pressure and displacement- Endoscope

Unit - III	THERMAL PHYSICS	9

Transfer of heat energy (conduction, convection and radiation) – thermal expansion of solids and liquids – expansion joints – bimetallic strips – thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity – Forbe's method: thermal conductivity of good conductor and Lee's disc method: thermal conductivity of bad conductor : theory and experiment – conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers (qualitative) - refrigerators, ovens and solar water heaters.

Unit – IV	QUANTUM PHYSICS	11

Wave particle duality – electron diffraction – Heisenberg's uncertainty principle - wave function and its operators, physical significance of wave function – Schrödinger's wave equation – time independent and time dependent equations – particle in a infinite potential well: 1D, 2D and 3D Boxes – Normalization, probabilities, Expectation values, Eigen values and Eigen functions - tunnelling (qualitative) – Scanning Tunnelling Microscope (STM) - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig -Penney model and origin of energy bands.

Unit - V	OPTICS AND ULTRASONICS	9

Optics: Reflection and refraction of light waves - total internal reflection - interference – Michelson Interferometer: construction and working to determine thickness of the thin transparent material - Theory of air wedge and experiment: determination of the thickness of thin wire. **Ultrasonics:** Production of ultrasonics by Magnetostriction and Piezoelectric method – Acoustic grating: Wavelength of ultrasonic waves – Non-destructive testing – Pulse echo system through transmission and reflection modes – Medical applications – Sonogram.

	Total Periods:	45

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Explain the basics of properties of matter and its applications.	K2
CO2	Apply the knowledge of laser and fibre optics principle in various fields.	K3
CO3	Illustrate the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers.	K2

COs	Statements	K-Level
CO4	Explain the importance of quantum theory and its applications in tunnelling microscopes.	K2
CO5	Apply the concepts of optics in material property and ultrasonics in medical field.	K3

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	1	-	-	-	-	-	1	-	-	-
CO	3	2	1	-	-	1	-	-	-	-	-	1	1	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Bhattacharya, D.K. & Poonam, T. —Engineering Physics. Oxford University Press, 2015
2	Gaur, R.K. & Gupta, S.L. —Engineering Physics. Dhanpat Rai Publishers, 2012
3	Pandey, B.K. & Chaturvedi, S. —Engineering Physics. Cengage Learning India,2012
4	Arumugam M. Engineering Physics. Anuradha publishers, 2010
5	Palanisamy P.K. Engineering Physics. SCITECH Publications, 2011.
6	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education, 2017.
7	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill, 2017.

Reference Books

1	Halliday, D., Resnick, R. & Walker, J. —Principles of Physics. Wiley, 2015.
2	Serway, R.A. & Jewett, J.W. —Physics for Scientists and Engineers. Cengage Learning, 2010.
3	Tipler, P.A. & Mosca, G. —Physics for Scientists and Engineers with Modern Physics.
4	W.H.Freeman, 2007.4. Mani P. Engineering Physics I. Dhanam Publications, 2011.
5	Marikani A. Engineering Physics - PHI Learning Pvt., India, 2009.
6	K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.

U24CY2101	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

Course Objectives:	To understand water quality parameters in water treatment and corrosion prevention methods, outline the phases and significance of alloys, summarize fuels and combustion properties, explore the uses of energy storage devices, and impart knowledge in nanomaterial preparation methods.

Unit - I	WATER TECHNOLOGY	9

Sources and impurities, Water quality parameters: Definition and significance of color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). 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. Desalination of brackish water: Reverse Osmosis (RO)- Applications of RO in domestic and industrial purposes.

Unit - II	CORROSION AND ITS CONTROL	9

Corrosion: Introduction - Mechanism of Corrosion - Chemical corrosion, Electrochemical corrosion - Differential Aeration corrosion - Pilling Bedworth rule - Factors influencing corrosion. Corrosion control- Cathodic Protection - Sacrificial Anodic Protection method - Impressed Current Cathodic Protection - Use of Inhibitors. **Protective coatings** - Metallic coatings - Anodic and Cathodic coatings - Methods of application of Metal coatings. Organic coatings - Paints, Varnishes, Emulsion paints, Special paints - Luminescent paint, Heat - resistant paint, Fire - retardant paint, Water repellent paint, Antifouling paint.

Unit - III	ALLOYS AND PHASE RULE	9

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – Heat treatment of steel.**Phase rule:** Introduction, definition of terms with examples, One component system -water system - Reduced phase rule - Thermal analysis and Cooling curves - Two Component System - Lead-Silver system – Pattinson's process.

Unit – IV	FUELS, COMBUSTION AND ENERGY STORAGE DEVICES	9

Fuels and Combustion: Classification of fuels-Calorific value, units of heat, Gross and Net calorific values, problems on Calorific values. Coal- ranking of coal-Properties of coal- Carbonization-Manufacture of Metallurgical coke -Otto Hoffmann's by-product oven method. Petroleum-Refining of crude oil, Manufacture of Synthetic petrol (Bergius process), Knocking-Octane number and Cetane number. **Energy storage devices:** Types of batteries - Primary battery - dry cell, Secondary battery - Lead acid battery and Lithium-ion battery; Electric vehicles - working principle; Fuel cells: H_2-O_2 fuel cell, Microbial Fuel Cell (MFC).

Unit - V	NANOCHEMISTRY	9

Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – Nanoparticle, Nanoclusters, Nanorods, Nanowire and Nanotube. Preparation of nanomaterials: Sol-gel, Solvothermal, Laser ablation, Chemical Vapour Deposition (CVD), Electrochemical deposition and Electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

	Total Periods:	45

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Apply suitable methodologies for water treatment using water quality parameters.	K3
CO2	Outline the different types of corrosion processes and preventive methods.	K2
CO3	Explain the relationship between phases and the selection of alloy materials.	K2

COs	Statements	K-Level
CO4	Interpret the knowledge of fuels in combustion technology and various energy storage devices.	K2
CO5	Infer the basic concepts of nanotechnology and the synthesis of nanomaterials.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	2	-	-	-	2	2	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	2	2	-	-	-	-	2	-	-	-
CO3	3	2	-	-	-	1	2	-	-	-	-	1	-	-	-
CO4	3	2	-	-	-	2	2	-	-	-	-	2	-	-	-
CO5	3	2	-	-	-	2	2	-	-	-	-	1	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai 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 Textbook of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.
4	O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.

Reference Books

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	T. Pradeep, "Nano: The Essentials: Understanding Nanoscience and Nanotechnology", (2008) Tata McGraw-Hill Publishing Company Limited, New Delhi.
3	B.R.Puri, L.R.Sharma, M.S.Pathania.,"Principles of Physical Chemistry", Vishal Publishing Company ,2008.
4	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.

U24GE3003	ENGINEERING GRAPHICS	L	T	P	C
		2	2	0	4

Course Objectives:	The main learning objective of this course is to prepare the students to acquaint the knowledge on Drawing Standards, projections of points, straight lines, plane surfaces, orthographic projection of solids, section of solids, development of lateral surfaces, isometric and perspective projections of simple solids, engineering curves and freehand sketch of simple objects.

CONCEPTS AND CONVENTIONS
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, LINES AND PLANE SURFACE	12

Orthographic projection – principles - Principal planes - First angle projection - projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Unit - II	PROJECTION OF SOLIDS	12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method.
Practicing three-dimensional modeling of simple objects by CAD Software.

Unit - III	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	12

Sectioning of solids like prisms, pyramids, cylinder and cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.
Practicing three-dimensional modeling of simple objects by CAD Software.

Unit – IV	ISOMETRIC AND PERSPECTIVE PROJECTIONS	12

Principles of isometric projection — isometric scale —Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.
Practicing three-dimensional modeling of isometric projection of simple objects by CAD Software.

Unit - V	PLANE CURVES AND FREEHAND SKETCHING	12

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.
Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three-Dimensional objects — Layout of views - Freehand sketching of multiple views from pictorial views of objects.

	Total Periods:	60

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Interpret orthographic projections of points, lines and plane surfaces.	K2
CO2	Illustrate the projection of solids placed in first quadrant	K2
CO3	Show the projections of sectioned solids and development of surfaces.	K2
CO4	Show the projections of isometric and perspective sections of simple solids.	K2

COs	Statements	K-Level
CO5	Interpret conic curves, involutes, cycloids and perform freehand sketching	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
2	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2018.

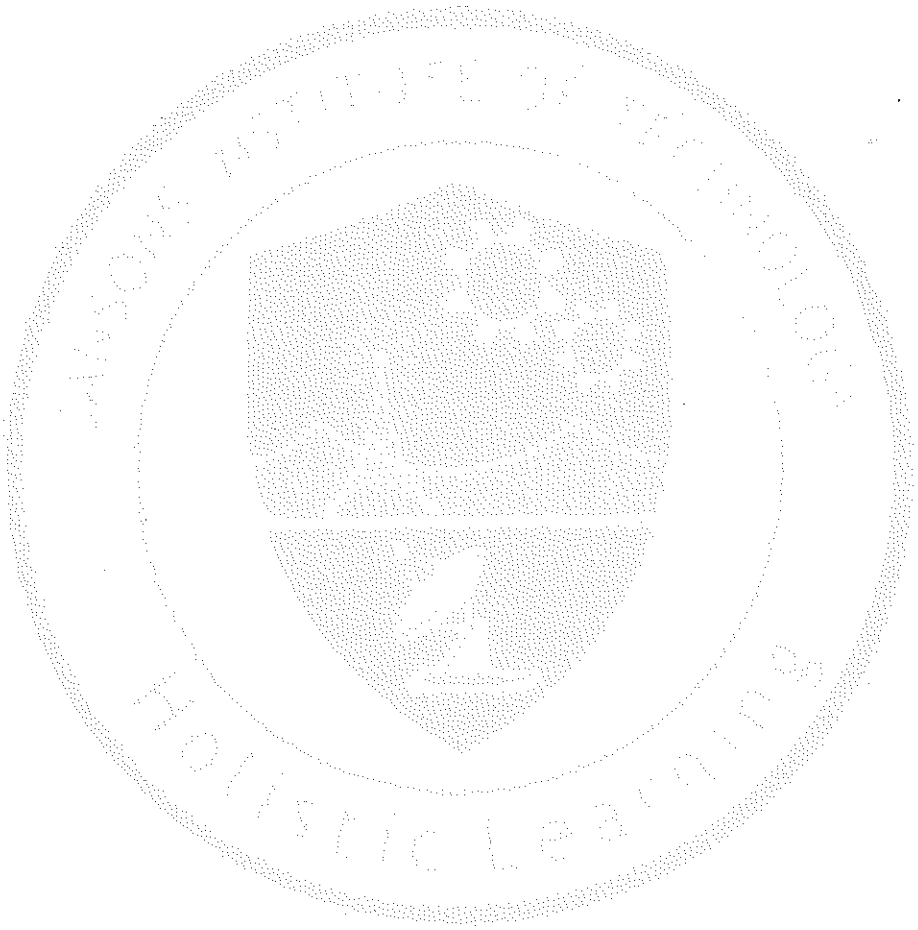
Reference Books

1	Bhratt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53 Edition, 2019.
2	Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
3	Gopalakrishna K.R., "Engineering Drawing" (Vol. I &II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
4	Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5	Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
6	Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 5th Edition, 2015.

Publication of 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 & SP 46 — 2003: Lines for technical drawings.
4	IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5	IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.



U24GE1101	தமிழர் மரபு	L	T	P	C
		1	0	0	1

Course Objectives:	இந்த பாடத்திட்டத்தில், மாணவர்களுக்கு தமிழர்களின் செழுமையான கலாச்சாரம் மற்றும் பாரம்பரியம் பற்றிய நுண்ணறிவை வழங்கவும், தமிழகத்தில் நடைமுறையில் உள்ள கட்டிடக்கலை அற்புதங்களை உருவாக்குவதற்கான பொறியியல் நுட்பங்கள் குறித்த விரிவான தகவல்களை மாணவர்களுக்கு வழங்கவும் மற்றும் மாணவர்களை தமிழர் மரபின் வேர்களுடன் இணைக்கவும், பாராட்டவும், பாதுகாக்கவும் உதவுகிறது

Unit - I	**மொழி மற்றும் இலக்கியம்**	**3**

இநதிய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழக காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

Unit - II	**மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை**	**3**

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிறபங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக்கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

Unit - III	**நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுக்கள்**	**3**

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

Unit – IV	**தமிழர்களின் திணைக் கோட்பாடுகள்**	**3**

தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்க கால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

Unit - V	**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**	**3**

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுய மரியாதை இயக்கம் – இந்திய மருத்துவத்தில் சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுக்கள், கையெழுத்துப்படிகள் - தமிழ்ப்புத்தகங்களின் அச்சு வரலாறு.

Total Periods:	**15**

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	தமிழ் இலக்கியத்தில் உள்ள மனித விழுமியங்களையும் உரிமைகளையும் புரிந்து கொள்ளலாம்.	K2
CO2	தமிழக மக்கள் கடைப்பிடிக்கும் கலை மற்றும் கலாச்சாரத்தை அறிந்து கொள்ளலாம்.	K2
CO3	தமிழ்நாட்டு மக்கள் பயிற்சி செய்யும் பல்வேறு விளையாட்டுகளையும் நடனங்களையும் புரிந்து கொள்ளலாம்.	K2
CO4	சங்க இலக்கியம் மற்றும் அரசர்களின் வீரம் பற்றிய கருத்துக்களை அறிந்து கொள்ளலாம்.	K2
CO5	சுதந்திரப் போராட்ட வீரர்களின் வாழ்க்கை வரலாற்றை, வேத மூலிகைகள் மற்றும் வாழ்க்கையின் வளர்ச்சிகளை அறிந்து கொள்ளலாம்.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO5	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் – முனைவர். இல. சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)

5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

Reference Books

1	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
2	Historical Heritage of the Tamils (Dr. S. V. Subramanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
3	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
4	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, and Educational Services Corporation, Tamil Nadu)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
6	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
7	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

U24GE1101	HERITAGE OF TAMILS	L	T	P	C
		1	0	0	1

Course Objectives:	This course enables the students to provide an insight to the students into the rich culture and heritage of the state, to provide the students detailed information on the engineering techniques to construct architectural marvels practiced in Tamil Nadu and also to make the students connect with their roots, appreciate, and preserve it.

Unit - I	**LANGUAGE AND LITERATURE**	**3**
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.		
Unit - II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	**3**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
Unit - III	**FOLK AND MARTIAL ARTS**	**3**
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
Unit – IV	**THINAI CONCEPT OF TAMILS**	**3**
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature- Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		
Unit - V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
	Total Periods:	**15**

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Understand the human values and rights in Tamil literature.	K2
CO2	Classify the art and culture being practiced by people of Tamil Nadu.	K2
CO3	Outline the various games and dance practices by people of Tamil Nadu.	K2
CO4	Explain the concepts of Sangam Literature and the bravery of Kings	K2
CO5	Summarise the life history of freedom fighters, Vedic herbs and developments in life	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO5	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் – முனைவர். இல. சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
4	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

Reference Books

1	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
2	Historical Heritage of the Tamils (Dr. S. V. Subramanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
3	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
4	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, and Educational Services Corporation, Tamil Nadu)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
6	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
7	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

U24GE3004	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives:	To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

Exp. No	Title
	GROUP – A (CIVIL & MECHANICAL)
	I - CIVIL ENGINEERING PRACTICE
1	PLUMBING WORK: a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household. b) Preparing plumbing line sketches. c) Laying pipe connection to the suction side of a pump d) Laying pipe connection to the delivery side of a pump. e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.
2	WOOD WORK: a) Sawing, b) Planning and c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint. Wood Work Study: a) Studying joints in door panels and wooden furniture b) Studying common industrial trusses using models
	II - MECHANICAL ENGINEERING PRACTICE
1	WELDING WORK: a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding b) Practicing gas welding and Basics
2	MACHINING WORK: a) Turning Operation b) Drilling Operation c) Tapping Operation
3	ASSEMBLY WORK: a) Assembling a centrifugal pump b) Assembling a household mixer c) Assembling an air conditioner
4	SHEET METAL WORK: a) Making of a square tray b) Making of a funnel
5	FOUNDRY WORK: a) Demonstrating basic foundry operations.
	Total Periods : 30
	GROUP B (ELECTRICAL & ELECTRONICS)
	III - ELECTRICAL ENGINEERING PRACTICE
1	a) Residential house wiring using switches, fuse, indicator, lamp and energy meter. b) Fluorescent lamp wiring. c) Stair case wiring d) Measurement of energy using single phase energy meter. e) Measurement of resistance to earth of electrical equipment. f) Study of Iron Box wiring and assembly

Exp. No	Title
	IV - ELECTRONICS ENGINEERING PRACTICE
1	a) Study of Electronic components and equipments – Resistor colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO. b) Study of logic gates AND, OR, EX-OR and NOT. c) Generation of Clock Signal. d) Soldering simple electronic circuits and checking continuity. e) Study the elements of smart phone.
	Total Periods: **30**

Course Outcomes

On completion of the course, the student can

COs	Statements	K - Level
CO1	Demonstrate various carpentry joints and plumbing connections.	K2
CO2	Identify welding tools, equipment and perform welding joints.	K2
CO3	Demonstrate simple machining process and sheet metal work.	K2
CO4	Demonstrate basic home electrical works, appliances and measure the electrical quantities.	K2
CO5	Infer the electronic components, logic gates, soldering and test simple electronic circuits.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	2	1	-	-	-	-	-	-	2	-	-	2	1	-	-
CO2	2	1	-	-	-	-	-	-	2	-	-	2	1	-	-
CO3	2	1	-	-	-	-	-	-	2	-	-	2	1	-	-
CO4	2	1	-	-	-	-	-	-	2	-	-	2	1	-	-
CO5	2	1	-	-	-	-	-	-	2	-	-	2	1	-	-
CO	2	1	-	-	-	-	-	-	2	-	-	2	1	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

U24GE2101	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2
Course Objectives:	To make students understand and apply the basic concepts of properties of matter, light, sound, thermal properties, semiconductor physics and fibre optics by carrying out experiments. To inculcate experimental skills to test the water and to familiarize with the electro analytical techniques applied for quantitative analysis.				

PHYSICS LABORATORY

Exp. No	Title (Any seven experiments)
1	Torsional pendulum - Determination of rigidity modulus of wire.
2	Non-uniform bending - Determination of Young's modulus of the beam.
3	Uniform bending – Determination of Young's modulus of the beam.
4	Laser- Determination of the wavelength of the laser using grating.
5	Air wedge - Determination of thickness of a thin sheet/wire.
6	Optical fibre -Determination of Numerical Aperture and acceptance angle.
7	Ultrasonic Interferometer - Determination of velocity of ultrasonic waves in liquids.
8	Determination of thermal conductivity of a bad conductor – Lee's Disc method.
9	Determination of wavelength of mercury spectrum – spectrometer grating.
10	Determination of band gap of a semiconductor.
11	Determination of Numerical Aperture and acceptance angle - Optical fibre.
	Total Periods: **30**

CHEMISTRY LABORATORY

Exp. No	Title (Any seven experiments)
1	Determination of Total, Temporary & Permanent Hardness of Water by EDTA method.
2	Determination of Chloride Content of water sample by Argentometric method.
3	Determination of types and amount of Alkalinity in water sample.
4	Preparation of Na_2CO3 as a primary standard and Estimation of Acidity of a water sample using the primary standard solution.
5	Determination of Dissolved Oxygen (DO) content of water sample by Winkler's method.
6	Determination of strength and amount of the given Hydrochloric Acid by pH metric applications.
7	Determination of strength and amount of acids in a Mixture of Acids using Conductivity meter.
8	Conductometric titration of Barium Chloride against Sodium Sulphate (Precipitation Titration).
9	Estimation of Ferrous ion present in Ferrous Ammonium Sulphate (FAS) solution using Potentiometer.
10	Estimation of Iron content of the water sample using Spectrophotometer.
	Total Periods: **30**

Course Outcomes

On completion of the course, the student can

COs	Statements	K - Level
CO1	Extend the principles of elasticity and optics properties in engineering applications.	K2
CO2	Demonstrate the principles of sound in ultrasonic interferometer.	K2
CO3	Explain the thermal properties in engineering applications.	K2
CO4	Apply the knowledge of water quality parameters in water treatment through volumetric analysis.	K2
CO5	Interpret the amount of metal ions present in the solutions through Instrumental analysis.	K2
CO6	Infer the quantity of substances present in the solution by Electro Analytical Techniques.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	2	-	-	-	-	-	-	2	-	-	2	-	-	-
CO2	3	2	-	-	-	-	-	-	2	-	-	1	-	-	-
CO3	3	2	-	-	-	-	-	-	2	-	-	1	-	-	-
CO4	3	2	-	-	-	-	2	-	2	-	-	2	-	-	-
CO5	3	2	-	-	-	-	2	-	2	-	-	1	-	-	-
CO6	3	2	-	-	-	-	2	-	2	-	-	1	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**-**	**1**	**-**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Physics Laboratory Manual / Record, Department of Physics.
2	Bhattacharya D K and Poonam Tandon, "Engineering Physics", 2nd Edition, Oxford University Press, Chennai, 2017
3	Marikani A, "Engineering Physics", 3rd edition, PHI publishers, Chennai, 2021.
4	Dr V.Veeraiyan, Dr L .Devaraj Stephan, "Chemistry Lab Manual "2021.
5	Engineering Chemistry Laboratory Manual / Record, Department of Chemistry.

Reference Books

1	Shatendra Sharma and Jyotsna Sharma, "Engineering Physics", 2nd Edition, Pearson India Education Services Private Limited, Chennai, 2018

2	Avadhanulu M N, Kshirsagar P G, Arun Murthy TVS, "A Text book of Engineering Physics", 2nd Edition, S Chand Publishing, New delhi, 2018.
3	Thyagaran K, Ajoy Ghatak, "Lasers - Fundamentals and Applications", 2nd Edition, Laxmi Publications Pvt Limited, New Delhi, 2019.
4	J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, "Vogel's Textbook of Quantitative Chemical Analysis" (2009).
5	Daniel C. Harris," Quantitative Chemical Analysis" 2015.

U24GE7101	ENGLISH LABORATORY	L	T	P	C
		0	0	2	1
Course Objectives:	To build on students' English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts.				

Exp. No	Title
1	Telephone communication
2	Self-Introduction
3	Summarising a documentary
4	Mini Presentation
5	Product Description
6	Picture Comprehension
7	Ted Talks Report
8	Travelogue
9	Debates and Discussions
10	Just a Minute
	Total Periods: 30

Course Outcomes

On completion of the course, the student can

COs	Statements	K - Level
CO1	Relate the fundamentals of communication.	K2
CO2	Explain different points of view in a discussion on various topics	K2
CO3	Illustrate products and processes based on their purpose	K2
CO4	Explain fluently and accurately in formal and informal communicative contexts	K2
CO5	Interpret their opinions effectively in both formal and informal discussions	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

U24GE7102	DESIGN THINKING FOR INNOVATION	L	T	P	C
		0	0	2	1

Course Objectives:	To understand innovation, stages involved in design thinking and use the different idea generation techniques in Design Thinking.

Unit - I	HISTORY OF MODERN DESIGN	4

Introduction to Engineering design, History of Modern design: Early innovations- industrialization, Global Innovation Index- Design Thinking and Innovation.

Unit - II	DESIGN THINKING APPROACHES	6

Design thinking as a systematic approach to innovation, Three lenses of Design thinking, design challenges, product development-Case studies.

Unit - III	STAGES OF DESIGN THINKING	6

Introduction – Empathize- Define- Ideate- Prototype- Test- Examples, constraints in design- Case studies.

Unit – IV	IDEA GENERATION TECHNIQUES	6

Introduction -Creative Thinking-Idea Generation Techniques- brain storming, visual thinking, Mind Mapping-SCAMPER, Story boarding, Questioning Assumptions, Reverse Thinking- Case studies.

Unit - V	DESIGN THINKING AND INNOVATION	8

Innovation, User Values and Behaviours-experimental mindset strategies for creativity, teams for innovation, design alternatives, decision making for new design. Concept Poster: Organize all information about an innovation concept to identify critical questions for prototyping. Project: Apply tools to your innovation problem or the provided scenario.

	Total Periods:	30

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Explain early innovations in modern design history	K2
CO2	Classify design thinking approaches and applications.	K2
CO3	Illustrate stages and constraints of design thinking	K2
CO4	Interpret various idea generation techniques and applications	K2
CO5	Demonstrate innovation concepts and creative strategies with suitable techniques	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	-	-	1	-	-	2	2	-	2	-	-	-
CO3	2	1	-	-	-	1	2	-	2	2	-	2	-	-	-
CO4	2	1	-	-	-	1	-	-	2	2	-	2	-	-	-
CO5	2	1	-	-	-	1	2	-	2	2	-	2	-	-	-
CO	**2**	**1**	**-**	**-**	**-**	**1**	**2**	**-**	**2**	**2**	**-**	**2**	**-**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
2	Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
3	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve - Apply", Springer, 2011.
4	Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

Reference Books

1	"Design Thinking - A Primer"By Prof. Ashwin Mahalingam, Prof. Bala Ramadurai, IIT Madras.
2	Design Thinking: A User-Centred Approach to Innovation. (2023). Dr. Harjinthar Singh, Dr. Khairul Anuar Abdul Wahid: Marc & Zed | PUBLISHING.
3	"Design Thinking - A Primer"By Prof. Ashwin Mahalingam, Prof. Bala Ramadurai, IIT Madras. Swayan NPTEL course.
4	Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
5	Handbook of Design Thinking: Tips & Tools for how to design thinking by Christian Mueller Roterberg, Kindle Direct Publishing.

U24HS1201	PROFESSIONAL ENGLISH II	L	T	P	C
		2	0	0	2

Course Objectives:	To improve the basic grammar with reading, writing and analytical thinking skills in comprehending documents through professional context which demonstrate an understanding of job application, interviews for internship and placements.

Unit - I	MAKING COMPARISONS	6

Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases.

Unit - II	EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING	6

Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints. Grammar - Active Passive Voice transformations, Infinitive and Gerunds

Unit - III	BUSINESS COMMUNICATION	6

Technical Synonyms and Antonyms, Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

Unit – IV	REPORTING OF EVENTS AND RESEARCH	6

Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions

Unit - V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	6

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.

	Total Periods:	30

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Compare the ideas in technical context.	K2
CO2	Interpret the cause and effects in events, industrial processes through writing and speaking skills.	K2
CO3	Relate problems for feasible solutions and communicate it in professional format.	K2
CO4	Explain logical ideas and opinions in technical context.	K2
CO5	Outline professional resume for internships and jobs in an effective manner.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO	-	-	-	-	-	-	-	-	2	3	-	3	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

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.Veena Selvam, Dr.Sujatha Priyadarshini, Dr.Deepa Mary Francis, Dr.KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

Reference Books

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, New Delhi.
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, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

U24MA2202	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

Course Objectives:	Introduce essential PDE concepts and Fourier series analysis for engineering, exploring heat flow solutions and diverse scenarios, while also incorporating Z transform for discrete time systems.

Unit - I	PARTIAL DIFFERENTIAL EQUATIONS	9+3

Formation of partial differential equations – Classification of linear and nonlinear partial differential equations - Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- 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	FOURIER SERIES	9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval's identity – Complex form of the Fourier series – 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 (Cartesian coordinates only).

Unit – IV	FOURIER TRANSFORMS	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 – Convergence of Z-transforms - – Initial and final value theorems - Inverse Z-transform using partial fraction and convolution theorem - Formation of difference equations – Solution of difference equations using Z - transforms.

Total Periods:	60

Course Outcomes

On completion of the course, the student can

CO	Statements	K-Level
CO1	Identify the various methods to solve the given partial differential equations.	K3
CO2	Construct the functions as a Fourier series.	K3
CO3	Apply the Fourier series techniques to solve the one-dimensional, two-dimensional heat flow problems and one-dimensional wave equations.	K3
CO4	Solve the physical engineering challenges by using Fourier transforms techniques.	K3
CO5	Make use of the Z- transform techniques to solve the ordinary difference equations.	K3

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Grewal B.S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, New Delhi, 2018.
2	Kreyszig E, "Advanced Engineering Mathematics", 10th Edition, John Wiley, New Delhi, India, 2018.

Reference Books

1	Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers", SPIE Press, 1999.
2	Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2021.
3	James. G., "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, New Delhi, 2016.
4	Narayanan. S.; Manicavachagom Pillay.T.K and Ramanaiah.G, "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.
5	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.
6	Wylie. R.C. and Barrett. L.C., "Advanced Engineering Mathematics ", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

U24PH2204	MATERIALS SCIENCE	L	T	P	C
		3	0	0	3

Course Objectives:	To make the students understand and apply the electrical properties, quantum mechanical concepts, magnetic properties, semiconductor properties, friction, wear, surface engineering, quantum confinement, diffraction, spectroscopic, microscopic study on different engineering materials. Also, to understand the importance of new engineering materials.

Unit - I	**ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS**	**9**

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Quantum free electron theory– Fermi- Dirac statistics – Density of energy states –tight binding approximation - Electron effective mass – concept of hole. Magnetic materials: Dia, para and ferromagnetic effects –Ferromagnetism and domain theory- microscopic theory, Magnetic resonance, Magneto resistance – quantum interference devices – GMR devices.

Unit - II	**SEMICONDUCTORS AND TRANSPORT PHYSICS**	**11**

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature –Hall effect and devices – Ohmic contacts- Introduction to P-N junction Diode and V-I characteristics, Zener diode and its characteristics, Schottky barrier diode - Varactor diode –Tunnel diode - UJT, LDR.

Unit - III	**MECHANICAL PROPERTIES OF MATERIALS**	**8**

Friction – Surface Interactions, Normal Force, Coefficient of Friction, Types of Friction. Wear - Mechanisms of Wear, Wear rate, Tribological Factors – Study of friction, wear and lubrication. Energy Dissipation – Surface Engineering – contact mechanics – applications. Propagation of Elastic Waves – Vibrations – Resonance velocity – applications in NVH analysis.

Unit – IV	**NEW ENGINEERING MATERIALS AND NANOELECTRONIC DEVICES**	**8**

Metallic glasses – types, preparation, properties and applications – Shape memory alloys (SMA) – characteristics, types, properties of NiTi alloy and applications - advantages and disadvantages of SMA. Quantum confinement – Quantum structures – quantum wells, wires and dots – Resonant tunnelling diode: characteristics – Quantum interference effects - Single electron phenomena – Single electron Transistor - Spintronics.

Unit - V	**MATERIAL CHARACTERIZATION**	**9**

Importance of materials characterization – Powder X-ray diffraction (XRD) – Scanning electron microscope (SEM): Principle, construction and working – Transmission electron microscope (TEM) : Principle, construction and working – Raman spectroscopy: Principle, construction, working and study of polymers – Thermo gravimetric analysis (TGA): principle, construction, working and analysis of conducting polymers - Atomic force microscopy (AFM) - Vibration sample magnetometer (VSM) – Nanoindentation: Hardness testing.

	Total Periods:	**45**

Course Outcomes

On completion of the course, the student can

CO	Statements	K-Level
CO1	Explain the electrical and magnetic properties of materials.	K2
CO2	Apply the concept of semiconductor physics in electronic devices	K3
CO3	Summarize the mechanical properties of materials.	K2
CO4	Outline the new engineering materials and nanodevices.	K2

CO	Statements	K-Level
CO5	Utilize the microscopic and spectroscopic techniques for material characterization.	K3

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	V.Raghavan. Materials Science and Engineering: A First Course, Prentice Hall India Learning Private Limited, 2015.
2	S.O. Kasap, Principles of Electronic Materials and Devices, Mc-Graw Hill, 2018.
3	J.A.Belk. Electron Microscopy and Microanalysis of Crystalline Materials. Applied Science Publishers, London, 1979.
4	C.N.Banwell and E.M.McCash. Fundamentals of Molecular Spectroscopy. McGraw-Hill Education, 2017.
5	G.W.Hanson. Fundamentals of Nanoelectronics. Pearson Education (Indian Edition), 2009.

Reference Books

1	R.Balasubramaniam, Callister's Materials Science and Engineering. Wiley (Indian Edition), 2014.
2	Wendelin Wright and Donald Askeland, Essentials of Materials Science and Engineering, CL Engineering, 2013.
3	Robert F.Pierret, Semiconductor Device Fundamentals, Pearson, 2006.
4	Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Pearson, 2017.
5	Ben Rogers, Jesse Adams and Sumita Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2017.

U24ME3201	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

Course Objectives:	Students can understand about concept of equilibrium of particles, principles of equilibrium of rigid bodies, moment of area, mass moment of inertia, various types and laws of frictions and dynamic forces applied in rigid bodies.

Unit - I	**STATICS OF PARTICLES**	**9**
Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles -Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.		
Unit - II	**EQUILIBRIUM OF RIGID BODIES**	**9**
Principle of Transmissibility, Equivalent Forces, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two Dimensions - Reactions at Supports and Connections.		
Unit - III	**GEOMETRY DEPENDENT PROPERTIES**	**9**
Centroids and centre of gravity – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem.		
Unit – IV	**FRICTION**	**9**
The laws of dry friction, Coefficients of Friction, Angles of Friction, Wheel Friction, Rolling Resistance, Ladder friction.		
Unit - V	**DYNAMICS OF PARTICLES**	**9**
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion - Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.		
	Total Periods:	**45**

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Explain the fundamental concepts in determining the effect of forces on a particle.	K2
CO2	Outline the effect of forces in a rigid body.	K2
CO3	Interpret the geometry dependent properties of solids and sections.	K2
CO4	Explain the concepts and laws of dry friction	K2
CO5	Infer the principles of kinetics involved in dynamic conditions.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	2	-	-	-	-	-	-	-	-	-	2	2	1	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	2	1	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	2	1	-
CO4	2	2	-	-	-	-	-	-	-	-	-	2	2	1	-
CO5	2	2	-	-	-	-	-	-	-	-	-	2	2	1	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education.,12thEdition, 2019.
2	Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018

Reference Books

1	Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2	Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 14th edition, Prentice Hall, 2020.
3	Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2014.
4	Bolton J N, Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 9th edition, Wiley student edition, 2020.
5	Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013.

U24GE1201	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

Course Objectives:	இந்த பாடத்திட்டத்தில், மக்களின் வாழ்க்கைமுறையில் பொருட்களை உருவாக்கும் கலை மற்றும் மேம்பாடுகளை புரிந்து கொள்ளவும், கட்டிடங்கள் கட்டும் பல்வேறு முறைகளை புரிந்து கொள்ளவும், தமிழர்கள் கட்டிடக்கலையில் பயன்படுத்தப்படும் நுட்பங்களை புரிந்து கொள்ளவும், நவீன தொழில்நுட்பத்துடன் தமிழின் கருத்துக்களை புரிந்து கொள்ளவும் பயன்படுத்தவும் உதவுகிறது.

Unit - I	**நெசவு மற்றும் பானைத் தொழில்நுட்பம்**	**3**

சங்க காலத்தில் நெசவுத்தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

Unit - II	**வடிவமைப்பு மற்றும் கட்டிடத் தொழில் நுட்பம்**	**3**

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும், நடுகல் லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் –சோழர் காலத்து பெருங்கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல் , மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந் தோ - சாரோசெனிக் கட்டிடக் கலை.

Unit - III	**உற் பத்தித் தொழில் நுட்பம்**	**3**

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம் பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல் மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங் கு மணிகள் – எலும் புத்துண்டுகள் – தொல் லியல் சான் றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

Unit – IV	**வேளாண்மை மற்றும் நீர்ப்பாசனத்தொழில்நுட்பம்**	**3**

அணை, ஏரி, குளங் கள் , மதகு – சோழர் காலக் குமுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன் வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

Unit - V	**அறிவியல் தமிழ் மற்றும் கணித் தமிழ்**	**3**

அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய் தல் – தமிழ் மென் பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல் விக்கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம் .

	Total Periods:	**15**

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	தமிழர்களின் வாழ்க்கை வரலாற்றில் படிப்படியான முன்னேற்றத்தை அறிந்து கொள்ளலாம்.	K2

COs	Statements	K-Level
CO2	கடந்த காலத்தின் தாக்கத்தை நிகழ்காலத்துடன் சேர்த்து வீடுகள் மற்றும் கட்டிடங்களை கட்டலாம்.	K2
CO3	தொழில்நுட்பத்தின் உதவியுடன் குறிப்பிடத்தக்க விஷயங்களை உருவாக்க கற்றுக்கொள்ளலாம்.	K2
CO4	கடல்களின் அளவீடுகளைக் கண்டறிய பண்டைய திறன்களைப் பயன்படுத்தலாம்.	K2
CO5	தமிழின் கருத்துக்களை நவீன தொழில்நுட்பத்துடன் பயன்படுத்தலாம்.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO5	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் – முனைவர். இல. சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு),
4	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

Reference Books

1	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
2	Historical Heritage of the Tamils (Dr. S. V. Subramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

3	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
4	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
6	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
7	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

U24GE1201	TAMILS AND TECHNOLOGY	L	T	P	C
		1	0	0	1

Course Objectives:	This course enables the students to understand the art of making things and developments in the lifestyle of people, understand the various methods of constructing buildings, understand the techniques being used in Architecture by Tamils and also understand and apply the concepts of Tamil with modern technology.

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

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

Unit - II	**DESIGN AND CONSTRUCTION TECHNOLOGY**	3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Unit - III	**MANUFACTURING TECHNOLOGY**	3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

Unit – IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY**	3

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

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

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total Periods:	15

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Understand the gradual improvement in the life history of Tamils.	K2
CO2	Interpret the concepts of the design & construction technology in Sangam age.	K2
CO3	Explain the manufacturing technology in the Sangam age.	K2
CO4	Summarise the ancient skills to find out the measurements of oceans.	K2
CO5	Outline the concepts of Tamil with modern technology.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO3	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO5	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
CO	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2	கணினித் தமிழ் – முனைவர். இல. சுந்தரம். (விகடன் பிரசுரம்).
3	கீழடி – வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
4	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)

Reference Books

1	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
2	Historical Heritage of the Tamils (Dr. S. V. Subramanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
3	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
4	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, and Educational Services Corporation, Tamil Nadu)
5	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author)
6	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
7	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

U24GE3201	PYTHON PROGRAMMING	L	T	P	C
		2	0	2	3

Course Objectives:	To understand the basics of algorithmic problem solving and solve problems using python conditionals, loops and functions. To gain knowledge about the concepts of data structures - lists, tuples, dictionaries to represent complex data and input/output with files in python.

Unit - I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	12

Introduction – Translators - Compilation and Interpretation - Language Processors - Computer Software –Types of Software – Application Software Packages - Software Development Steps - Fundamentals of Computing – Identification of Computational Problems – Algorithms - Building Blocks of Algorithms - Notation - Algorithmic Problem Solving - Strategies for Developing Algorithms.

Suggested Activities:

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.

Unit - II	DATA TYPES, EXPRESSIONS, STATEMENTS	12

Introduction to Python – History & Versions - Importance of Python – Applications - Comparison of Python with C and Java - Installing Python in Windows & Ubuntu - Structure of a Python Program - Standard libraries in Python - Executing Python programs - Python Interpreter and Interactive Mode, Types of Errors – Keywords - Values and Types- Variable Names and Keywords - Type Conversion - Operators and Operands - Precedence of Operators - Expressions – Statements.

Suggested Activities:

1. Install and configure Python IDE
2. Python programming using simple statements and expressions

Unit - III	CONTROL FLOW, FUNCTIONS, STRINGS	12

Conditionals Statements – Boolean Values and Operators – Conditional: if – Alternative: if-else - Chained Conditional: if-elif-else - Iteration Statements – state – while – for – break – continue -pass - Fruitful Functions: Return Values, Parameters, Local and Global Scope, Function Call, Function Composition, Recursion; Strings: String Slices, Immutability, String Functions and Methods, String Module - Programs using Decision Making, Loops, Functions and Strings.

Suggested Activities:

1. Scientific problems using Conditionals and Iterative loops.
2. Implementing programs using Functions.
3. Implementing programs using Strings.

Unit – IV	LISTS, TUPLES, DICTIONARIES	12

Lists: List Operations - List Slices - List Methods and Functions - List Loop, Mutability – Aliasing - Cloning Lists - List Parameters; Tuples: Tuples Operations - Methods and Functions - Tuple Assignment - Tuple as Return Value; Dictionaries: Operations - Methods and Functions - Programs using Lists, Tuples and Dictionaries.

Suggested Activities:

1. Implementing real-time/technical applications using Lists, Tuples.
2. Implementing real-time/technical applications using Sets, Dictionaries.

Unit - V	FILES, MODULES, PACKAGES	12

Files and Exception: File Types – Text Files – Binary Files - Reading and Writing files - Format Operator - Command Line Arguments - Errors and Exceptions - Handling Exceptions, Modules and Packages.

Suggested Activities:

1. Implementing real-time/technical applications using File & Exception handling.
2. Implementing programs using modules & packages.
3. Exploring Pygame tool and developing a game activity using Pygame like bouncing ball, car race etc.

Total Periods:	60

Course Outcomes

On completion of the course, the student can

COs	Statements	K - Level
CO1	Outline the algorithmic solutions to solve the simple computational problems.	K2
CO2	Infer and execute simple python programs.	K2
CO3	Explain the simple python program using functions, conditionals and looping.	K2
CO4	Interpret the compound data using python lists, tuples and dictionaries.	K2
CO5	Extend the usage of read and write data from/to files in python programs.	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	2	-	-	-	-	-	-	-	1	-	-	1	1	-	-
CO2	2	-	-	-	-	-	-	-	1	-	-	1	1	-	-
CO3	2	1	-	-	-	-	-	-	1	-	-	1	1	-	-
CO4	2	1	-	-	-	-	-	-	1	-	-	1	1	-	-
CO5	2	1	-	-	-	-	-	-	1	-	-	1	1	-	-
CO	2	1	-	-	-	-	-	-	1	-	-	1	1	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press,2021
3	David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler, "Python Basics: A Practical Introduction to Python 3", 4th Edition, 2020.
4	Udayan Das, Aubrey Lawson, Chris Mayfield, Narges Norouzi, "Introduction to Python Programming", OpenStax, Rice University, Texas, 2024.

Reference Books

1	Arockia Mary P, Problem Solving and Python Programming, Shanlax Publications, 2021.
2	G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.

3	Dr. Krishna Kumar Mohbey, Dr. Brijesh Bakariya, "An Introduction to Python Programming: A Practical Approach", BPB Publications, 2021
4	https://www.python.org/
5	https://realpython.com/python-modules-packages/
6	https://learnpython.com/blog/python-modules-packages-libraries-frameworks/
7	https://www.upgrad.com/tutorials/software-engineering/python-tutorial/module-and-package-in-python/

U24ME4201	COMPUTER AIDED MACHINE DRAWING	L	T	P	C
		0	0	4	2
Course Objectives:	To acquaint the skills and practical experience in handling 2D drafting and 3D modelling software systems, standard drawing practices using fits and tolerances.				

Part	Description
PART I	**DRAWING STANDARDS & FITS AND TOLERANCES** Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits – Tolerancing of individual dimensions IS919- Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of Geometric Dimensioning & Tolerancing.
PART II	**2D DRAFTING** Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed Drawing. 1. Bearings – Bush Bearing, 2. Valves – Safety and Non-return Valves. 3. Couplings – Flange, Oldham's, Muff, Gear couplings. 4. Joints – Universal, Knuckle, Gib& Cotter, Strap, Sleeve &Cotter joints. 5. Engine parts – Piston, Connecting Rod, Crosshead (vertical and horizontal), Stuffing box, multi-plate clutch. 6. Machine Components – Screw Jack, Machine Vice, LatheTail Stock, Lathe Chuck, Plummer Block, Vane and Gear pumps.

Course Outcomes

On completion of the course, the student can

COs	Statements	K - Level
CO1	Explain the importance of drawing standards in communication within engineering and design fields.	K2
CO2	Interpret engineering drawings and specifications related to fits and tolerances.	K2
CO3	Apply appropriate tools in drafting software to create 2D technical drawings.	K3
CO4	Utilize editing functions to modify and revise drawing entities according to design requirements.	K3
CO5	Apply block creation and insertion techniques to reuse and standardize frequently used drawing components.	K3

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	3	2	-	-	-	-	-	-	2	-	-	2	2	-	-
CO2	3	2	-	-	-	-	-	-	2	-	-	2	2	-	-
CO3	3	2	1	-	-	-	-	-	2	-	-	2	2	-	-
CO4	3	2	1	-	-	-	-	-	2	-	-	2	2	-	-
CO5	3	2	1	-	-	-	-	-	2	-	-	2	2	-	-
CO	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**2**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	Gopalakrishna K.R., "Machine Drawing", 17th Edition, Subhas Stores Books Corner, Bangalore, 2018.
2	N. D. Bhatt and V.M. Panchal, "Machine Drawing", 51st Edition, Charator Publishers, 2022.

Reference Books

1	K. L Narayana, P.Kannaiah, K.Venkata Reddy, Machine Drawing , 15th Edition, New Age International Publication.
2	Goutam Pohit and Goutam Ghosh, "Machine Drawing with AutoCAD", 1st Edition, Pearson Education, 2014.
3	Junnarkar, N.D., "Machine Drawing", 1st Edition, Pearson Education, 2014.
4	N. Siddeshwar, P. Kanniah, V.V.S. Sastri," Machine Drawing", published by Tata McGrawHill, 2018.
5	S. Trymbaka Murthy, "A Text Book of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 2016.

U24GE7201	COMMUNICATION LABORATORY	L	T	P	C
		0	0	4	2
Course Objectives:	To encourage group discussion, effective presentation skills to analyse concepts that are relevant to the context and able to communicate effectively through formal and informal writing.				

Exp. No	Title
1	Speaking Skill.
2	Role Play.
3	Email Writing.
4	Group Discussion.
5	Dialogue writing.
6	Paragraph Writing.
7	Formal / Semi – Formal letters
8	Writing Instructions
9	Short Article Writing
10	Writing Recommendations
	Total Periods: **60**

Course Outcomes

On completion of the course, the student can

COs	Statements	K - Level
CO1	Relate speaking skills effectively in formal and semi formal context.	K2
CO2	Infer concepts with problems from various perspectives for suitable solutions.	K2
CO3	Interpret the writing skills with technical format.	K2
CO4	Explain the content with the correct format to convey information with clarity.	K2
CO5	Relate recommendations for effective execution of tasks.	K2

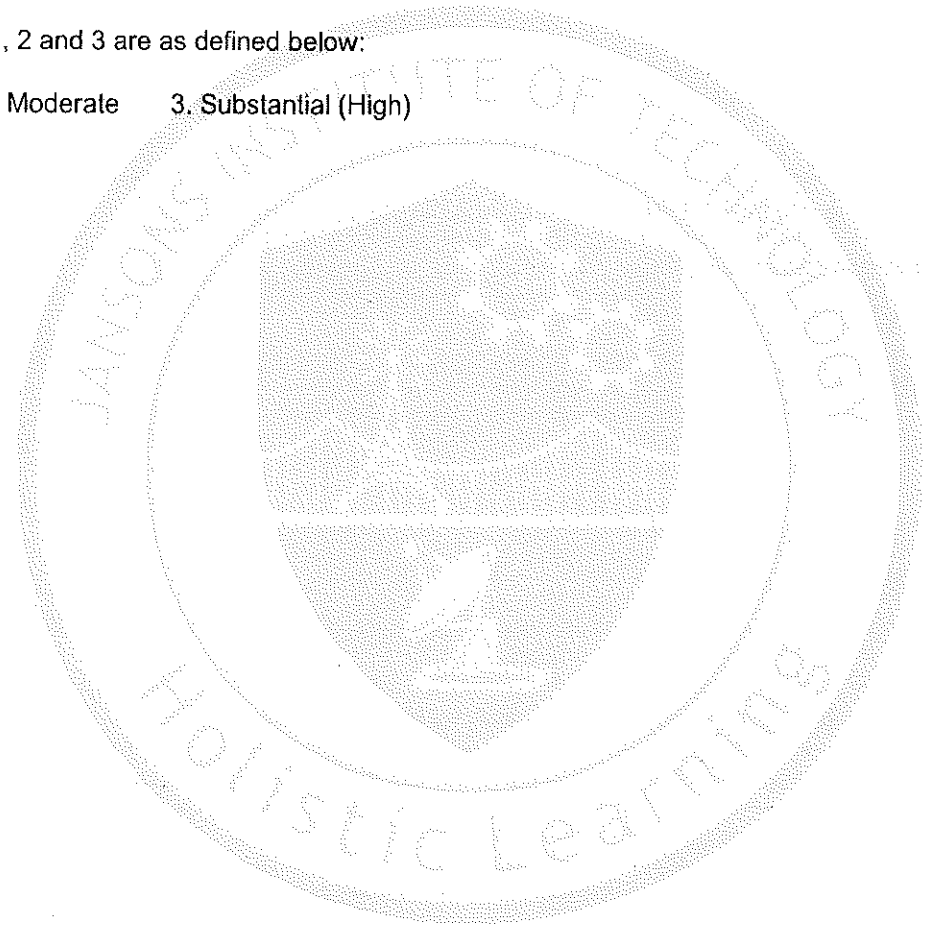
Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-
CO	-	-	-	-	-	-	-	-	3	3	-	3	-	-	-

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)



U24GE7202	FUNDAMENTALS OF ENTREPRENEURSHIP AND STARTUP	L	T	P	C
		0	0	2	1

Course Objectives:	To familiarize Entrepreneurship and Startups, understand and formulate the Problem Canva, Business model Canva and relate the incubation support with respect to startups.

Unit - I	FUNDAMENTALS OF ENTREPRENEURSHIP	4

Meaning and importance of Entrepreneurship- Types of entrepreneurial skills – Entrepreneurship in different sectors- Role of entrepreneurship development programmes (EDP).

Unit - II	FUNDAMENTALS OF STARTUP	6

Introduction- Features of Startup- Understanding problems and Customer Persona- Problem statement Canva- Empathy map and Value Preposition- Prototyping- Presentation on Problem canva.

Unit - III	BUSINESS PLAN AND PITCHING	6

Market Analysis- Business Model Canva- Go to Market Strategy- Cost Analysis and Revenue streams- Presentation on Business model Canva.

Unit – IV	INCUBATION SUPPORT TO STARTUPS	6

Commercialisation- Meaning and Definition of Incubation support-Functions of pre incubation and Incubation centres- Registration process.

Unit - V	CASE STUDIES ON STARTUP	8

How to Pitch a startup- Pitch deck – Case studies of Successful startups in India- Failure analysis of Startups Pitch deck presentation.

	Total Periods:	30

Course Outcomes

On completion of the course, the student can

COs	Statements	K-Level
CO1	Explain the types of entrepreneurial skills	K2
CO2	Summarize the problem statement Canva for the identified problem	K2
CO3	Extend a business plan with market analysis and financial projection	K2
CO4	Explain commercialisation and incubation support for startups	K2
CO5	Demonstrate a pitch deck for startup with insights from the case studies	K2

Knowledge Level: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

CO – PO – PSO Articulation Matrix

	Programme Outcomes												PSO		
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03
CO1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO2	1	-	-	-	-	1	-	-	2	2	-	2	-	-	-
CO3	-	-	-	-	-	1	-	-	2	2	1	2	-	-	-
CO4	1	-	-	-	-	1	-	2	-	-	-	2	-	-	-
CO5	-	-	-	-	-	1	-	2	2	3	-	2	-	-	-
CO	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**2**	**2**	**1**	**2**	**-**	**-**	**-**

Correlation levels 1, 2 and 3 are as defined below:

1. Slight 2. Moderate 3. Substantial (High)

Text Books

1	"Entrepreneurship: Theory, Process, and Practice" Authors: Donald F. Kuratko, Richard M. Hodgetts, and Justin G. Longenecker, Publisher: Cengage Learning Year of Publication: 2021.
2	"Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers".
3	Alexander Osterwalder and Yves Pigneur Publisher: Wiley Year of Publication: 2010.
4	Rashmi Bansal, Connect the Dots, Westland and Tranquebar Press, 2012.

Reference Books

1	"Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" by Eric Ries, Publisher: Currency, Year of Publication: 2011.
2	"The Art of the Start 2.0: The Time-Tested, Battle-Hardened Guide for Anyone Starting Anything" Author: Guy Kawasaki, Publisher: Portfolio, Year of Publication: 2015.