DHANALAKSHMI SRINIVASAN
COLLEGE OF ENGINEERING
(AUTONOMOUS)
COIMBATORE - 641 105 | www.dsce.ac.in

DEPARTMENT OF CIVIL ENGINEERING

REGULATIONS-2024

B.E. – CIVIL ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

NH -47, Palakkad Main Road, Post, Navakkarai,
Coimbatore-641 105
Tamil Nadu, India

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DEPARTMENT OF CIVIL ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER I

S. No.	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1	HS24001	Communicative English – I	HSM	3	0	0	3	3
2	MA24001	Engineering Mathematics – I	BS	3	1	0	4	4
3	PH24001	Engineering Physics	BS	3	0	0	3	3
4	CY24001	Engineering Chemistry	BS	3	0	0	3	3
5	ES24001	Engineering Graphics	ES	2	0	4	6	4
6	TA24001	Heritage of Tamils	HSM	1	0	0	1	1
7	MN24001	Overview of Engineering and Technology	MN	3	0	0	3	0
PRACTICALS								
8	BS24001	Engineering Physics & Chemistry Laboratory	BS	0	0	4	4	2
9	ES24002	Engineering Practices Laboratory	ES	0	0	4	4	2
10	HS24002	Communicative Laboratory	HSM	0	0	2	2	1
TOTAL				**18**	**1**	**14**	**33**	**23**

SEMESTER II

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	HS24003	Communicative English II	HSM	3	0	0	3	3
2.	MA24002	Statistics and Numerical Methods	BS	3	1	0	4	4
3.	EE24003	Basic Electrical & Electronics Engineering	ES	3	0	0	3	3
4.	CS24001	Problem Solving and Python Programming	ES	3	1	0	4	4
5.	PH24004	Physics of Materials	BS	3	0	0	3	3

6.	TA24002	Tamils and Technology	HSM	1	0	0	1	1
7.	MN24002	Environmental Science and Sustainability	MN	3	0	0	3	0
PRACTICALS								
8.	CE24001	Computer Aided Building Drawing Laboratory	PC	0	0	4	4	2
9.	CS24002	Problem Solving and Python Programming Laboratory	ES	0	0	4	4	2
TOTAL				**19**	**2**	**8**	**29**	**22**

SEMESTER– III

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	MA24304	Engineering Mathematics-III	BS	3	1	0	4	4
2.	CE24301	Engineering Mechanics	PC	3	1	0	4	4
3.	CE24302	Fluid Mechanics	PC	3	0	0	3	3
4.	CE24303	Construction Materials	ES	3	0	0	3	3
5.	CE24304	Transportation Engineering	PC	3	0	0	3	3
6.	CE24321	Surveying and its Practices	PC	3	0	2	5	4
PRACTICALS								
7.	CE24311	Material Testing Laboratory	PC	0	0	4	4	2
8.	CE24312	Fluid Mechanics Laboratory	PC	0	0	4	4	2
TOTAL				**18**	**2**	**10**	**32**	**25**

SEMESTER – IV

S. No	Course Code	Course Title	Category	L	T	P	Contact Hours	C
THEORY								
1.	CE24401	Strength of Materials	PC	3	1	0	4	4
2.	CE24403	Water Supply and Waste Water Engineering	PC	3	0	0	3	3
3.	CE24404	IoT Concepts and Applications in Civil Engineering	PC	3	0	0	3	3
4.	CE24421	Drone Technology	PC	3	0	0	3	3
5.	CE24402	Geo Technical Engineering	PC	3	0	2	5	4
PRACTICALS								
6.	CE24411	Strength of Materials Laboratory	PC	0	0	4	4	2
7.	CE24412	Water Supply and Waste Water Engineering Laboratory	PC	0	0	4	4	2
TOTAL			**TOTAL**	**17**	**2**	**10**	**29**	**21**

HS24001-COMMUNICATIVE ENGLISH-I								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- To enable learners to understand the basics of communication.
- To empower learners to use narrative techniques to convey ideas and experiences in academic and work environment.
- To support learners in enhancing their linguistic competence and engaging in effortless dialogue.
- To assist learners in mastering language for the successful academic and professional communication.
- To strengthen language proficiency for effective comprehension of core curricula.

UNIT I - Basics of Communication **Listening -** Telephone conversation, Listening to Podcast, NEWS, Interviews **Speaking -** Verbal and Non-Verbal Conversation, Role play **Reading** - Types of Reading- Skimming, Scanning, Intensive and Extensive finding key information in a given text **Writing -** Passage Comprehension , Formal Letter Writing Professional Email Writing **Grammar -** Parts of Speech - Noun, Verb, Pronoun & Adverb, Tense -Present Tense, Types of Sentences **Vocabulary -** Prefix & Suffix	**9**
UNIT II - Narrative Skill Development **Listening -** Watching travel documentary **Speaking -** Narrating a story , Narrating a personal incident **Reading -** Reading Travelogues, Blogs **Writing** Paragraph Writing, Rearrangement of jumbled sentences **Grammar -** Tense Past Tense, Subject Verb Agreement, Auxiliary and Modal Verbs **Vocabulary -** Synonyms and Antonyms	**9**
UNIT III Enriching Speaking Skills **Listening -** Dialogues & conversations **Speaking -** Group Conversation, Speaking on given topics and context **Reading -** Reading Newspaper Articles, Reading user manuals **Writing -** Instructions, Writing definitions **Grammar -** Adjective, Tense Future Tense, Types of Questions WH Questions **Vocabulary -** Abbreviations & Acronyms	**9**
UNIT IV - Language Enhancement **Listening -** Listening to TED Talks **Speaking -** Speaking about friends/places/hobbies, Delivering Welcome Address **Reading -** Reading Biography, Reading Editorial **Writing -** Short Report writing **Grammar** Preposition, Question Tags, Yes or No questions, Articles **Vocabulary** One word Substitution	**9**
UNIT V - Technical Usage of Language **Listening -** Listening to native dialects & live commentaries **Speaking -** Group Discussion, Debates, Proposing Vote of Thanks	**9**

Reading - Opinion articles, Journal Reports **Writing -** Essay Writing **Grammar -** Cause and Effect expressions**,** Negations **Vocabulary -** Gerund & infinitives, Compound Noun	
Total Hours	**45**

Textbook(s)	
1	English for Engineers & Technologists Orient Blackswan Private Ltd., Anna University, 2020.
2	Veena Selvam, Sujatha Priyadarshini, Deepa Mary Francis, K. N. Shoba, Lourdes Joevani, English for Science & Technology, Cambridge University Press, 2021.
Reference(s)	
1	English for Academic Correspondence and Socializing by Adrian Wall work, Springer, 2011.
2	Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.
3	Meenakshi Raman, Technical Communication, Oxford University Press, New Delhi, 2017
4	Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

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

Course Outcomes		Level
CO1	Communicate effectively using grammatical words according to the context.	K1
CO2	Analyze the given context and frame content accordingly using narrative skills.	K2
CO3	Effectively use language techniques in extended discussions.	K2
CO4	Frame short and long sentences using grammatical techniques according to given context.	K1
CO5	Respond with clarity and accuracy in a range of professional situations, using appropriate linguistic accuracy.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**-**
CO2	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**1**	**3**	**-**	**3**	**-**	**-**	**-**
CO3	**2**	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO4	**2**	**3**	**2**	**3**	**-**	**3**	**3**	**3**	**2**	**3**	**-**	**3**	**-**	**-**	**-**
CO5	**2**	**3**	**3**	**3**	**-**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

MA24001 – ENGINEERING MATHEMATICS – I								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	1	0	60	4	40	60	100

Course Objectives

- Understand the concept of matrices and reduction quadratic form to canonical form.
- Solve the problems using fundamentals principles of calculus.
- Apply the concept of calculus in several variables.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals.

UNIT I - MATRICES Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values 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.	**12**
UNIT II – DIFFERENTIAL CALCULUS 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	**12**
UNIT III - FUNCTIONS OF SEVERAL VARIABLES Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – 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.	**12**
UNIT IV – INTEGRAL CALCULUS Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts(reduction),Trigonometric substitutions, Integration of rational functions by partial fraction,improper intergrals.	**12**
UNIT V - MULTIPLE INTEGRALS Double integrals – Change of order of integration – Double integrals in polar coordinates – Area as a double integral - Triple integrals.	**12**
Total Hours	**60**

Textbook(s)

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(s)

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.

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

Course Outcomes		Level
CO1	Understand the matrix algebra methods for solving practical problems.	K2
CO2	Apply differential calculus tools in solving various application problems.	K4
CO3	Use differential calculus ideas on several variable functions.	K3
CO4	Apply different methods of integration in solving problems.	K4
CO5	Apply multiple integral ideas to find the area.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO2	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO3	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO4	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
CO5	**3**	**3**	**1**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**3**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

PH24001 – ENGINEERING PHYSICS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- To introduce the concepts of Laser and its applications.
- To achieve an understanding of mechanics.
- To introduce the concepts of thermal physics.
- To gain knowledge about the basics of quantum mechanics.
- To understand the applications of quantum mechanics.

UNIT I – LASER Theory of laser - characteristics - spontaneous and stimulated emission - Laser action- Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - population inversion - Types of laser – Nd -YAG laser, CO_2 laser - Basic applications of lasers in industries – laser heat treatment in annealing, welding, drilling, cutting and soldering – Application of laser in fibre optic communication system.	**9**

UNIT II - MECHANICS Linear motion and rotational motion – Multi particle dynamics – Center of mass (CM) – kinetic energy of system of particles– Physical significance of moment of inertia – M.I of a diatomic molecule – Torsional pendulum.	**9**
UNIT III - THERMAL PHYSICS Modes of heat transfer - thermal conduction, convection and radiation - heat conduction in solids - thermal conductivity - Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - Application: Solar water heater.	**9**
UNIT IV - BASIC QUANTUM MECHANICS Photons and light waves - wave particle duality - De Broglie's wavelength - Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - particle in an infinite potential well - particle in a 3D box - correspondence principle (qualitative).	**9**
UNIT V - APPLIED QUANTUM MECHANICS Barrier penetration and quantum tunneling (qualitative)- Scanning Tunneling microscope – Resonant diode – Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model.	**9**
Total Hours	**45**

Textbook(s)	
1	M. N. Avadhanulu, P. G. Kshirsagar, T. V. S. Arun Murthy, "A Textbook of Engineering Physics", 11th Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2019.
2	D. K. Bhattacharya, T. Poonam, "Engineering Physics". Oxford University Press, 2015.
3	R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 2013.
4	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017
Reference(s)	
1	R. Wolfson, "Essential University Physics", Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2	D. Halliday, R. Resnick, J. Walker, "Principles of Physics", Wiley Publishers (Indian Edition), 2015.
3	Dattu R Joshi, "Engineering Physics", 1st Edition, Tata McGraw Hill Publications, New Delhi, 2010.
4	B. K. Pandey, S. Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
5	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw Hill (Indian Edition), 2017.

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

Course Outcomes		Level
CO1	Gain knowledge about lasers and its applications.	K2
CO2	Understand the importance of mechanics.	K1
CO3	Acquire knowledge on the concepts of thermal physics.	K2
CO4	Understand the concepts of quantum mechanics.	K1
CO5	Comprehend and express their knowledge about applications of quantum mechanics.	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	1	2	1	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	2	1	-	-	-	-	-	1	-	-	-
CO4	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
CO5	3	3	1	1	2	1	-	-	-	-	-	-	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

CY24001 – ENGINEERING CHEMISTRY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	3	40	60	100

Course Objectives

- The objective of this course is to better understanding of basic concepts of chemistry and its applications on engineering domine.
- It imparts knowledge on properties of water and its treatment methods, different types of fuels and its applications.
- It also imparts knowledge about different storage devices.
- This course also highlights the preparation, properties and applications of nanomaterials.
- It also gives basic idea about different types of engineering materials.

UNIT I - WATER TECHNOLOGY **Water Technology:** Introduction – Sources − Impurities − Hardness of water −Estimation of harness of water − Boiler feed water − Boiler troubles (Scale and Sludge, Boiler corrosion, Caustic embrittlement, Priming and Foaming)− Treatment of boiler feed water − Internal treatment (Phosphate, Sodium aluminate, Colloidal, Calgon conditioning) − External treatment (Demineralisation process, Zeolite process) − Desalination process − Reverse Osmosis − Municipal water treatment– Case study.	**9**
UNIT II - FUELS **Fuels:** Introduction − Classification of fuels − Solid fuels − Coal and Coke − Metallurgical coke − Manufacture of metallurgical coke (Otto Hoffmann's by-product oven) − Liquid fuels − Petroleum and Diesel − Synthetic petrol (Bergius process) − Knocking in petrol − Octane number − Knocking in diesel − Cetane number − Power alcohol – Gaseous fuels – Natural gaseous fuel – Synthetic gaseous fuel (CNG, LPG) – Flue gas analysis – ORSAT method.	**9**
UNIT III - ELECTROCHEMICAL STORAGE DEVICES **Batteries:** Introduction – Types of batteries – Primary battery (Dry cell) – Secondary battery (Lead acid battery) – Modern battery (Lithium ion battery) – Fuel cells – H_2-O_2 fuel cell– Solar Cells –Electric vehicles: Working principles –Super capacitors: Types and examples.	**9**
UNIT IV - NANO CHEMISTRY **Nano Materials:**Introduction – Types of nano materials – Nanoparticle, Nanocluster, Nanorod, Nanowire and Nanotube – Preparation of nanomaterials (Sol-gel, Solvothermal, Chemical vapour deposition (CVD), Electro chemical deposition (ECD), Laser ablation and	**9**

Electro spinning methods) – Applications of nanomaterials.	
UNIT V - ENGINEERING MATERIALS **Engineering Polymers:** Introduction – Types of polymers (Natural and Synthetic polymers) – Polymerization – Types of polymerization (Addition polymerization and Condensation polymerization) –Degree of polymerization – Thermosetting and Thermoplastic polymers– Application of polymers.	**9**
Total Hours	**45**

Textbook(s)	
1	P. C. Jain and Monica Jain, "A Text Book of Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt Ltd, New Delhi, 2020.
2	Shashi Chawla "A Text Book of Engineering Chemistry" 3rd Edition, Dhanpat Rai Publishing Company Pvt Ltd, New Delhi, 2011.
3	S. S. Dara and S. S. Umare "A Text Book of Engineering Chemistry", 12th Edition, S. Chand & Company Publishing, 2018.
4	B. Sivasankar, "Engineering Chemistry", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.
Reference(s)	
1	Shikha Agarwal, "Engineering Chemistry - Fundamentals and Applications", 2nd Edition, Cambridge University Press, New Delhi, 2019.
2	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath, James Murday, "Text Book of Nanoscience and Nanotechnology", Universities Press – IIM Series in Metallurgy and Materials Science, 2018.
3	V. R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, "Polymer Science" New Age International Publishers, 2009.

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

Course Outcomes		**Level**
CO1	Knowledge about different types of water and propose suitable methods for treatment of water.	K1
CO2	Customize various types of fuels for engineering processes and applications.	K3
CO3	Dramatize different storage devices and apply the concepts in engineering energy sectors.	K3
CO4	Identify and apply the basic concepts of nanotechnology and design the synthesis of nano materials for the applications of engineering and technology.	K1
CO5	Summarize the types of engineering materials and their suitable applications in recent technologies.	K2

Mapping with Program Outcomes

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**	**2**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	**2**	**-**	**-**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**1**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**2**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

ES24001 – ENGINEERING GRAPHICS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	2	0	4	60	4	40	60	100

Course Objectives

- Drawing engineering curves and free hand sketch of simple objects.
- Drawing orthographic projection of points, lines and plane surface.
- Drawing orthographic projection of solids.
- Drawing development of solids and section of solids.
- Drawing isometric and perspective projections of simple solids.

CONCETPS AND CONVENTIONS (Not for Examination) Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. **UNIT I - PLANE CURVES AND FREE HAND SKETCHING** 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.	**12**
UNIT II - PROJECTION OF POINTS, LINES AND PLANE SURFACE 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.	**12**
UNIT III - PROJECTION OF SOLIDS 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 and auxiliary plane method.	**12**
UNIT IV - PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other-obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids-Prisms, Pyramids cylinders and cones.	**12**
UNIT V - ISOMETRIC AND PERSPECTIVE PROJECTIONS Principles of isometric projection - isometric scale - Isometric projections of simple solids and truncated solids- Prisms, Pyramids cylinders and cones. Combination of two solid objects vertical positions. Perspective projection of simple solids- Prisms, Pyramids and cylinders by visual ray method. Computer assisted isometric and perspective projections.	**12**

	Total Hours	**60**
Textbook(s)		
1	N. D. Bhatt,V. M. Panchal, "Engineering Drawing", 53rd Edition, Charotar Publishing House, 2019.	
2	K. V. Natrajan,"A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.	
3	N. S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University Press, 2015.	
Reference(s)		
1	Basant Agarwal,C. M. Agarwal, "Engineering Drawing", McGraw Hill, 2ndEdition, 2019.	
2	K. R. Gopalakrishna, "Engineering Drawing" (Vol.I & II combined), 27th Edition, Subhas Publications, Bangalore, 2017.	
3	J. Luzzader, Warren,M. Duff, John, "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.	
4	N. S. Parthasarathy, Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.	
5	M. B. Shah, B. C. Rana, "Engineering Drawing", 2ndEdition, Pearson Education India, 2009.	
6	K. Venugopal,V. Prabhu Raja, "Engineering Graphics", New Age International (P) Ltd, 2008.	

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

Course Outcomes		**Level**
CO1	Familiarize with the fundamentals and standards of engineering drawing. Construct the conic curves, in volutes and cycloid, and perform free hand sketching of basic geometrical constructions and multiple views of objects.	K3
CO2	Draw the orthographic projections of points, lines and plane surfaces.	K4
CO3	Draw the projection of simple solids.	K3
CO4	Draw the projection of sectioned solids and draw the development of surfaces of simple solids.	K3
CO5	Visualize and projections of Isometric and perspective projections of simple solids.	K5

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO2	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO3	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO4	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
CO5	**3**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**2**	**-**
3 – Strong, 2 – Medium, 1 – Low															

TA24001 – HERITAGE OF TAMILS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	1	0	0	15	1	40	60	100

Course Objectives

- To learn the extensive literature of classical tamil.
- To review the fine arts heritage of tamil culture.
- To realize the contribution in Indian freedom struggle.
- To understand the role of Temple in Sangam cities/ports, Chola conquest.
- To examine Tamil cultural influence in India.

UNIT I - LANGUAGE AND LITERATURE 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.	**3**
UNIT II - HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 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.	**3**
UNIT III - FOLK AND MARTIAL ARTS Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	**3**
UNIT IV - THINAI CONCEPT OF TAMILS 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.	**3**
UNIT V - CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement Inscriptions & Manuscripts.	**3**
Total Hours	**15**

Textbook(s)

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 சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).

Reference(s)

1	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL (in print).
2	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies
3	Historical Heritage of the Tamils (Dr. S. V. Subramanian, Dr. K. D. Thirunavukkarasu) (Published

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

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

Course Outcomes		Level
CO1	Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, Thinai concept, Indian Freedom Struggle & Aham, Puram and Aram Concept.	K1
CO2	Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars, heritage of sculpture, painting ancient people.	K1
CO3	Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments.	K2
CO4	Understand the Ancient Cities and Ports of Sangam Age of Tamils	K2
CO5	Understand the Cultural Influence of Tamils over the other parts of India, contribution of Tamils self-esteem movement.	K1

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO2	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO3	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO4	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO5	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

TA24001 – தமிழர் மரபு							
Semester	Hours/Week			Total Hours	Credit	Maximum Marks	
	L	T	P		C	CIAT	ES	Total
I	1	0	0	15	1	40	60	100

Course Objectives

- விரிவான இலக்கியம் மற்றும் செம்மொழி தமிழ் கற்க.
- தமிழ் கலாச்சாரத்தின் நுண்கலை பாரம்பரியத்தை மதிப்பாய்வு செய்ய.
- இந்திய சுதந்திரப் போராட்டத்தில் பங்களிப்பை உணர வேண்டும்.
- சங்க நகரங்கள்/துறைமுகங்களில் கோயிலின் பங்கைப் புரிந்து கொள்ள, சோழர்களின் வெற்றி.

- இந்தியாவில் தமிழ் கலாச்சார தாக்கத்தை ஆய்வு செய்ய.

அலகு I - மொழி மற்றும் இலக்கியம் இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை திருக்குறளில் மேலாண்மைக் கருத்துக்கள் தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் -பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் சிற்றிலக்கியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி.	**3**
அலகு II - மரபு பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - நாட்டுப்புறத் தெய்வங்கள் குமரிமுனையில் திருவள்ளுவர் சிலை .	**3**
அலகு III - நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள் தெருக்கூத்து கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து. ஒயிலாட்டம் தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	**3**
அலகு IV - தமிழர்களின் திணைக் கோட்பாடுகள் தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும்.	**3**
அலகு V - இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம், கையெழுத்துப்படிகள்.	**3**
Total Hours	**15**

Textbook(s)

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 சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு).

Reference(s)

1	Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
2	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies).

3	Historical Heritage of the Tamils (Dr. S.V. Subramanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies).
5	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).
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr. K. K. Pillay) (Published by: The Author).
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL).

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

Course Outcomes		Level
CO1	Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, Thinai concept, Indian Freedom Struggle & Aham, Puram and Aram Concept.	K1
CO2	Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars, heritage of sculpture, painting of ancient people.	K1
CO3	Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments.	K2
CO4	Understand the Ancient Cities and Ports of Sangam Age of Tamils	K2
CO5	Understand the Cultural Influence of Tamils over the other parts of India, contribution of Tamils self-esteem movement.	K1

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO2	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO3	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO4	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
CO5	-	-	-	-	-	-	**3**	**3**	-	**3**	-	**3**	-	-	-
3 – Strong, 2 – Medium, 1 – Low															

MN24001 – OVERVIEW OF ENGINEERING AND TECHNOLOGY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	0	0	45	0	40	60	100

Course Objectives

- To outline the basics of the Civil Engineering.

- To learn the fundamentals of Mechanical Engineering.
- To impart knowledge on fundamental concepts and recent trends in the field of Electrical and Control Systems.
- To provide the overview of the Computer Science and Engineering and AI&DS.
- To provide the overview of Food Technology and Bio Medical Engineering.

UNIT I – INTRODUCTION TO ENGINEERING & TECHNOLOGY Science, Engineering and Technology(E&T), Approaches for a Scientific process vs an Engineering process; Engineering Product Life Cycle, processes in Engineering Design Methodology with few examples; various branches in Engineering and Technology (Traditional and Recent), Impact of E&T on human life, (pros & cons); Activities performed by an Engineer, Interdisciplinary nature of real world problems; Revised Bloom's Taxonomy Levels (BTL)	**9**
UNIT II – OVERVIEW OF CIVIL, MECHANICAL AND AGRICULTURAL ENGINEERING Introduction - Who is a civil Engineer? -Roles and Responsibilities- Scope and Opportunities- Structures -Geo Technical Engineering - Estimation and Costing- Construction - Project Management - Structural Engineering - Irrigation and Water Supply. Introduction - Who is a Mechanical Engineer? - Roles and Responsibilities - Scope and Opportunities – Manufacturing- Design - Automobile-Power Generation - Industrial Engineering- computer aided design and manufacturing - computer integrated manufacturing. Introduction - Who is an Agricultural Engineer? - Difference between Agricultural & Horticultural Engineering - Types of Agricultural Engineering - Processing or Post Harvest Engineering - Farm Power and Machinery Engineering - Soil and Water Conservation Engineering - Environmental Control Engineering - Forestry - Wood Product Engineering - Food Engineering - Scope and Opportunities.	**9**
UNIT III – OVERVIEW OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERING Introduction- Different between Electrical Engineer and Electronics Engineer - Roles and Responsibilities - Scope and Opportunities - Power Generation and Consumption - Reason development - Current area of research - Energy audit - Energy utilization -PLC- Embedded control systems and computer based control system- wired and wireless communication- satellite communication- IoT communication network.	**9**
UNIT IV - OVERVIEWOF COMPUTER SCIENCE AND ENGINEERING, CYBER SECURITY & AI &DS Introduction- Different between Computer Science and Engineering and AI&DS - Job Description-Roles and Responsibilities - Scope and Opportunities.Computer hardware and software - programming languages, operating system - application of software-database management system (DBMS) - Computer networks - Internet and computer security- Web technology - Mobile application - Artificial intelligent (AI) - Machine learning(ML) - Internet of things(IoT) - Black chain - Cyber security -Cloud computing.	**9**
UNIT V –OVERVIEW OF FOOD TECHNOLOGY AND BIO MEDICAL ENGINEERING Introduction - Scope and Importance of Food Technology - Historical development and trends in the field - Sources of food - Chemical composition of food - Microorganisms in food - Food borne illness and safety measures - Unit operations in food Processing - Principles and	**9**

methods of Food Processing - Case studies on successful food products or processes. Introduction-Role of Biomedical Engineer - Scope of Biomedical Engineer- Key Areas: Bio materials, Biomechanics, Biomedical Instrumentation, Medical Devices, Clinical Engineering, Cell and Tissue Engineering-Career Opportunities: Research and Development- Applications and Future Directions.	
Total Hours	**45**

Textbook(s)	
1	"Overview of Engineering and Technology", Lecture Notes from DSCE, 2024.
2	"Introduction to Engineering Technology and Engineering" by Val D Hawks, A Brent Strong, 1st Edition, Pearson Publisher, 2000.
Reference(s)	
1	N. R. Banapurmath,V. S. Yalliwal, "Basics of Mechanical Engineering",Vikas Publishing House, 2021.
2	G. Shanmugam, M. S. Palanichamy, "Basic Civil and Mechanical Engineering", McGraw Hill Education; 1st Edition, 2018.
3	D. P. Kothari, I.J. Nagrath, "Basic Electrical Engineering", 4th Edition, McGraw Hill Education, 2019.
4	Albert Malvino, David J. Bates," Electronic Principles (SIE)", 7th Education, McGraw Hill 2017.
5	Reema Thareja, "Fundamentals of Computer", Oxford University Press, 2016.

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

Course Outcomes		**Level**
CO1	Identify the major areas and relate their current trends in Civil Engineering.	K1
CO2	Explain the principles behind various mechanical systems and components.	K2
CO3	Identify different Electricals and Control Systems applied in the Engineering field.	K3
CO4	Relate the various Electronics and Communication Systems involved in real life.	K4
CO5	Understand the components of computer hardware, software, and operating systems and their applications in real life.	K2

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**-**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**1**	**-**	**-**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 - Low															

BS24001 – ENGINEERING PHYSICS AND CHEMISTRY LABORATORY							
Semester	Hours/Week			Total Hours	Credit	Maximum Marks	
	L	T	P		C	CIAT	ESE	Total

I	0	0	4	60	2	60	40	100

ENGINEERING PHYSICS LABORATORY

Course Objectives

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills.
- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To determine error in experimental measurements and techniques used to minimize such errors.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS (Any 7 Experiments)	
1. Determination of rigidity modulus of a metallic wire using torsional pendulum.	
2. Determination of Young's modulus – Non-uniform bending method.	
3. Determination of Young's modulus – Uniform bending method.	
4. Determination of Young's modulus – Cantilever method.	
5. Determination of wavelength of the laser using grating.	
6. a) Determination of Acceptance angle and Numerical aperture of an optical fiber. b) Determination of width of the groove using laser.	
7. Determination of thickness of a thin film by air-wedge arrangement.	
8. Determination of velocity of sound and compressibility of liquid using Ultrasonic Interferometer.	
9. Determination of velocity of ultrasonic waves using acoustic grating.	
10. Determination of the band gap of a given semiconducting material.	
11. Determination of Planck's constant and work function using Photoelectric effect.	
12. Determination of frequency of the vibrator using Melde's string arrangement.	
Total Hours	**30**

Reference(s)

1	M. N. Srinivasan, S. Balasubramanian, R. Ranganathan, "Practical Physics", S. Chand & Sons Educational Publications, New Delhi, 2011.
2	P. R Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

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

Course Outcomes		**Level**
CO1	Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.	K1
CO2	Use graphical models to analyze laboratory data.	K2
CO3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.	K2
CO4	Access, process and analyze scientific information.	K3
CO5	Solve problems individually and collaboratively	K3

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**3**	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

CO2	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

ENGINEERING CHEMISTRY LABORATORY

Course Objectives

- To make the students to acquire practical skills in basic understanding of water quality parameters such as, hardness, alkalinity, acidity, DO, chloride and copper content.
- To induce the students to familiarize with electro analytical techniques such as, conductometry, potentiometry and pH metry.
- To demonstrate the synthesis of nano particles.
- To develop skills on analysis of coal.

LIST OF EXPERIMENTS: (Any 7 Experiments)	
1. Estimation of acidity of a water sample using the primary standard.	
2. Determination of types and amount of alkalinity in water sample.	
3. Determination of total, temporary & permanent hardness of water by EDTA method.	
4. Determination of DO content of water sample by Winkler's method.	
5. Determination of chloride content of water sample by Argentometric method.	
6. Estimation of copper content of the given solution by Iodometry.	
7. Estimation of TDS of a water sample by gravimetry.	
8. Determination of strength of strong acid using conductivity meter.	
9. Determination of strength of acids in a mixture of acids using conductivity meter.	
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)	
11. Determination of strength of given hydrochloric acid using pH meter.	
12. Estimation of iron content of the given solution using potentiometer.	
13. Estimation of sodium/potassium present in water using flame photometer.	
14. Preparation of nano particles (TiO_2/ZnO/CuO) by Sol-Gel method.	
15. Proximate analysis of Coal	
Total Hours	**30**

Reference(s)

1	J. Mendham, R. C. Denney, J. D. Barnes, M. Thomas, B. Sivasankar, "Vogel's Text Book of Quantitative Chemical Analysis", (2009).
2	G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, "Vogel's Text Book of Quantitative Chemical Analysis, 5th Edition, 2009.

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

Course Outcomes		**Level**
CO1	Analyze the quality of water samples with respect to their hardness, alkalinity, acidity and DO.	K4
CO2	Determine the amount of metal ions through volumetric and spectroscopic	K4

	techniques.	
CO3	Analyze and determine the composition of coals.	K3
CO4	Learn simple method of synthesis of nano particles.	K1
CO5	Quantitatively analyze the impurities in solution by electro analytical techniques.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**-**	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	**3**	**1**	**2**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	**3**	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**2**	**1**	**2**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**2**	**1**	**2**	**-**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

ES24002 – ENGINEERING PRACTICES LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	4	60	2	60	40	100

Course Objectives

- Prepare pipe line plan; laying and connecting various pipe fittings used in common household plumbing work. Making joints in wood materials used in common household wood work.
- Prepare various welding joints in steel plates using arc welding work
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

CIVIL ENGINEERING PRACTICES:

PLUMBING WORK:

- Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
- Preparing plumbing line sketches.
- Laying pipe connection to the suction side of a pump.
- Laying pipe connection to the delivery side of a pump.
- Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

- Sawing
- Planning
- Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

WOOD WORK STUDY: • Studying joints indoor panels and wooden furniture. • Studying common industrial trusses using models.	
ELECTRICAL ENGINEERING PRACTICES :	
• Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket • Staircase wiring • Fluorescent Lamp wiring with introduction to CFL and LED types. • Energy meter wiring and related calculations/ calibration • Study of Iron Box wiring and assembly • Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac) • Study of emergency lamp wiring/Water heater	
MECHANICAL ENGINEERING PRACTICES :	
WELDING WORK: • Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding. • Practicing gas welding • Making of models.	
BASIC MACHINING WORK: • (simple) Turning. • (simple) Drilling. • (simple) Tapping.	
SHEET METAL WORK: • Making of as square tray.	
FOUNDRY WORK: • Demonstrating basic foundry operations.	
ELECTRONIC ENGINEERING PRACTICES:	
SOLDERING WORK: • Soldering simple electronic circuits and checking continuity	
ELECTRONIC ASSEMBLY AND TESTING WORK: • Assembling and testing electronic components on a small PCB.	
ELECTRONIC EQUIPMENT STUDY: • Study elements of smart phone. • Study of TV parts and working. • Assembly and dismantle of computer/ laptop	
Total Hours	**60**
Reference(s)	
1.	Shoop, Charles Franklin, "Mechanical Engineering Practice: A Laboratory reference text", McGraw-Hill Publisher, 1956.
2.	S Gowri, T Jayapoovan, "Engineering Practices Lab Manual", Vikas Publishing House, 2011.

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

Course Outcomes		Level
CO1	Draw pipe line plan; layout and connect various pipe fittings used in common household plumbing work; make joints in wood materials used in	K1

	common household wood work.	
CO2	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assembles simple mechanical common household equipments; Make a tray out of metal sheet using sheet metal work.	K2
CO3	Wire various electrical joints in common household electrical wire work.	K2
CO4	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.	K2

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO2	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO3	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO4	**3**	**2**	**-**	**-**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

HS24002 -COMMUNICATIVE LABORATORY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	2	30	1	60	40	100

Course Objectives

- To enable learners to understand the basics of communication.
- To empower learners to use narrative techniques to convey ideas and experiences in academic and work environment.
- To support learners in enhancing their linguistic competence and engaging in effortless dialogue.
- To assist learners in mastering language for the successful academic and professional communication.
- To strengthen language proficiency for effective comprehension of core curricula.

Basics of Communication **Listening -** Telephone conversation, Listening to Podcast, NEWS, Interviews **Speaking -** Verbal and Non-Verbal Conversation, Role play **Reading -** Types of Reading- Skimming, Scanning, Intensive and Extensive **-** finding key information in a given text	**6**
Narrative Skill Development **Listening -** Watching travel documentary **Speaking -** Narrating a story -Narrating a personal incident **Reading -** Reading Travelogues, Blogs	**6**
Enriching Speaking Skills **Listening -**Dialogues & Conversations **Speaking -**Group Conversation, Speaking on given topics and context	**6**

Reading - Reading Newspaper Articles, Reading user manuals	
Language Enhancement **Listening -** Listening to TED Talks, **Speaking -** Speaking about friends/places/hobbies, Delivering Welcome Address **Reading -** Reading Biography, Reading Editorial.	**6**
Technical Usage of Language **Listening -** Listening to native dialects & live commentaries **Speaking -** Group Discussion, Debates, Proposing Vote of Thanks **Reading -** Opinion articles, Journal Reports	**6**
Total Hours	**30**

Reference(s)

1	English for Academic Correspondence and Socializing by Adrian Wall work, Springer, 2011.
2	Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw-Hill India, 2017.

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

Course Outcomes		Level
CO1	Communicate effectively using grammatical words according to the context.	K3
CO2	Analyze the given context and frame content accordingly using narrative skills.	K4
CO3	Effectively use language techniques in extended discussions.	K3
CO4	Frame short and long sentences using grammatical techniques according to given context.	K3
CO5	Respond with clarity and accuracy in a range of professional situations, using appropriate linguistic accuracy.	K4

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO2	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO3	**2**	**2**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
3 - Strong, 2 - Medium, 1 – Low															

SEMESTER-II

HS24003– COMMUNICATIVE ENGLISH – II								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	45	3	40	60	100

Course Objective

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.
- Explore the business communication knowledge and understand the importance of presentation.

UNIT I - INTRODUCTION TO TECHNICAL ENGLISH Listening - Listening to talks mostly of a scientific/technical nature and completing information-gap exercises Speaking - Asking for and giving directions Reading - reading short technical texts from journals- news papers Writing - purpose statements – extended definitions – writing instructions – checklists- recommendations Language Development - subject verb agreement - compound words	**9**
UNIT II - READING AND STUDY SKILLS Listening - Listening to longer technical talks and completing exercises based on them- Speaking – Describing a process Reading – Reading longer technical texts- identifying the various transitions in a text- paragraphing Writing - Interpreting charts, graphs Vocabulary Development-vocabulary used in formal letters/emails and reports Language Development - Impersonal passive voice, numerical adjectives.	**9**
UNIT III - TECHNICAL WRITING AND GRAMMAR Listening - Listening to classroom lectures/ talks on engineering/technology Speaking - Introduction to technical presentations Reading – longer texts both general and technical, practice in speed reading; Writing - Describing a process, use of sequence words Vocabulary Development - sequence words- Misspelled words. Language Development - embedded sentences.	**9**
UNIT IV - PROFESSIONAL WRITING Listening - Listening to documentaries and making notes. Speaking – mechanics of presentations Reading – reading for detailed comprehension Writing - email etiquette - job application – cover letter – Resume preparation (digital and paper based) – analytical essays and issue based essays Vocabulary Development - finding suitable synonyms-paraphrasing Language Development - clauses- if conditionals.	**9**
UNIT V - BUSINESS COMMUNICATION Listening - TED/Ink talks Speaking – participating in a group discussion Reading – reading and understanding technical articles	**9**

Writing – Writing reports - accident and survey report – Memos – Notices - Circulars - Minutes of a meeting - Vocabulary Development- verbal analogies- reported speech.	
Total Hours	**45**

Textbook(s)	
1	Swan Michael- Practical English Usage- Oxford University Press.
2	.Thomson.A.J and Martinet. A. V - A practical English Grammar- Oxford India.
Reference(s)	
1	Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi,2014.
2	Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015.
3	Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
4	Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.
5	Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007.
6	Troyka & Hesse – Handbook for writers- Pearson Publication, 11th edition, 2017.

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

Course Outcome		**Level**
CO1	Use proper technical vocabulary and grammar in appropriate contexts.	K1
CO2	Enhance speaking skills to participate confidently in formal / informal conversations and to do effective Presentations/Discussions.	K2
CO3	Critically read and analyze technical texts and articles of a general kind.	K1
CO4	Acquire a working knowledge of writing strategies, formats and templates of professional writing.	K2
CO5	Analyze different way of communication and get familiarized with proper presentation.	K1

Mapping with Program Outcomes

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**1**	**1**	**1**	**1**	**2**	**2**	**0**	**0**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO2	**0**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO3	**1**	**1**	**0**	**1**	**2**	**1**	**1**	**0**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO4	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**2**	**3**	**3**	**3**	**-**	**-**	**-**
CO5	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**3**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

MA24002 – STATISTICS AND NUMERICAL METHODS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	1	0	60	4	40	60	100

Course Objective

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I - NON- PARAMETRIC TESTS Introduction - The Sign test - The Signed - Rank test - Rank - sum tests - The U test - The H test - Tests based on Runs - Test of randomness - The Kolmogorov Tests	**9+3**
UNIT II - DESIGN OF EXPERIMENTS One way and two way classifications - Completely randomized design – Randomized block design – Latin square design.	**9+3**
UNIT III - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.	**9+3**
UNIT IV - INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single integrations using Trapezoidal and Simpson's 1/3 rules.	**9+3**
UNIT V - NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.	**9+3**
Total Hours	**60**

Textbook(s)

1	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

Reference(s)

1	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016

2	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007
4	Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

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

Course Outcome		Level
CO1	Apply the concept of testing of hypothesis for small and large samples in real life problems.	K1
CO2	Apply the basic concepts of classifications of design of experiments in the field of agriculture	K4
CO3	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.	K2
CO4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.	K3
CO5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.	K2

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
CO2	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
CO3	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
CO4	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
CO5	**3**	**3**	**1**	**1**	**1**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

EE24003 -BASIC ELECTRICAL AND ELECTRONICS ENGINEERING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ES	Total
II	3	0	0	45	3	40	60	100

Course Objective

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics

- To introduce the functional elements and working of measuring instruments

UNIT 1 ELECTRICAL CIRCUITS DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state).Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only).	**9**
UNIT II ELECTRICAL MACHINES Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.	**9**
UNIT III ANALOG ELECTRONICS Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode – Characteristics Applications -MOSFET, I-V Characteristics and Applications, Operational amplifier and its applications.IC-555 timer, Astable multivibrator.	**9**
UNIT IV DIGITAL ELECTRONICS Review of number systems, binary codes, error detection and correction codes, representation of logic functions-SOP and POS forms, adder and subtractor - minimization using K maps (Simple Problems only), Combinational logic circuits.	**9**
UNIT V - MEASUREMENTS AND INSTRUMENTATION Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition system..	**9**
Total Hours	**45**

Textbook(s)

1	Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020
2	S.K. Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.
3	Sedha R.S., "A text book book of Applied Electronics", S. Chand & Co., 2008
4	James A. Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.

Reference(s)

1	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2	Thomas L. Floyd, 'Digital Fundamentals', 11thEdition, Pearson Education, 2017.
3	Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7thedition, 2017.
4	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010
6	Muthusubramaniam R, Salivahanan S, "Basic Electrical and Electronics Engineering", Tata Mc Graw Hill P ublishers, 2018

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

Course Outcome- After completing this course, the students will be able to		**Level**
CO1	Compute the electric circuit parameters for simple problems	K2
CO2	Explain the working principle and applications of electrical machines	K2
CO3	Analyze the characteristics of analog electronic devices	K1
CO4	Explain the basic concepts of digital electronics	K2
CO5	Explain the operating principles of measuring instruments	K3

Mapping with Program Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	-	-	-	-	1	1	1	-	2	-	-	1
CO2	2	2	1	-	-	-	-	1	1	1	-	2	-	-	1
CO3	2	1	1	-	-	-	-	1	1	1	-	2	-	-	1
CO4	2	2	1	-	-	-	-	1	1	1	-	2	-	-	1
CO5	2	2	1	-	-	-	-	1	1	1	-	2	-	-	1
3 – Strong, 2 – Medium, 1 – Low															

CS 24001 PROBLEM SOLVING AND PYTHON PROGRAMMING								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	3	1	0	60	4	40	60	100

Course Objectives

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO PROBLEM SOLVING Fundamentals of Computing, Identification of computational problems, Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).	**12**
UNIT II BASICS OF PYTHON PROGRAMMING Introduction: Features, Installation, Modes of operations (interpreter and interactive mode); variables and data types: int, float, boolean, string, and list; expressions, statements, operators and comments; modules and functions.	**12**

UNIT III CONTROL STATEMENTS & FUNCTIONS Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion.	**12**
UNIT IV SEQUENTIAL DATA TYPES Strings: String slices, String functions and methods, immutability; Lists: list operations, list slices, list methods, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.	**12**
UNIT V FILES HANDLING AND EXCEPTIONS Files Handling: File types and operations (open, close, read and write), file positions; command line arguments; Exceptions : Introduction to errors and exceptions, handling exceptions, modules, packages.	**12**
Total Hours	**60**

Textbook(s)	
1	Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2	Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.
Reference(s)	
1	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2	G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.
4	Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5	Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

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

Course Outcomes		**Level**
CO1	Develop algorithmic solutions to simple computational problems.	K3
CO2	Develop and execute simple Python programs.	K3
CO3	Write simple Python programs using conditionals and loops for solving problems.	K2
CO4	Represent compound data using Python lists, tuples, dictionaries etc.	K2
CO5	Read and write data from/to files in Python programs.	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
CO3	3	3	3	2	2	-	-	-	-	-	2	-	3	-	-
CO4	2	2	-	-	2	-	-	-	-	-	1	-	3	-	-
CO5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-

3 – Strong, 2 – Medium, 1 – Low

PH24004 – PHYSICS OF MATERIALS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	45	3	40	60	100

Course Objective

- To make the students effectively understand the nature of crystalline materials.
- To impart knowledge on electrical properties of conducting materials.
- To introduce the concepts of semiconductor physics and device applications.
- To understand the importance of magnetic materials and super conductors.
- To inculcate an idea of significance of Nano devices.

UNIT I - CRYSTALLINE MATERIALS Introduction to Crystal structures - BCC, FCC and HCP - directions and planes - linear and planar densities - crystal imperfections - edge and screw dislocations - grain and twin boundaries - Burgers vector and elastic strain energy - Slip systems, plastic deformation of materials.	**9**
UNIT II - CONDUCTING AND MAGNETIC MATERIALS Classical free electron theory - Expression for electrical conductivity and thermal conductivity- Wiedemann -franz law - Quantum free electron theory: degenerate states - Density of energy states -Energy bands in solids(Qualitative) Magnetic materials: Dia, para and ferromagnetic effects – paramagnetism in the conduction electrons in metals – exchange interaction and ferromagnetism – quantum interference devices – GMR devices.	**9**
UNIT III - SEMICONDUCTING MATERIALS AND DEVICES Classification of semiconductor -Intrinsic semiconductor -Carrier concentration in an intrinsic semiconductor - Extrinsic semiconductors - Carrier concentration in n-type and p-type semiconductors - Carrier transport in Semiconductors: Drift, mobility and diffusion - Hall effect and Devices.	**9**
UNIT IV - OPTICAL PROPERTIES OF MATERIALS Classification of optical materials – Optical processes in semiconductors: optical absorption and emission, charge injection and recombination, optical absorption– Optoelectronic devices: light detectors and solar cells – light emitting diode - optical processes in organic semiconductor devices - OLED.	**9**
UNIT V - NANO MATERIALS Quantum confinement – Quantum structures – quantum wells, wires and dots – Zener-Bloch oscillations – Resonant tunneling – quantum interference effects – Semiconductor photonic structures – 1D, 2D and 3D photonic crystal. Active and passive optoelectronic devices – photo processes – carbon nano tubes: Properties and applications.	**9**
Total Hours	**45**

Textbook(s)

1	Raghavan, V "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.

Reference(s)

1	James F. Shackelford, "Introduction to Materials Science for Engineers", 8th edition, 8th edition, Pearson, 2015.

2	Donald R Askeland, Wedelin J Wright, “Essentials of Materials Science and Engineering”, Cengage Learning India Private Ltd., 2018.
3	Balasubramaniam, R. “Callister's Materials Science and Engineering”. Wiley India Pvt. Ltd., 2014

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

Course Outcome		Level
CO1	Express their knowledge in understanding crystalline structures	K1
CO2	Gain knowledge on classical and quantum electron theories and energy band structures	K2
CO3	Acquire knowledge on basics of semiconductor physics and its applications	K2
CO4	Gain knowledge about magnetic materials and super conductors	K2
CO5	Demonstrate a strong foundational knowledge in understanding nano materials.	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**2**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**1**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**2**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**2**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	**3**	**2**	**2**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

3 – Strong, 2 – Medium, 1 – Low

TA24002 – TAMILS AND TECHNOLOGY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	1	0	0	15	1	40	60	100

Course Objective

- Explore the historical development of technology in the Tamil region
- Examine how traditional Tamil practices and knowledge systems have influenced technological advancements
- Promote inclusivity and diversity in the technology sector, encouraging the participation of Tamils in various technological fields
- Provide a global perspective on Tamil contributions to technology and the role of Tamils in the global technology landscape
- Explore the role of the Tamil language in technology, including the development of software, language processing, and digital content in Tamil.

UNIT I - WEAVING AND CERAMIC TECHNOLOGY Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	**3**
UNIT II - DESIGN AND CONSTRUCTION TECHNOLOGY Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.	**3**
UNIT III - MANUFACTURING TECHNOLOGY Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -	**3**

Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.	
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	**3**
UNIT V - SCIENTIFIC TAMIL & TAMIL COMPUTING Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	**3**
Total Hours	**15**

Textbook(s)	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
Reference(s)	
1	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.
2	Studies in the History of India with special reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
3	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

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

Course Outcome		**Level**
CO1	Understand the extensive literature of Tamil and its classical nature.	K1
CO2	Understand the heritage of sculpture, painting and musical instruments of ancient people.	K2
CO3	Review on folk and martial arts of Tamil people.	K2
CO4	Realization of Thinai concepts, trade and victory of chozha dynasty.	K2
CO5	Understand the contribution of Tamils in Indian freedom struggle, self-esteem movement and siddha medicine.	K2

Mapping with Program Outcomes

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

TA24002 – தமிழரும் தொழில்நுட்பமும்								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	1	0	0	15	1	40	60	100

Course Objective

- தமிழ் பிராந்தியத்தில் தொழில்நுட்பத்தின் வரலாற்று வளர்ச்சியை ஆராய்ச்சி செய்யுங்கள்.
- பாரம்பரிய தமிழ் நடைமுறைகளும் அறிவு அமைப்புகளும் தொழில்நுட்ப முன்னேற்றங்களை எவ்வாறு பாதித்துள்ளன என்பதை ஆராயுங்கள்
- பல்வேறு தொழில்நுட்பத் துறைகளில் தமிழர்களின் பங்கேற்பை ஊக்குவித்தல், தொழில்நுட்பத் துறையில் உள்ளடக்கம் மற்றும் பன்முகத்தன்மையை ஊக்குவித்தல்.
- தொழில்நுட்பத்திற்கான தமிழ் பங்களிப்புகள் மற்றும் உலகளாவிய தொழில்நுட்ப நிலப்பரப்பில் தமிழர்களின் பங்கு பற்றிய உலகளாவிய கண்ணோட்டத்தை வழங்கவும்.
- மென்பொருளின் வளர்ச்சி, மொழி செயலாக்கம், தமிழில் டிஜிட்டல் உள்ளடக்கம் உள்ளிட்ட தொழில்நுட்பத்தில் தமிழ் மொழியின் பங்கை ஆராயுங்கள்.

அலகு I - நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் பானைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.	**3**
அலகு II - வடிவமைப்பு மற்றும் சுட்டிடத் தொழில்நுட்பம் சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு. சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் -மாமல்லபுரச் சிற்பங்களும், கோவில்களும் சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.	**3**
அலகு III - உற்பத்தித் தொழில் நுட்பம் கப்பல் கட்டும் கலை உலோகவியல் - இரும்புத் தொழிற்சாலை இரும்பை உருக்குதல், எஃகு வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் நாணயங்கள் அச்சடித்தல் மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் சங்கு மணிகள் எலும்புத்துண்டுகள் தொல்லியல் சான்றுகள் சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.	**3**
அலகு IV - வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம் அணை, ஏரி குளங்கள், மதகு சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் கால்நடை பராமரிப்பு கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் கடல்சார் அறிவு - மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார சமூகம்.	**3**
அலகு V - அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் -	**3**

சொற்குவைத் திட்டம்.		
	Total Hours	**15**
Textbook(s)		
1	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).	
2	கணினித் தமிழ் - முனைவர் இல சுந்தரம். (விகடன் பிரசுரம்).	
Reference(s)		
1	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.	
2	Studies in the History of India with special reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)	
3	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)	

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

	Course Outcome	**Level**
CO1	தமிழின் விரிவான இலக்கியங்களையும் அதன் செம்மொழித் தன்மையையும் புரிந்து கொள்ளுங்கள்.	K1
CO2	பழங்கால மக்களின் சிற்ப ஓவியம் மற்றும் இசைக்கருவிகளின் பாரம்பரியத்தைப் புரிந்து கொள்ளுங்கள்	K2
CO3	தமிழ் மக்களின் நாட்டுப்புற மற்றும் தற்காப்பு கலைகள் பற்றிய ஆய்வு.	K2
CO4	திணை கருத்துக்கள், வர்த்தகம் மற்றும் சோழ வம்சத்தின் வெற்றி.	K2
CO5	இந்திய சுதந்திரப் போராட்டத்திலும், சுயமரியாதை இயக்கத்திலும், சித்த மருத்துவத்திலும் தமிழர்களின் பங்களிப்பைப் புரிந்து கொள்ளுங்கள்	K2

Mapping with Program Outcomes

Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO2	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO3	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO4	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
CO5	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

MN24002 – ENVIRONMENTAL SCIENCE AND SUSTAINABILITY								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	3	0	0	30	0	40	60	100

Course Objective

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.

UNIT I - ENVIRONMENT AND BIODIVERSITY Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow – ecological succession. Biodiversity - Types of biodiversity: genetic, species and ecosystem biodiversity – Values of biodiversity, India as a megadive/rsity nation – hot-spots of biodiversity – Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and Endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation.	**6**
UNIT II - ENVIRONMENTAL POLLUTION Causes, Effects and Preventive measures of Air pollution, Water pollution, Soil pollution and Noise pollution. Solid, Hazardous and E-Waste management. Environmental protection, Environmental protection acts.	**6**
UNIT III - RENEWABLE SOURCES OF ENERGY Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.	**6**
UNIT IV - SUSTAINABILITY AND MANAGEMENT Development, GDP, Sustainability - concept, needs and challenges - economic, social and aspects of sustainability - from unsustainability to sustainability - millennium development goals, and protocols - Sustainable Development Goals - targets, indicators and intervention areas Climate change - Global, Regional and Local environmental issues and possible solutions - case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry - A case study.	**6**
UNIT V - SUSTAINABILITY PRACTICES Zero waste and R concept, Circular economy, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles - carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization - Socio-economical and technological change.	**6**
Total Hours	**30**

Textbook(s)

1	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition,New Age International Publishers, 2018.

2	Benny Joseph, "Environmental Science and Engineering", Tata McGraw Hill, New Delhi, 2016.
Reference(s)	
1	R. K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media. 38. Edition, 2010.
2	Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3	Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt. Ltd, New Delhi, 2007.
4	Rajagopalan, R, "Environmental Studies - From Crisis to Cure", Oxford University Press, 3rd Edition, 2015.
5	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

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

Course Outcome		Level
CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.	K1
CO2	To identify the causes, effects of environmental pollution and natural disasters and contributeto the preventive measures in the society.	K1
CO3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	K3
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K2
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energycycles and the role of sustainable urbanization	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	**1**	**-**	**-**	**-**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	**3**	**2**	**-**	**-**	**-**	**3**	**3**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO3	**3**	**-**	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO4	**3**	**2**	**1**	**1**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO5	**3**	**2**	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**
3 – Strong, 2 – Medium, 1 – Low															

CE24001– COMPUTER AIDED BUILDING DRAWING LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	0	0	4	60	2	60	40	100

Course Objective

- To introduce the students to draft the plan, elevation and sectional views of buildings in accordance with development and control rules satisfying orientation and functional requirements as per National Building Code.

LIST OF EXPERIMENTS:

1. Principles of planning, orientation and complete joinery details (Paneled and Glazed Doors and Windows)
2. Buildings with load bearing walls

	3. Buildings with sloping roof.	
	4. R.C.C. framed structures	
	5. Industrial buildings–North light roof structures	
	6. Pre Engineered Structures	
	7. Building Information Modeling	
	Total Hours	**60**

Reference(s)

1	Shah.M.G., Kale.C.M. and Patki.S.Y., "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Publishers Limited, 2004.
2	Verma.B.P "Civil Engineering Drawing and House Planning", Khanna Publishers,1989.

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

	Course Outcome	Level
CO1	Gain a broad understanding of planning and designing of buildings.	K1
CO2	Prepare, read and interpret the drawing in a professional set up.	K1
CO3	Know the procedures of submission of drawing	K1
CO4	Develop working and submission drawing for building.	K2
CO5	Plan and design a residential or public building as per the given requirements.	K3

Mapping with Program Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**-**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO2	**3**	**-**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO3	**3**	**-**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO4	**3**	**-**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**
CO5	**3**	**-**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

3 – Strong, 2 – Medium, 1 – Low

CS24002 – PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
I	0	0	4	60	2	60	40	100

Course Objectives

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

LIST OF EXPERIMENTS:

1. a. Write a program for checking the given number is even or odd.
   b. Write a program for displaying reversal of a number.
2. a. Write a program for finding biggest number among 3 numbers.
   b. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
3. a. Implement python script to check the given year is leap year or not.

b. Implement Python Script to generate first N natural numbers.	
4. a. Implement Python Script to generate first N natural numbers. b. Implement Python Script to check given number is palindrome or not.	
5. a. Implement Python script to print factorial of a number. b. Implement Python Script to print sum of N natural numbers.	
6. a. Implement Python Script to check given number is Armstrong or not. b. Implement Python Script to generate prime numbers series up to n	
7. Finding the minimum and maximum elements in the lists	
8. Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.	
9. Implement a python script for factorial of number by using recursion	
10. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).	
11. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)	
12. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)	
Total Hours	**60**

Reference(s)

1	Paul Deitel, 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", 3rd Edition, MIT Press, 2021.

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

Course Outcomes		Level
CO1	Develop algorithmic solutions to simple computational problems.	K2
CO2	Develop and execute simple Python programs.	K2
CO3	Write simple Python programs using conditionals and loops for solving problems.	K3
CO4	Decompose a Python program into functions.	K3
CO5	Represent compound data using Python lists, tuples, dictionaries etc.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**3**	**-**
CO2	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**-**	**-**
CO3	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**	**-**	**-**
CO4	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**3**	**-**	**-**
CO5	**1**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**-**	**-**
3 – Strong, 2 – Medium, 1 - Low															

SEMESTER-III

MA24304– ENGINEERING MATHEMATICS - III								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	1	0	60	4	60	40	100

Course Objective: The students will be able to

- Enhance analytical thinking and logical reasoning for solving engineering related mathematical problems.

UNIT I FOURIER SERIES Periodic functions-Dirchlet's Conditions-General Fourier Series-Odd and even functions-Half range sine series-Half range cosine series- Complex form of Fourier series-Parseval's Identity-Harmonic analysis.	**12**
UNIT II FOURIER TRANSFORMS Statement of Fourier integral theorem-Fourier transform pair- Fourier sine and cosine transforms-Properties-Transforms of simple functions-Convolution theorem-Parseval's Identity in mechanical engineering applications.	**12**
UNIT III - LAPLACE AND INVERSE LAPLACE TRANSFORM Laplace transform-Sufficient conditions for existence-Transform of elementary functions-Basic Properties-Transform of derivatives and integral functions-Derivatives and integrals of transforms-Transforms of unit step function and impulse functions-Transform of periodic functions. Inverse Laplace Transform-Statement of convolution theorem-Initial and final value theorems-Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	**12**
UNIT IV - NUMERICAL METHODS – I Roots of algebraic and transcendental equations. Fixed point iteration method, Newton-Raphson method for multiple roots. Solution to system of linear equations – LU decomposition method, partition method.	**12**
UNIT V - NUMERICAL METHODS – II Numerical solutions to partial differential equations – Finite difference approximation to derivatives, solution of Laplace equation in two dimension, heat and wave equations in one dimension (explicit methods).	**12**
Total Hours	**60**

Textbook(s)

1	Higher Engineering Mathematics, B.S. Grewal, 44th Edition, 2015, Khanna Publishers, ISBN: 81-7409-195-5.
2	Higher Engineering Mathematics, B.V. Ramana, 11th Edition, 2010, Tata McGraw-Hill, ISBN: 13-978-07-063419-0; ISBN: 10-0-07-063419-X.

Reference(s)

1	Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, 2007, John Wiley & Sons, ISBN: 978-81-265-3135-6.
2	Numerical methods for scientific and engineering computation, M.K. Jain, S.R.K. Iyenger and R.K. Jain, 6th Edition, 2012, New Age International Publishers, ISBN: 9788122433234, 8122433235.

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

Course Outcomes		Level
CO1	Understand the fundamental concepts of variation of functionals, periodic phenomena,Laplace and inverse Laplace transforms and numerical techniques.	K2
CO2	Solve the problems on extremal of functional, Fourier series, Laplace and inverse Laplace transforms and basics of numerical methods.	K3
CO3	Apply the acquired knowledge to solve variational problems, half range series, differential equations using Laplace transform, system of linear equations and PDEs using finite difference technique.	K4
CO4	Analyze and interpret applications of functionals, complex Fourier series, IVP and BVP using LT, sparse linear systems and PDEs occurring in Engineering problems.	K4
CO5	Analyze and interpret laplace equation, exploring solutions of PDE using MATLAB	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO3	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**
CO4	**-**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**
CO5	**-**	**1**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
3 – Strong, 2 – Medium, 1 - Low													

CE24301– ENGINEERING MECHANICS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	1	0	45	4	40	60	100

Course Objective

- To provide a clear understanding of the basic concepts of principles of mechanics, analyze forces, apply momentum principles to solve practical problems in civil engineering structures and mechanical systems.

UNIT I - STATICS OF PARTICLES Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular	**9**

Components of a Force, Unit Vectors, Equilibrium of a Particle, Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.	
UNIT II - EQUILIBRIUM OF RIGID BODIES Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, 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, Equilibrium in Two and Three Dimensions, Reactions at Supports and Connections.	**9**
UNIT III - DISTRIBUTED FORCES Centroids of lines and areas - symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus- Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Moments of Inertia of Areas and Mass, Polar Moment of Inertia, Radius of Gyration, Parallel-Axis Theorem, Moments of Inertia of Composite Areas.	**9**
UNIT IV - FRICTION The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge Friction, Wheel Friction, Rolling Resistance, Ladder Friction.	**9**
UNIT V - DYNAMICS OF PARTICLES Kinematics - Rectilinear Motion and Curvilinear Motion of Particles, Kinetics - Equations of Motion, 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.	**9**
Total Hours	**45**

Textbook(s)

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, 11th Edition, 2017.
2	Vela Murali, Engineering Mechanics, Oxford University Press, 2nd Edition, 2015.

Reference(s)

1	Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1st Edition, Cengage Learning, 2008.
2	Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th Edition, Prentice Hall, 2013.
3	Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics Statics and Dynamics, 4th Edition, Pearson Education Asia Pvt. Ltd., 2005.

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

Course Outcomes		Level
CO1	Illustrate the vectorial and scalar representation of forces and moments	K2
CO2	Analyze the rigid body in equilibrium	K3
CO3	Evaluate the properties of distributed forces	K3
CO4	Determine the friction and the effects by the laws of friction	K3
CO5	Calculate dynamic forces exerted in rigid body	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**
CO2	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**
CO3	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**3**	**3**	**3**
3 – Strong, 2 – Medium, 1 - Low													

CE24302– FLUID MECHANICS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	60	40	100

Course Objective

- To understand and apply the principles of fluid statics, kinematics and dynamics of fluid flow and model studies for solving complex problems.

UNIT I - FLUIDS PROPERTIES AND FLUID STATICS Scope of fluid mechanics-Definitions of a fluid-Methods of analysis– Continuum hypothesis - System and Control volume approach–Fluid properties-Fluid statics–Manometry-Forces on plane and curved surfaces Buoyancy and floatation- Stability of floating bodies.	**9**
UNIT II - BASIC CONCEPTS OF FLUID FLOW (a) Kinematics-Classification of flows-Stream line, streak-line and path-linesStream function and velocity potentials- Flow nets; (b) Dynamics - Application of control volume to continuity, energy and momentum -Euler's equation of motion along a stream line - Bernoulli's equation - Applications to velocity and discharge measurements-Linear momentum equation–Application to Pipe bends-Moment-of-momentum equation.	**9**
UNIT III - DIMENSIONAL ANALYSIS AND MODEL STUDIES Fundamental dimensions-Dimensional homogeneity-Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters-Similitude and model studies-Distorted and undistorted models.	**9**

UNIT IV - INCOMPRESSIBLE VISCOUS FLOW Reynolds experiment-Laminar flow in pipes and between parallel plates - Development of laminar and turbulent flows in pipes-Darcy-Weisbach equation-Moody diagram-Major and minor losses of flowinpipes- Pipes in series and parallel–Equivalent pipes.	**9**
UNIT V - BOUNDARY LAYERS Definition of boundary layers-Laminar and turbulent boundary layersDisplacement, momentum and energy thickness- Momentum integral equation- Applications.	**9**
Total Hours	**45**

Textbook(s)

1	Streeter, V.L.Wylie, E.B. and Bedford K. W, "Fluid Mechanics", Tata Mc GrawHill, New Delhi, 9th Edition, 1998.
2	Modi P.N and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 2003.

Reference(s)

1	Engineering Materials 1, An Introduction to Properties, Applications and Design , D.R.H. Jones , Michael F. Ashby , Butterworth-Heinemann, 5th Edition, 2018, ISBN-10: 0081020511
2	Engineering and General Geology ,Parbin Singh, Edition 2013, S.K. Kataria& Sons, ISBN 10: 9350142678
3	Engineering Materials , Rangawala, 43rd Edition,2007, Publisher: Charotar Publishing House Pvt. Ltd, ISBN-10: 9385039172
4	Basic Civil Engineering, SateesgGopi , 2009, Pearson publication, ISBN 9788131729885

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

Course Outcomes		Level
CO1	Demonstrate the difference between solid and fluid, its properties and behaviour in static conditions.	K2
CO2	Apply the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.	K3
CO3	Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performance of prototypes by model studies.	K3
CO4	Estimate the losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.	K3
CO5	Explain the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.	K4

Mapping with Program Outcomes

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

CO4	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**3**	**3**	**3**
3 – Strong, 2 – Medium, 1 - Low													

CE24303– CONSTRUCTION MATERIALS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	60	40	100

Course Objective

- To understand the characteristics, uses and performance of various construction materials.

UNIT I –STONES AND BRICKS Engineering Rock Classification, Physical properties of minerals, major rock forming minerals, occurrence and use of minerals. Bricks – Introduction, raw materials and manufacturing process, types, properties of bricks, tests on bricks, IS Specifications.	**9**
UNIT II –TIMBER AND GLASS Classification of timber, qualities of good timber, common timbers used for building work, Types of plywood, Ply board, properties and applications. Bamboo as building material. Types of glass and its engineering properties for use in construction.	**9**
UNIT III–METALS IN CONSTRUCTION Types and properties of Iron and Steel – Manufacturing process of steel – Advantages of new alloy steels – Properties and advantages of aluminium and application. HYSD and TMT bars. Clay products, ceramics –Refractories Fibre Textiles – Geosynthetics for Civil Engineering applications, Polymers in Civil Engineering.	**9**
UNIT IV–FIBRES AND CONSTRUCTION DEMOLITION WASTE Carbon fibres, CFRP, Polyfibres, Pre-Preg Carbon fibres, reinforced polymers and polyesters Waste disposal, categories of waste, properties of C&D waste, waste utilization criteria, Recyclable and non-recyclable C&D waste, BIS codal provisions	**9**
UNIT V –SMART CONSTRUCTION MATERIALS Introduction, Shape memory alloys, Magnetostrictive Materials, Piezoelectric materials, Electro rheological and electrochromic materials- applications in civil engineering.	**9**
Total Hours	**45**

Reference(s)

1	Engineering Materials 1, An Introduction to Properties, Applications and Design , D.R.H. Jones , Michael F. Ashby , Butterworth-Heinemann, 5th Edition, 2018, ISBN-10: 0081020511
2	Engineering and General Geology ,Parbin Singh, Edition 2013, S.K. Kataria& Sons, ISBN 10: 9350142678
3	Engineering Materials , Rangawala, 43rd Edition,2007, Publisher: Charotar Publishing House Pvt.

	Ltd, ISBN-10: 9385039172
4	Basic Civil Engineering, SateesgGopi , 2009, Pearson publication, ISBN 9788131729885

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

Course Outcomes		Level
CO1	Explain the properties of engineering materials	K2
CO2	Examine the behaviour of various wooden and timber materials in construction industry	K3
CO3	Examine the behaviour of various metals and their properties in construction industry	K3
CO4	Select suitable various types of engineering materials to be used in construction industry and utilization of construction and demolition waste	K3
CO5	Illustrate the properties of Smart engineering materials and fibres in civil engineering	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**1**
CO2	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**-**
CO3	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**-**
CO4	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**-**
CO5	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**	**1**	**1**
3 – Strong, 2 – Medium, 1 - Low													

CE24304– TRANSPORTATION ENGINEERING

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	60	40	100

Course Objective

- To learn about various transportation systems and to gain knowledge about their characteristics, components and design.

UNIT I –HIGHWAY NETWORK PLANNING AND ALIGNMENT Transportation and Society, Transportation Modes, Road Classification and Patterns, Road Development plans, Highway Alignment Requirements, factors controlling alignment, Engineering Surveys, Detailed Project Report.	**9**
UNIT II: HIGHWAY GEOMETRIC DESIGN Highway Cross Section Elements, Sight Distance characteristics of highways, Numerical Problems, Design of Horizontal Alignment- Super elevation and transition curves, Numerical Problems, Extra widening, Numerical Problems, Extra widening, Numerical Problems, Design of Vertical Alignment Grades and Grade Compensation, Numerical Problems, Types of	**9**

vertical curves and design. Numerical Problems.	
UNIT III: RAILWAY ENGINEERING Location surveys and alignment - Permanent way - Gauges - Components - Functions and requirements - Geometric design Track Junctions-Points and crossings - types and functions - design and layout - simple problems - Railway stations and yards. Signaling and interlocking - control systems of train movements.	**9**
UNIT IV: DOCKS AND HARBOURS Types - Layout and planning principles- breakwaters - docks- wharves and quays - Transit sheds- warehouses- navigation aids.	**9**
UNIT V - AIRPORT ENGINEERING Aircraft characteristics - Airport obstructions and zoning - Runway - taxiways and aprons- Terminal area planning	**9**
Total Hours	**45**

Reference(s)

1	S. K. Khanna., C. E. G. Justo and A. Veeraragavan, Highway Engineering- Nem Chand Bros, India.
2	M.M. Agarwal, Railway Engineering, Prabha& Co. 2018.
3	Oza and Oza, Elements of Dock and Harbour Engineering, Charotar Publishing House, 1996.

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

Course Outcomes		Level
CO1	Acquire knowledge on development, classification, planning, alignment and engineering surveys of highways & related infrastructures.	K2
CO2	Understand the concept of cross sectional elements & sight distances and design horizontal alignment of highways.	K3
CO3	Plan the layout of different types of terminals	K3
CO4	Plan the layout of docks and harbour.	K3
CO5	Plan and design runway for airports.	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**2**	**2**	**2**
CO2	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**
CO3	**3**	**1**	**-**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**
CO4	**2**	**1**	**-**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**
CO5	**3**	**2**	**-**	**1**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**
3 – Strong, 2 – Medium, 1 - Low													

CE24321– SURVEYING AND ITS PRACTICES

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	2	60	4	60	40	100

Course Objective

- To introduce the fundamental concepts, objectives and classification of surveying and to develop practical skills in performing field surveys.

UNIT I –INTRODUCTION Fundamentals of Maps: Maps - types; scales-types; measuring distance; finding direction and use of symbols. Map projection - Latitude, Longitude and time, Topographical survey – Toposheets and Principles of topo sheet numbering, Analysis of landforms using maps. History of Surveying: Definition of Surveying, Uses of Surveying, Basic principles of surveying, Classification of Surveys. Introduction to Chain surveying, Compass surveying, Plane table surveying and Theodolite surveying. Booking of chain survey work - Field book entries.	**6**
UNIT II –LEVELLING Leveling: Principles and basic definitions, Fundamental axes and parts of a dumpy level, types of adjustments and objectives, temporary adjustments of a dumpy level, Types of leveling – Simple leveling, Profile leveling, fly leveling and cross sectioning. Booking of levels 1. Rise and fall method 2. Height of instrument method – comparison, Arithmetic checks. Numerical problems.	**6**
UNIT III –THEODOLITE AND TACHEOMETRIC SURVEYING Horizontal and vertical angle measurements- Temporary and permanent adjustments-Heights and distances-Tacheometer-Stadua constants-Analytic lens-Tangential and stadia Tacheometry surveying	**6**
UNIT IV - TOTAL STATION Introduction - Parts of a Total Station – Accessories – Advantages - Limitations and Applications, Field procedure for total station survey, data transfer, preparation of maps. Contour surveying using Total station.	**6**
UNIT V - INTRODUCTION TO MODERN SURVEYING GPS, DGPS, Drone surveying and LiDAR.	**6**
PRACTICAL EXPERIMENTS 1. To measure distance between two points using direct ranging and setting out perpendiculars. 2. Marking central line of a building using grid plan using chain and its accessories 3. To determine difference in elevation between two points using differential levelling technique, using height of the instrument method and rise and fall methods. 4. To perform profile levelling and to draw the longitudinal section and cross section to	**30**

determine the depth of cut and height of filling for a given formation level. 5. To determine the elevation, Distance and gradient between two inaccessible points using Theodolite. 6. To determine the elevation, Distance and gradient between two inaccessible points using total station. 7. Traversing using total station 8. To set out simple curves using linear methods-perpendicular offsets from long chord and offsets from chord produced methods. 9. To set out simple curve using Rankine's deflection angles method. 10. To set out compound curve by angular method.	
Total Hours	**60**

Textbook(s)

1	Surveying Vol.I and Vol.II, Punmia B.C, 16th Edition, 2016, Laxmi Publications, (P) Ltd, New Delhi ISBN-10: 9788170088530 ISBN-10: 8170088836

Reference(s)

1	Plane surveying, Chandra A.M, 2nd Edition, 2015, Newage International (P) Ltd., ISBN 10: 8122438806
2	Fundamentals of Remote Sensing, George Joseph, 3rd Edition, 2018, Universities press, ISBN 10: 9386235463, ISBN-13: 978-9386235466.
3	Surveying Vol.I& II,, Duggal S.K, 8th Edition, 2017, Tata Mc Graw Hill Publishing Co., ISBN 10: 9781259028991 ISBN-10: 978125902899
4	Surveying, Vol.I& II, Arora K.R, 2016, Standard Book House, ISBN-10: 8189401246 ISBN 10: 8189401238

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

Course Outcomes		Level
CO1	Describe fundamental concepts of Surveying, Levelling, Total station and application of remote sensing and GIS.	K2
CO2	Discuss components of all types of surveying.	K3
CO3	Apply the concepts of measurements in engineering problems.	K4
CO4	Demonstrate the field procedure using Total station	K5
CO5	Demonstrate the applications of remote sensing and GIS for solving engineering problems	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**2**
CO2	**2**	**2**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**

CO3	**2**	**2**	**1**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**1**
CO4	**1**	**2**	**1**	**-**	**3**	**1**	**1**	**-**	**-**	**-**	**1**	**2**	**1**
CO5	**1**	**2**	**1**	**-**	**3**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**1**
3 – Strong, 2 – Medium, 1 - Low													

CE24311– MATERIAL TESTING LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	4	45	2	60	40	100

Course Objective

- To learn the principles and procedures of testing of materials used in the construction of highways.

I TEST ON AGGREGATES 1. Specific gravity determination of the coarse aggregate sample 2. Determination of abrasion value of the coarse aggregate sample. 3. Determination of water absorption capacity of the coarse aggregate sample.	
II TEST ON BITUMEN 4. Specific gravity determination of the bitumen/asphalt sample. 5. Determination of consistency of the bituminous material. 6. Viscosity determination of bituminous binder. 7. Determination of softening point of the asphalt/bitumen sample 8. Determination of ductility value of the bitumen sample 9. Estimation of loss of bitumen on heating 10. Determination of optimum binder content by Marshall method	
Total Hours	**45**

Reference(s)

1	Highway Materials and Pavement Testing, Nem Chand and Bros.,Roorkee, Revised Fifth Edition, 2009
2	N.L.Arora,A Textbook of Transportation Engineering, New India Publication,1997

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

Course Outcomes		Level
CO1	Characterize Pavement Aggregate through relevant test.	K2
CO2	Ascertain the Quality of Bitumen.	K3
CO3	Determine the Optimum Binder Content Using Marshall Method.	K5
CO4	Evaluate the Consistency and Properties of Bitumen.	K5
CO5	Determine the Bitumen Content in the Bituminous Mixes	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	3	2	1	1	1	1	3	3	3	3	3
CO2	3	1	3	2	1	1	1	1	3	3	3	3	3
CO3	3	1	3	2	1	1	1	1	3	3	3	3	3
CO4	3	1	3	2	1	1	1	1	3	3	3	3	3
CO5	3	1	3	2	1	1	1	1	3	3	3	3	3
3 – Strong, 2 – Medium, 1 - Low													

CE24312– FLUID MECHANICS LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	4	45	2	60	40	100

Course Objective

- The experimental work involved in this laboratory shall make the student understand the basic concepts of fluid mechanics, mainly flow through pipes

LIST OF EXPERIMENTS	
1. Determination of co-efficient of discharge for orificemeter	
2. Determination of co-efficient of discharge for rotometer	
3. Determination of co-efficient of discharge for venturimeter	
4. Study of friction losses and minor losses in pipes	
5. Determination of the performance characteristics of centrifugal pump.	
6. Determination of the performance characteristics of reciprocating pump.	
7. Determination of the performance test on gear pump.	
8. Determination of the performance test on pelton wheel	
9. Determination of the performance characteristics of turbines.	
Total Hours	**45**

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

Course Outcomes		Level
CO1	Apply Bernoulli equation for calibration of flow measuring devices.	CO1
CO2	Measure friction factor in pipes and compare with Moody diagram	CO2
CO3	Determine the performance characteristics of rotodynamic pumps.	CO3
CO4	Determine the performance characteristics of positive displacement pumps.	CO4
CO5	Determine the performance characteristics of turbines.	CO5

Mapping with Program Outcomes

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

CO5	**3**	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**3**	**3**
3 – Strong, 2 – Medium, 1 - Low													

SEMESTER-IV

CE24401– STRENGTH OF MATERIALS								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	1	0	45	4	60	40	100

Course Objective: The students will be able to

- To learn the fundamental concepts of Stress, Strain and deformation of solids, to know the mechanism of load transfer in beams, the induced stress resultants and deformations ,to understand the effect of torsion on shafts and springs and to analyze columns and struts.

UNIT I –STRESS, STRAIN AND DEFORMATION OF SOLIDS Simple Stresses and strains – Elastic constants - Relationship between elastic constants – Stress Strain Diagram – Ultimate Stress – Yield Stress – Deformation of axially loaded member - Composite Bars - Thermal Stresses – State of Stress in two dimensions – Stresses on inclined planes – Principal Stresses and Principal Planes – Maximum shear stress - Mohr's circle method.	**9**
UNIT II –SHEAR FORCE AND BENDING MOMENT IN BEAMS Types of beams – Types of supports and loads- Bending moment and Shear force – Sign conventions - Point of contra flexure-Shear force and bending moment diagrams for concentrated load, uniformly distributed load, uniformly varying load and Couples.	**9**
UNIT III –BENDING STRESS AND SHEAR STRESS IN BEAMS Introduction, Assumptions in simple bending theory, Derivation of Bernoulli's equation, modulus of rupture, section modulus, flexural rigidity, expression for horizontal shear stress in beam, variation of bending stress and shear stress diagram for cross sections-rectangular, T and I sections - Numerical problems.	**9**
UNIT IV –DEFLECTION OF BEAM AND TORSION Deflection of Beams –Double integration method - Macaulay's methods – Moment area method - conjugate beam method for computation of slopes and deflections of determinant beams. Simple torsion – Torsional loads – Torsion equation for circular shafts and hollow circular shafts – Assumptions -Torsional rigidity - closed and open coiled helical springs- leaf springs – springs in series and parallel.	**9**
UNIT V –ANALYSIS OF COLUMNS AND STRUTS Introduction, short and long columns, radius of gyration, slenderness ratio, buckling load, effective length, Euler's theory of columns, Derivation of Euler's Buckling load for columns with different end conditions, Limitations of Euler's theory, Rankine's formula. Numerical problems on solid and hollow column section. Eccentric columns – Problems.	**9**
Total Hours	**45**

Textbook(s)

1	Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand& company Ltd., New Delhi, 2015
2	Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain,"Theory of Structures" (SMTS) Vol - II, Laxmi Publishing Pvt Ltd, New Delhi 2017.

Reference(s)	
1	Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2	William A .Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, Tata McGraw Hill Publishing company, 2007.

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

Course Outcomes		Level
CO1	Understand the concept of stress, strain and deformation of solids.	K2
CO2	Analyze beams with their supports and loading condition.	K4
CO3	Derive the bending stress and shear stress in beams.	K3
CO4	Apply various methods to determine the deflection of beams.	K5
CO5	Analyze columns based on loading condition.	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**3**	**2**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**3**	**3**
CO2	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO3	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
CO5	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
3 – Strong, 2 – Medium, 1 - Low													

CE24403– WATER SUPPLY AND WASTEWATER ENGINEERING

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	60	40	100

Course Objective

- To introduce students to various components and design of water supply scheme, water treatment methods, water storage distribution system, sewage treatment and disposal and deign of intake structures and sewerage system.

UNIT I –QUANTITY AND QUALITY OF WATER Introduction: Scope for Environmental Engineering - Need for protected water supply - Quantity of Water - Population Forecasting methods - Per capita demand - Types of water demands Characteristics of water with respect to BIS standards - Water borne diseases.	**9**
UNIT II –SOURCE, CONVEYANCE AND TREATMENT OF WATER Intakes - pipes - Design for the economical diameter of the rising main - Nomograms – Objectives of water treatment - Typical flow chart of a water treatment plant - Aeration - Sedimentation - Settling tanks -Types - Design of sedimentation tanks.	**9**

UNIT III –FILTRATION, DISINFECTION AND DISTRIBUTION Filtration Design of Rapid sand and slow sand filters - Disinfection - Distribution- Layouts of distribution system - Distribution reservoirs - Storage capacity of distribution reservoirs - Automation in Water Supply -Water Economics and Pricing.	**9**
UNIT IV –QUANTITY OF SEWAGE Types of sewerage systems suitability - Dry weather flow - Computation of design flow - Estimation of storm flow -Time of concentration - Design of storm water drain - Characteristics of sewage - Design of Sewers - Sewer Materials - Non Silting and Non Scouring Velocities. Manholes - Water seal system.	**9**
UNIT V –TREATMENT OF SEWAGE Types of Treatment - Flow diagram of a typical municipal sewage treatment plant - Primary Treatment -Screening - Grit chambers - Skimming tanks - Primary sedimentation tanks - Sludge deposit - Secondary treatment - Concepts of Aerobic and Anaerobic activity - Trickling filter - Activated sludge process - Secondary sedimentation tanks - Tertiary treatment - Sludge digestion and filter beds - Methods of sludge disposal- Sustainable treatment technologies.	**9**
Total Hours	**45**

Reference(s)

1	Garg, S.K., Environmental Engineering Vol.I, Water Supply Engineering, Khanna Publishers, New Delhi, 35th Edition, 2021.
2	Garg, S.K.,Environmental Engineering Vol.II, Sewage Disposal and Air Pollution Engineering, Khanna Publishers, New Delhi, 2021.
3	Birdie, G.S. and Birdie, J.S., Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, New Delhi, 2014.
4	Metcalf and Eddy., 2014. Waste water Engineering, Treatment, Disposal and Reuse, 3rd Edition, Tata McGraw Hill, New Delhi.

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

Course Outcomes		Level
CO1	Understand the various components of water supply scheme and design of intake structure and conveyance system for water transmission	K2
CO2	Understand on the characteristics and composition of sewage, ability to estimate sewage generation and design sewer system including sewage pumping stations	K2
CO3	Understand the process of conventional treatment and design of water and wastewater treatment system and gain knowledge of selection of treatment process and biological treatment process	K2
CO4	Ability to design and evaluate water distribution system and water supply in buildings and understand the self-purification of streams and sludge and septage disposal methods.	K3
CO5	Able to understand and design the various advanced treatment system and knowledge about the recent advances in water and wastewater treatment process	K3

	and reuse of sewage	

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	-	2	-	-	-	1	1	-	-	1	-
CO2	2	3	-	2	-	-	-	1	1	-	-	1	-
CO3	3	3	3	-	-	3	2	2	2	-	2	1	2
CO4	3	3	3	2	2	3	3	2	3	2	2	2	2
CO5	3	3	3	2	2	3	3	2	3	2	2	2	2
3 – Strong, 2 – Medium, 1 - Low													

CE24404– IOT CONCEPTS AND APPLICATIONS IN CIVIL ENGINEERING

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	3	0	0	45	3	60	40	100

Course Objective

- To teach students with basic knowledge of IoT that paves a platform to understand physical and logical design of IOT
- To introduce the technologies behind Internet of Things(IoT).
- To explain the students how to code for an IoT application using open platform.
- To analyze real-world applications of IoT in construction, structural health monitoring, smart cities, and environmental monitoring.
- To explore the use of sensors, data acquisition, and communication in civil infrastructure.

UNIT I –INTRODUCTION Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT Models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT	**9**
UNIT II -COMPONENTS IN IOT Functional Blocks of an IoT Ecosystem – Sensors, Actuators, and Smart Objects – Control Units - Communication modules (Bluetooth, Zigbee,Wifi, GPS, GSM Modules)	**9**
UNIT III - PROTOCOLS AND TECHNOLOGIES BEHIND IOT Protocols - IPv6, 6LoWPAN, MQTT, CoAP - RFID, Wireless Sensor Networks, BigData Analytics, Cloud Computing, Embedded Systems.	**9**
UNIT IV - OPEN PLATFORMS AND PROGRAMMING Introduction to construction management, Schedule optimization using ML algorithms, Resource allocation and risk management with AI, Predictive analytics for infrastructure maintenance- Case studies: AI-driven construction project management systems.	**9**
UNIT V - IOT APPLICATIONS IN CIVIL ENGINEERING INFRASTRUCTURE MONITORING AND MANAGEMENT Introduction to IoT and Civil Engineering, Smart Construction and Site Monitoring, Structural Health Monitoring (SHM), Smart Transportation Systems, Environmental Monitoring	**9**

Challenges, Trends, and Future Scope	
Total Hours	**45**

Textbook(s)	
1	Machine Learning with Python for Everyone, Mark Fenner, Pearson
2	Machine Learning, AnuradhaSrinivasaraghavan, Vincy Joseph, Wiley
Reference(s)	
1	Neural Networks, Fuzzy Logic, and Genetic Algorithms : Synthesis and Applications By S. Rajshekharan, G. A. VijayalakshmiPai, PHI
2	KishanMehrotra, Chilukuri Mohan and Sanjay Ranka, Elements of Artificial Neural Networks, Penram International
3	Tom Mitchell, Machine Learning, TMH

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

Course Outcomes		Level
CO1	Understand the concept of IoT and the communication models and various protocols for IoT.	K2
CO2	Analyze applications of IoT in real time scenario.	K4
CO3	Evaluate the effectiveness of IoT-based smart infrastructure solutions in urban planning and civil engineering projects.	K3
CO4	Apply IoT technologies for real-time data collection and decision-making in transportation and environmental monitoring systems.	K5
CO5	Identify challenges and emerging trends in implementing IoT for sustainable and intelligent civil infrastructure systems.	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**1**	**1**	**-**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
CO2	**1**	**1**	**-**	**2**	**3**	**2**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
CO3	**2**	**1**	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**2**
CO4	**3**	**1**	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**2**
CO5	**3**	**1**	**-**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**3**	**3**	**3**
3 – Strong, 2 – Medium, 1 - Low													

CE24421-DRONE TECHNOLOGY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	0	45	3	60	40	100

Course Objective

- To understand the basics of drone concepts and their applications in civil engineering
- To learn the fundamentals of design, fabrication and programming of drones
- To impart knowledge on flying and operation of drones for surveying and inspection
- To explore various applications of drones in civil engineering and construction
- To understand safety risks, regulations and guidelines for safe drone operation

UNIT I –INTRODUCTION TO DRONE TECHNOLOGY Drone Concept - Terminology - History of drone technology - Types of current generation drones based on propulsion methods - Classification of UAVs - Overview of main drone components - Technical characteristics of components - Drone technology impact on civil engineering and construction - Applications in infrastructure inspection and monitoring	**9**
UNIT II –DRONE DESIGN AND COMPONENTS FOR CIVIL APPLICATIONS Drone Configurations for civil engineering applications - Energy sources and battery technology - Level of autonomy - Flight controllers - Sensors for civil engineering applications - Cameras and imaging systems - GPS and navigation systems - Payload options for surveying and inspection - Data transmission systems - Basic principles of drone assembly	**9**
UNIT III - DRONE OPERATION AND DATA ACQUISITION Concept of operation - Flight modes - Pre-flight procedures - Operating a drone in different environments - Drone controls - Flight operations management - Weather considerations - Mission planning for surveying and mapping - Data acquisition methods - Real-time data transmission - Post-flight procedures - Maintenance requirements	**9**
UNIT IV –CIVIL ENGINEERING APPLICATIONS Topographic surveying and mapping - Building and infrastructure inspection - Construction site monitoring and progress tracking - Earthwork volume calculations - Transportation infrastructure inspection - Environmental monitoring - Disaster assessment and management - Thermal imaging for building inspection - LiDAR applications in civil engineering - BIM integration with drone data - Case studies in civil engineering applications	**9**
UNIT V -REGULATIONS, SAFETY AND FUTURE TRENDS Drone safety risks - Guidelines for safe operation - Aviation regulations and standards - Drone licensing requirements - Privacy and ethical considerations - Future trends in drone technology - Miniaturization of drones - Increasing autonomy - Use of drone swarms in construction - AI and machine learning integration - Advanced mapping technologies - Emerging applications in civil engineering	**9**
Total Hours	**45**

Textbook(s)

1	Claesson, A., Lidberg, J., & Mayer, D. (2021). "Drones in Civil Engineering: Applications, Challenges and Future Perspectives", John Wiley & Sons, Inc.
2	Greenwood, W., Lynch, J. P., &Zekkos, D. (2022). "UAV Applications in Civil Infrastructure", CRC Press.
Reference(s)	
1	Hamilton, S. (2020). "Drones for Civil Engineering and Construction: A Guide to Practical Applications", Que Publishing.
2	Cunningham, M., Jones, K., &Moshammer, R. (2021). "Civil Engineering Applications of Drone Technology: Technical Guide", Springer International Publishing.
3	Tatum, M.C. & Liu, J. (2021). "Unmanned Aircraft Systems in the Construction Industry", American Society of Civil Engineers.

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

Course Outcomes		Level
CO1	Understand various types of drone technology and their applications in civil engineering	K2
CO2	Execute suitable operating procedures for flying drones in civil engineering contexts	K3
CO3	Select appropriate sensors and payloads for specific civil engineering applications	K5
CO4	Develop drone-based solutions for civil engineering problems like surveying and inspection	K6
CO5	Process and analyze drone-acquired data for civil engineering projects	K4

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**1**	**2**	**3**	**1**	**3**	**2**	**1**	**2**	**-**	**1**	**-**	**3**	**1**
CO2	**1**	**2**	**3**	**1**	**3**	**2**	**1**	**2**	**-**	**1**	**-**	**3**	**1**
CO3	**1**	**2**	**3**	**1**	**3**	**2**	**1**	**2**	**-**	**1**	**-**	**3**	**1**
CO4	**1**	**2**	**3**	**1**	**3**	**2**	**1**	**2**	**-**	**1**	**-**	**3**	**1**
CO5	**1**	**2**	**3**	**1**	**3**	**2**	**1**	**2**	**-**	**1**	**-**	**3**	**1**
3 – Strong, 2 – Medium, 1 - Low													

CE24402– GEOTECHNICAL ENGINEERING

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	3	0	2	60	4	60	40	100

Course Objective:

- To understand the fundamental properties of soils, soil behaviour under various loading conditions and to develop skills in soil investigation and testing.

UNIT I: SOIL CLASSIFICATION AND COMPACTION Formation of soil –Soil structure – Phase relationship – Index properties – Significance – IS Classification system of soil – Compaction of soils – Theory, Laboratory and field tests – Field Compaction methods – Factors influencing compaction of soils	6
UNIT II: EFFECTIVE STRESS AND PERMEABILITY Soil water – Effective stress concepts in soils - Permeability – Hydraulic conductivity – Darcy's law – Factors influencing permeability – Determination of coefficient of permeability (Constant head and falling head methods) - Seepage – Flow nets.	6
UNIT III: SHEAR STRENGTH Shear strength of cohesive and cohesion less soils – Mohr-Coulomb failure theory of shear strength – Direct shear, Triaxial compression, UCC and Vane shear tests parameters.	6
UNIT IV: SITE INVESTIGATION AND SELECTION OF FOUNDATION Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotarydrilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed –Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation -Selection of foundation based on soil condition- Bore log report, Factors influencing the selection of foundation.	6
UNIT V FOOTINGS AND PILE FOUNDATION Types of Isolated footing, Combined footing, Mat foundation, Pile Foundation, Special foundations. Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula, Negative Skin Friction, Settlement of Pile Groups, Under Reamed Piles – Group capacity of pile by different methods.	6
PRACTICAL EXPERIMENTS: 1. Specific gravity of soil solids 2. Grain size distribution–Sieve analysis 3. Liquid limit and Plastic limit tests 4. Shrinkage limit 5. Determination of moisture–density relationship using standard proctor test 6. Sand replacement method 7.Permeability determination (constant head and falling head methods) 8. One dimensional consolidation test (Determination of co-efficient of consolidation only) 9. Direct shear test in cohesion less soil 10. Unconfined compression test in cohesive soil	**30**
Total Hours	**60**

Textbook(s)

1	Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2015
2	Gopal Ranjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International (P) Ltd, New Delhi,2006.
Reference(s)	
1	Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.
2	Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 2005.

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

Course Outcomes		Level
CO1	Understand various types of soils and its properties, formulate and solve engineering Problems	K2
CO2	Understand the basics of flow through soil medium	K2
CO3	Apply the concepts of shear strength of soils and its impact of engineering solutions to the loaded soil	K3
CO4	Demonstrate and execute a detailed site investigation to select geotechnical design parameters and type of foundation	K5
CO5	Design shallow foundations and raft foundations, its component or process as per the needs and specifications	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**2**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO2	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO3	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**2**
CO4	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**1**	**-**	**-**	**1**	**2**	**2**
CO5	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**1**	**-**	**-**	**1**	**2**	**2**
3 – Strong, 2 – Medium, 1 - Low													

CE24411- STRENGTH OF MATERIALS LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
IV	0	0	4	45	2	60	40	100

Course Objective:

- To study the mechanical properties of metals, wood, and springs through laboratory experiments.
- To analyze material behavior under various loading conditions using experimental methods.
- To validate strength of materials principles through practical laboratory work.

LIST OF EXPERIMENTS: 1) Evaluation of engineering stress and strain curve on mild steel under tension load. 2)Evaluate the hardness values of steel, copper, aluminium using Rockwellhardness testing machine 3)Evaluate the hardness values of steel, copper, aluminium using Brinell hardness testing machine 4)Torsion test on circular shaft –compute the shear stress and modulus of rigidity 5)Double shear test of mild steel rod 6)Compute the bending stress and young modulus of simply supported beam 7)Estimation of notch impact energy using Charpy Impact Testing Machines. 8)Estimation of notch impact energy using Izod Impact Testing Machines. 9)Compression test on wood. 10)Tests on springs-compression-load deformation characteristics, stiffness, shear stress, modulus of rigidity, energy	
Total Hours	**45**

Reference(s)

1	Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., VI Edition.
2	Kumar D S, "Strength of Materials (Mechanics of solids)", Kataria S K and Sons, New Delhi, III Edition.
3	Ferdinand P. Been, Russell Johnson, J.r. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing ‘co. Ltd., New Delhi, Low Price Edition, 2017.
4	Gere, James M, "Mechanics of Materials", Cengage Learning, 2018, IX Edition.

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

Course Outcomes		Level
CO1	To assess the behaviour of materials different load conditions.	K3
CO2	Estimate and interpret the effect of heat treatment on different materials	K3
CO3	Measure the deflection of beams at different load conditions.	K3

CO4	Evaluate the spring properties under compression load	K3
CO5	Characterize the microstructure of given samples	K3

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**3**	**2**	**1**	**3**	**-**	**1**	**-**	**-**	**2**	**1**	**-**	**2**	**2**
CO2	**3**	**2**	**1**	**3**	**-**	**1**	**-**	**-**	**2**	**1**	**-**	**2**	**2**
CO3	**3**	**2**	**2**	**3**	**-**	**1**	**-**	**-**	**2**	**1**	**-**	**2**	**2**
CO4	**3**	**2**	**2**	**3**	**-**	**1**	**-**	**-**	**2**	**1**	**-**	**2**	**2**
CO5	**3**	**2**	**2**	**3**	**-**	**1**	**-**	**-**	**2**	**1**	**-**	**2**	**2**
3 – Strong, 2 – Medium, 1 - Low													

CE24412– WATER SUPPLY AND WASTE WATER ENGINEERING LABORATORY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
III	0	0	4	45	2	60	40	100

Course Objective

- This subject includes the list of experiments to be conducted for characterization of water and municipal sewage. At the end of the course, the student is expected to be aware of the procedure for quantifying quality parameters for water and sewage.

LIST OF EXPERIMENTS:

ANALYSIS OF WATER SAMPLE

1. Sampling and preservation methods for water and wastewater (Demonstration only)
2. Measurement of Electrical conductivity and turbidity
3. Determination of fluoride in water by spectrophotometric method /ISE
4. Determination of iron in water (Demo)
5. Determination of Sulphate in water
6. Determination of Optimum Coagulant Dosage by Jar test apparatus
7. Determination of available Chlorine in Bleaching powder and residual chlorine in water

ANALYSIS OF WASTEWATER SAMPLE

8. Estimation of suspended, volatile and fixed solids
9. Determination of Sludge Volume Index in waste water
10. Determination of Dissolved Oxygen
11. Estimation of B.O.D.
12. Estimation of C.O.D.
13. Determination of TKN and Ammonia Nitrogen in wastewater
14. Determination of total and faecal coliform (Demonstration only)

Total Hours **45**

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

Course Outcomes		Level
CO1	Calibrate and standardize the equipment	K5
CO2	Collect proper sample for analysis	K5

CO3	To know the sample preservation methods	K5
CO4	To perform field oriented testing of water, wastewater	K5
CO5	To perform coliform analysis	K5

Mapping with Program Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	**2**	**2**	**1**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
CO2	**3**	**2**	**1**	**-**	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
CO3	**3**	**3**	**2**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
CO4	**3**	**3**	**2**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
CO5	**3**	**3**	**2**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
3 – Strong, 2 – Medium, 1 - Low													