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

DEPARTMENT OF AGRICULTURAL ENGINEERING

REGULATIONS-2024

B.Tech – AGRICULTURAL ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

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

REGULATIONS – 2024
DEPARTMENT OF (AGRICULTURAL ENGINEERING)

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	MC24001	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**

SEMESTERII

S. No	Course Code	CourseTitle	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.	AE24001	Principles and Practices of Crop Production	PC	2	0	2	4	3

4.	EE24003	Basics of Electrical & Electronics Engineering	ES	3	0	0	3	3
5.	CS24001	Problem Solving and Python Programming	ES	3	1	0	4	4
6.	TA24002	Tamils and Technology	HSM	1	0	0	1	1
7.	MC24002	Environmental Science and Sustainability	MN	3	0	0	3	0
PRACTICALS								
8.	EE24004	Basics of Electrical & Electronics Engineering Laboratory	ES	0	0	4	4	2
9.	CS24002	Problem Solving and Python Programming Laboratory	ES	0	0	4	4	2
TOTAL				**18**	**2**	**10**	**30**	**22**

SEMESTER– III

S. No	Course Code	CourseTitle	Category	L	T	P	Contact Hours	C
THEORY								
1.	MA24302	Transforms and Partial Differential Equations.	BS	3	1	0	4	4
2.	AE24301	Fluid Mechanics and Pumps	PC	3	0	0	4	3
3.	AE24302	Soil Science and Engineering	PC	3	0	0	3	3
4.	AE24303	Drone technology in Agriculture	PC	3	0	2	4	4
5.	AE24321	Surveying and Practices	PC	3	0	2	5	4
6.	AE24322	Mechatronics in Agricultural Engineering	PC	3	0	0	4	3
PRACTICALS								
7.	AE24311	Fluid Mechanics Laboratory	PC	0	0	4	4	2
8.	AE24312	Soil Science Laboratory	PC	0	0	4	4	2
TOTAL				**18**	**1**	**12**	**32**	**25**

SEMESTER–IV

S. No	Course Code	CourseTitle	Category	L	T	P	Contact Hours	C
THEORY								
1.	AE24401	Strength of Materials	PC	3	1	0	4	4
2.	AE24402	Robotics and Automation in Agriculture	PC	3	0	0	3	3
3.	AE24403	Crop Production Technology	PC	3	0	0	3	3
4.	AE24404	Environmental Instrumentation	PC	3	0	0	3	3
5.	AE24421	Unit Operations in Agricultural Processing	PC	2	0	2	4	3
6.	AE24405	Life Science for Engineers	MNC	2	0	0	2	0
PRACTICALS								
7.	AE24411	Strength of Materials Laboratory	PC	0	0	4	4	2
8.	AE24412	CAD Laboratory for Agricultural Engineering	PC	0	0	4	4	2
TOTAL				**16**	**1**	**10**	**27**	**20**

SEMESTER – I

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	**9**

Vocabulary - Abbreviations & Acronyms	
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 **Reading -** Opinion articles, Journal Reports **Writing -** Essay Writing **Grammar -** Cause and Effect expressions**,** Negations **Vocabulary -** Gerund &infinitives, Compound Noun	**9**
Total Hours	**45**

Textbook(s)

1	English for Engineers & Technologists Orient Blackswan Private Ltd., Anna University, 2020.
2	VeenaSelvam, SujathaPriyadarshini, 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 integrals.	**12**
UNIT V - MULTIPLE INTEGRALS	**12**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area as a double integral - Triple integrals.	
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:EarlyTranscendentals", 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 ManicavachagomPillai. 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	**9**

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.	
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", DhanpatRai 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, ShobhitMahajan, S. RaiChoudhury, “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 Electro spinning methods) – Applications of nanomaterials.	**9**
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, DhanpatRai Publishing Company Pvt Ltd, New Delhi, 2020.
2.	ShashiChawla "A Text Book of Engineering Chemistry" 3rd Edition, DhanpatRai 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.	ShikhaAgarwal, "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, JayadevSreedhar, "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	BasantAgarwal,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, VilluPattu, KaniyanKoothu, 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	**3**

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement Inscriptions& Manuscripts.	
Total Hours	**15**

Textbook(s)	
1	தமிழகவரலாறு - மக்களும்பண்பாடும், கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர். இலசுந்தரம் (விகடன்பிரசுரம்).
3	கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு).
4	பொருநை - ஆற்றங்கரைநாகரிகம் (தொல்லியல்துறைவெளியீடு).

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 – தமிழர்மரபு

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

- விரிவானஇலக்கியம்மற்றும்செம்மொழிதமிழ்கற்க.
- தமிழ்கலாச்சாரத்தின்நுண்கலைபாரம்பரியத்தைமதிப்பாய்வுசெய்ய.
- இந்தியசுதந்திரப்போராட்டத்தில்பங்களிப்பைஉணரவேண்டும்.
- சங்கநகரங்கள்/துறைமுகங்களில்கோயிலின்பங்கைப்புரிந்துகொள்ள, சோழர்களின்வெற்றி.
- இந்தியாவில்தமிழ்கலாச்சாரதாக்கத்தைஆய்வுசெய்ய.

அலகு I - மொழிமற்றும்இலக்கியம் இந்தியமொழிக்குடும்பங்கள் - திராவிடமொழிகள் - தமிழ்ஒருசெம்மொழிதமிழ்செவ்விலக்கியங்கள் - சங்கஇலக்கியத்தின்சமயச்சார்பற்றதன்மைதிருக்குறளில்மேலாண்மைக்கருத்துக்கள்தமிழ்க்காப்பியங்கள், தமிழகத்தில்சமணபௌத்தசமயங்களின்தாக்கம் - பக்திஇலக்கியம், ஆழ்வார்கள்மற்றும்நாயன்மார்கள்சிற்றிலக்கியங்கள்தமிழில்நவீனஇலக்கியத்தின் வளர்ச்சி.	**3**
அலகு II - மரபுபாறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை - சிற்பக்கலை நடுகல்முதல்நவீனசிற்பங்கள்வரை - ஐம்பொன்சிலைகள் - பழங்குடியினர்மற்றும்அவர்கள்தயாரிக்கும்கைவினைப்பொருட்கள், பொம்மைகள் - தேர்செய்யும்கலை - நாட்டுப்புறத்தெய்வங்கள்குமரிமுனையில்திருவள்ளுவர்சிலை .	**3**
அலகு III - நாட்டுப்புறக்கலைகள்மற்றும்வீரவிளையாட்டுகள் தெருக்கூத்துகரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து. ஒயிலாட்டம்தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்விளையாட்டுகள்.	**3**

அலகு IV - தமிழர்களின்திணைக்கோட்பாடுகள் தொல்காப்பியம்மற்றும்சங்கஇலக்கியத்தில்அகம்மற்றும்புறக்கோட்பாடுகள் - தமிழர்கள்போற்றியஅறக்கோட்பாடுசங்ககாலத்தில்தமிழகத்தில்எழுத்தறிவும், கல்வியும்.	**3**
அலகு V - **இந்தியதேசியஇயக்கம்மற்றும்இந்தியபண்பாட்டிற்குத்தமிழர்களின்பங்களிப்பு** இந்தியவிடுதலைப்போரில்தமிழர்களின்பங்குஇந்தியாவின்பிறப்பகுதிகளில்தமிழ்ப் பண்பாட்டின்தாக்கம் - சுயமரியாதைஇயக்கம், கையெழுத்துப்படிகள்.	**3**
Total Hours	**15**

Textbook(s)

1	தமிழகவரலாறு - மக்களும்பண்பாடும் - கே. கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் - முனைவர்இலசுந்தரம் (விகடன்பிரசுரம்).
3	கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு).
4	பொருநை - ஆற்றங்கரைநாகரிகம் (தொல்லியல்துறைவெளியீடு).

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

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	-	-	-

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

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

MC24001 – 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	**9**

Engineering - Environmental Control Engineering - Forestry - Wood Product Engineering - Food Engineering - Scope and Opportunities.	
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 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.	**9**
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	ReemaThareja, “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 techniques.	K4
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 common household wood work.	K1
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															

HS24002COMMUNICATIVE 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 **Reading -** Reading Newspaper Articles, Reading user manuals	**6**
Language Enhancement **Listening -** Listening to TED Talks,	**6**

Speaking - Speaking about friends/places/hobbies, Delivering Welcome Address **Reading -** Reading Biography, Reading Editorial.	
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	**9**

Language Development - Impersonal passive voice, numerical adjectives.	
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 Writing – Writing reports - accident and survey report – Memos – Notices - Circulars - Minutes of a meeting - Vocabulary Development- verbal analogies- reported speech.	**9**
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															

AE24001– PRINCIPLESANDPRACTICESOFCROPPRODUCTION

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CIAT	ESE	Total
II	2	0	2	60	3	50	50	100

Course Objective

- Tointroducethestudents toprinciplesof agriculturalandhorticulturalcropproduction
- To understandthecropselectionandestablishment procedures.
- To learn aboutthedifferent management practicesduringcropestablishmentandgrowth.
- Tointroducetheproduction practices ofagriculturaland horticulturalcrops.
- Todelineatetheroleofagriculturalengineersinrelationtovariouscropproductionpractices.

UNIT I - AGRICULTUREANDCROP PRODUCTION Introductiontoagricultureanditscropproductionsub-sectors-fieldcropproductionandhorticulture; Factors affecting crop growth and production: genetic (internal) and environmental(external) factors; Crop management through environmental modification and adaptation ofcropsto theexistingenvironmentthroughcrop culturalpractices	**6**
UNIT II - CROP SELECTIONANDESTABLISHMENT Regional and seasonal selection of crops; Systems of crop production; Competition among cropplants; Spacing and arrangement of crop plants; Field preparation for crops including systems oftillage;Establishmentofanadequatecropstandandgroundcover,includingselectionandtreatmentofseed,	**6**

andnurserygrowing.	
UNIT III - CROP MANAGEMENT Crop water Management; Crop nutrition management - need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients including fertigation scheduling; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest.	**6**
UNIT IV - PRODUCTIONPRACTICES OFAGRICULTURALCROPS Generalized management and cultivation practices for important groups of field crops in TamilNadu:cerealcrops,grainlegumes,oilseedcrops,sugarcane,andfibercrops,andspecialpurposecropssuch asthosegrownforgreen manureandfodder.	**6**
UNIT V - PRODUCTIONPRACTICES OFHORTICULTURAL CROPS Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, flowercrops; Cultivation practices of representatives of each group; Special features of production ofhorticulturalcrops-greenhousecultivation.	**6**
Practical Identification of field and horticultural crops. Seeds - estimation of seed rate, germination of seeds.Nursery, demonstration on different types in field. Fertilizers-type, estimation of recommendeddose. Weeds, identification of major weed type, demonstration on simple weeding implements.Weedicideusesandcaution.Pestidentificationandcontrol,demonstrationofIPMmethods.Harvesting methods for various field and horticultural crops and implements used. Observing indemonstration field, cultivation of wet land, dry land and garden land crops and documenting ofgrowthstage andrecordingofbiometricobservations.	**30**
Total Hours	**60**

Textbook(s)

1	RajendraPrasad,TextBookofFieldCropProduction.DirectorateofInformationandPublication,KrishiAnusandhanBhavan,Pusa,New Delhi,2015.
2	ReddyT.SankaraG.H.YellamandaReddi,PrinciplesofAgronomy,KalyaniPublishers,NewDelhi,2005.
3	HandbookofAgriculture.ICARPublications,NewDelhi,2011.

Reference(s)

1	BoseT. K.and L.P.Yadav.CommercialFlowers, NayaPrakash,Calcutta.1989.
2	CropProductionGuide,TamilNaduAgriculturalUniversityPublication, Coimbatore. 2005
3	Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices,plantationcrops,medicinalandaromaticplants.RajalakshmiPublications,Nagercoil.1993.
4	Kumar, N.,"Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 7th edition,2015
5	Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications,NewDelhi.1989.

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

	Course Outcome	Level
CO 1	Studentscompletingthiscoursewouldhaveacquiredknowledgeonthebasicprinciplesofcropproduction.	K1
CO 2	Studentswill beabletoselect suitable cropsanddecideuponitsestablishmentprocedures	K2
CO 3	Students willgetknowledgeon thedifferentcropmanagementpractices.	K2
CO 4	Studentswillhavetherequiredknowledgeintheareaofproductionofagriculturalandhorticulturalcrops.	K2
CO 5	Students will be able to delineate their role in relation to various crop production practices.	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**	**3**	**-**

CO2	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**-**	**-**
CO3	**3**	**2**	**1**	**-**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**2**	**3**	**2**	**2**
CO4	**-**	**-**	**-**	**1**	**2**	**2**	**-**	**1**	**-**	**3**	**1**	**3**	**3**	**1**	**2**
CO5	**-**	**-**	**-**	**1**	**2**	**2**	**1**	**1**	**-**	**3**	**1**	**3**	**3**	**1**	**2**
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	**9**

phase Alternator, Synchronous motor and Three Phase Induction Motor.	
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 multi vibrator.	**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 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	MahmoodNahvi 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 McGraw 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	-	-	-	2	-	-	1
CO2	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO3	2	1	1	-	-	-	-	1	-	-	-	2	-	-	1
CO4	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
CO5	2	2	1	-	-	-	-	1	-	-	-	2	-	-	1
3 – Strong, 2 – Medium, 1 – Low															

CS24001 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 MadhavanMukund, "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

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	**3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	
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)-ThirumalaiNayakarMahal - 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 - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.	**3**
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu 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 – தமிழரும்தொழில்நுட்பமும்

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

- தமிழ்பிராந்தியத்தில்தொழில்நுட்பத்தின்வரலாற்றுவளர்ச்சியைஆராய்ச்சிசெய்யுங்கள்.
- பாரம்பரியதமிழ்நடைமுறைகளும்அறிவுஅமைப்புகளும்தொழில்நுட்பமுன்னேற்றங்களைஎவ்வாறுபாதித்துள்ளனஎன்பதைஆராயுங்கள்
- பல்வேறுதொழில்நுட்பத்துறைகளில்தமிழர்களின்பங்கேற்பைஊக்குவித்தல், தொழில்நுட்பத்துறையில்உள்ளடக்கம்மற்றும்பன்முகத்தன்மையைஊக்குவித்தல்.
- தொழில்நுட்பத்திற்கானதமிழ்பங்களிப்புகள்மற்றும்உலகளாவியதொழில்நுட்பநிலப்பரப்பில்தமிழர்களின்பங்குபற்றியஉலகளாவியகண்ணோட்டத்தைவழங்கவும்.
- மென்பொருளின்வளர்ச்சி, மொழிசெயலாக்கம், தமிழில்டிஜிட்டல்உள்ளடக்கம்உள்ளிட்டதொழில்நுட்பத்தில்தமிழ்மொழியின்பங்கைஆராயுங்கள்.

அலகு I -நெசவுமற்றும்பானைத்தொழில்நுட்பம்: சங்ககாலத்தில்நெசவுத்தொழில்பானைத்தொழில்நுட்பம்கருப்புசிவப்புபாண்டங்கள் - பாண்டங்களில்கீறல்குறியீடுகள்.	**3**
அலகு II -வடிவமைப்புமற்றும்சுட்டிடத்தொழில்நுட்பம் சங்ககாலத்தில்வடிவமைப்புமற்றும்கட்டுமானங்கள்&சங்ககாலத்தில்வீட்டுப்பொருட்களில்வடிவமைப்பு. சங்ககாலத்தில்கட்டுமானபொருட்களும்நடுகல்லும் - சிலப்பதிகாரத்தில்மேடைஅமைப்புபற்றியவிவரங்கள் -மாமல்லபுரச்சிற்பங்களும், கோவில்களும்சோழர்காலத்துப்பெருங்கோயில்கள்மற்றும்பிறவழிபாட்டுத்தலங்கள் - நாயக்கர்காலக்கோயில்கள்மாதிரிகட்டமைப்புகள்பற்றிஅறிதல், மதுரைமீனாட்சிஅம்மன்ஆலயம்மற்றும்திருமலைநாயக்கர்மஹால் - செட்டிநாட்டுவீடுகள் - பிரிட்டிஷ்காலத்தில்சென்னையில்இந்தோ-சாரோசெனிக்கட்டிடக்கலை.	**3**

அலகு III -உற்பத்தித்தொழில்நுட்பம் கப்பல்கட்டும்கலைஉலோகவியல் - இரும்புத்தொழிற்சாலைஇரும்பைஉருக்குதல், எஃகுவரலாற்றுச்சான்றுகளாகசெம்புமற்றும்தங்கநாணயங்கள்நாணயங்கள்அச்சடித்தல்மணிஉருவாக்கும்தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடிமணிகள் - சுடுமண்மணிகள்சங்குமணிகள்எலும்புத்துண்டுகள்தொல்லியல்சான்றுகள்சிலப்பதிகாரத்தில்மணிகளின்வகைகள்.	**3**
அலகு IV -வேளாண்மைமற்றும்நீர்ப்பாசனத்தொழில்நுட்பம் அணை, ஏரிகுளங்கள், மதகுசோழர்காலக்குமுழித்தூம்பின்முக்கியத்துவம்கால்நடைபராமரிப்புகால்நடைகளுக்காகவடிவமைக்கப்பட்டகிணறுகள்வேளாண்மைமற்றும்வேளாண்மைச்சார்ந்தசெயல்பாடுகள்கடல்சார்அறிவு - மீன்வளம்முத்துமற்றும்முத்துக்குளித்தல்பெருங்கடல்குறித்தபண்டையஅறிவு - அறிவுசாரசமூகம்.	**3**
அலகு V -அறிவியல்தமிழ்மற்றும்கணித்தமிழ்: அறிவியல்தமிழின்வளர்ச்சி - கணித்தமிழ்வளர்ச்சிதமிழ்நூல்களைமின்பதிப்புசெய்தல் - தமிழ்மென்பொருட்கள்உருவாக்கம்தமிழ்இணையக்கல்விக்கழகம் - தமிழ்மின்நூலகம் - இணையத்தில்தமிழ்அகராதிகள் -சொற்குவைத்திட்டம்.	**3**
Total Hours	**15**

Textbook(s)

1	தமிழகவரலாறு- மக்களும்பண்பாடும்- கே.கே. பிள்ளை(வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ்- முனைவர்இலசுந்தரம். (விகடன்பிரசுரம்).

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
CO 1	தமிழின்விரிவானஇலக்கியங்களையும்அதன்செம்மொழித்தன்மையையும்புரிந்துகொள்ளுங்கள்.	K1
CO 2	பழங்காலமக்களின்சிற்பஓவியம்மற்றும்இசைக்கருவிகளின்பாரம்பரியத்தைப்புரிந்துகொள்ளுங்கள்	K2
CO 3	தமிழ்மக்களின்நாட்டுப்புறமற்றும்தற்காப்புகலைகள்பற்றியஆய்வு.	K2
CO 4	திணைகருத்துக்கள், வர்த்தகம்மற்றும்சோழவம்சத்தின்வெற்றி.	K2
CO 5	இந்தியசுதந்திரப்போராட்டத்திலும், சுயமரியாதைஇயக்கத்திலும், சித்தமருத்துவத்திலும்தமிழர்களின்பங்களிப்பைப்புரிந்துகொள்ளுங்கள்	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															

MC24002 – 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

- Tointroducethebasicconceptsofenvironment,ecosystemsandbiodiversityandemphasizeonthebiodiversityofIndia and itsconservation.
- Toimpartknowledgeonthecauses,effectsandcontrolorpreventionmeasuresofenvironmentalpollution and naturaldisasters.
- TofacilitatetheunderstandingofglobalandIndianscenarioofrenewableandnonrenewableresources,causesoftheirdegradationandmeasuresto preservethem.
- Tofamiliarizetheconceptofsustainabledevelopmentgoalsandappreciatetheinterdependence of economic and social aspects of sustainability, recognize and analyzeclimatechanges,conceptofcarboncreditandthechallengesofenvironmentalmanagement.
- To inculcate and embrace sustainability practices and develop a broader understanding ongreenmaterials,energycycles andanalyzetherole ofsustainableurbanization.

UNIT I - ENVIRONMENT ANDBIODIVERSITY Definition, scope and importance of environment – need for public awareness. Eco-system andEnergyflow –ecologicalsuccession. Biodiversity - Typesofbiodiversity:genetic,speciesandecosystem biodiversity – Values of biodiversity, India as a megadive/rsity nation – hot-spots of biodiversity – Threats tobiodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and EndemicspeciesofIndia– conservation ofbiodiversity:In-situ andex-situ conservation.	**6**
UNIT II - ENVIRONMENTALPOLLUTION Causes,EffectsandPreventive measures of Air pollution, Water pollution, Soil pollution and Noise pollution.Solid, Hazardous and E-Waste management. Environmentalprotection,Environmentalprotectionacts.	**6**
UNIT III - RENEWABLESOURCESOFENERGY Energymanagementandconservation,NewEnergySources:Needofnewsources.Differenttypesnew energy sources. Applications of Hydrogen energy, Ocean energy resources, Tidal	**6**

energyconversion. Concept,origin andpowerplantsofgeothermalenergy.	
UNIT IV - SUSTAINABILITY AND MANAGEMENT Development,GDP, Sustainability -concept,needsandchallenges - economic,socialandaspectsofsustainability - 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 CarbonCredit,Carbon Footprint.Environmentalmanagementin industry - Acasestudy.	**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, Energyefficiency, Sustainable transports.Sustainable energy: Non-conventional Sources, Energy Cycles -carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization - Socio-economicalandtechnologicalchange.	**6**
Total Hours	**30**

Textbook(s)

1	AnubhaKaushikandC.P.Kaushik's"PerspectivesinEnvironmentalStudies",6thEdition,NewAge InternationalPublishers, 2018.
2	BennyJoseph, " EnvironmentalScienceandEngineering",TataMcGraw Hill,NewDelhi, 2016.

Reference(s)

1	R. K.Trivedi,"HandbookofEnvironmentalLaws,Rules,Guidelines,CompliancesandStandards",Vol.IandII,Enviro Media. 38.Edition,2010.
2	Cunningham,W.P.Cooper,T.H.Gorhani,"EnvironmentalEncyclopedia",JaicoPubl.,House,Mumbai,2001.
3	DharmendraS.Sengar,"Environmentallaw",PrenticehallofIndiaPvt.Ltd,New Delhi, 2007.
4	Rajagopalan,R,"EnvironmentalStudies - FromCrisistoCure",OxfordUniversityPress,3rd Edition,2015.
5	ErachBharucha"TextbookofEnvironmentalStudiesforUndergraduateCourses"OrientBlackswanPvt.Ltd.2013.

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

Course Outcome		Level
CO1	Torecognizeandunderstandthefunctionsofenvironment,ecosystemsandbiodiversityand their conservation.	K1
CO2	Toidentifythecauses,effectsofenvironmentalpollutionandnaturaldisastersandcontributetothe preventive measures in thesociety.	K1
CO3	Toidentifyandapplytheunderstandingofrenewableandnon-renewableresourcesandcontributetothe sustainablemeasuresto preservethemforfuturegenerations.	K3
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	K2
CO5	Todemonstrate theknowledgeofsustainabilitypracticesandidentifygreenmaterials,energycyclesand therole ofsustainable 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															

EE24004-BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 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 train the students in conducting load tests on electrical machines
- To gain practical experience in characterizing electronic devices
- To train the students to use DSO for measurements

LIST OF EXPERIMENTS

1. 1. Verification of ohms and Kirchhoff's Laws.
2. Load test on DC Shunt Motor.
3. Load test on Self Excited DC Generator
4. Load test on Single phase Transformer
5. Load Test on Induction Motor
6. Static VI Characteristics of PN and Zener Diodes
7. Characteristics of MOSFET input and output
8. Half wave and Full Wave rectifiers
9. Study of Logic Gates
10. Implementation of Binary Adder and Subtractor
11. Study of DSO
12. Study of starters, isolator, miniature circuit breaker

Total Hours	**60**

Reference(s)

1	Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017
2	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.

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

After completing this course, the students will be able to		**Level**
CO1	Use experimental methods to verify the Ohm's and Kirchhoff's Laws.	K2
CO2	Analyze experimentally the load characteristics of electrical machines	K1
CO3	Analyze the characteristics of basic electronic devices	K1
CO4	Able to design different rectifiers, develop and construct.	K2

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**	**2**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**1**
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

MA24302-TRANSFORMSANDPARTIALDIFFERENTIAL EQUATIONS								
Semester	Hours/Week			Total	Credit	MaximumMarks		
	L	T	P	Hours	C	CA	ES	Total
III	3	1	0	60	4			

Course Objective

To introduce the fundamental concepts of partial differential equations, Fourier series and transform techniques for solving boundary value and heat flow problems, and to equip students with advanced mathematical tools including Z-transforms for analyzing physical processes and discrete-time systems.

UNITI–PARTIALDIFFERENTIALEQUATIONS Formation ofpartial differentialequations –Singular integrals - Solutions ofstandard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous and non- homogeneous types.	**12**
UNITII-FOURIERSERIES Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.	**12**
UNITIII- APPLICATIONSOFPARTIALDIFFERENTIAL EQUATIONS ClassificationofPDE–Methodofseparationofvariables-FourierSeriesSolutionsof one dimensional wave equation – One dimensional equation of heat conduction – Steadystatesolutionoftwodimensionalequationofheatconduction.	**12**
UNITIV- FOURIERTRANSFORMS Statement ofFourier integral theorem –Fouriertransform pair –Fourier sine and cosinetransforms–Properties–Transformsofsimplefunctions–Convolutiontheorem–Parseval'sidentity	**12**
UNITV-Z-TRANSFORMSANDDIFFERENCEEQUATIONS Z-transforms-Elementaryproperties–InverseZ-transform(usingpartialfractionand residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equationsusingZ - transform.	**12**
TotalHours	**60**

Textbook(s)

1	GrewalB.S.,"HigherEngineeringMathematics",43rdEdition,KhannaPublishers,NewDelhi,2014.

2	NarayananS.,ManicavachagomPillay.T.KandRamanaiah.G"AdvancedMathematicsforEngineeringStudents",Vol.II &III,S. ViswanathanPublishersPvt.Ltd,Chennai,1998.
Reference(s)	
1	Andrews,L.CandShivamoggi,B, "IntegralTransformsforEngineers"SPIEPress, 1999.
2	Bali.N.PandManishGoyal,"ATextbookofEngineeringMathematics",9th Edition,LaxmiPublicationsPvt.Ltd,2014.
3	ErwinKreyszig,"AdvancedEngineeringMathematics",10th Edition,JohnWiley,India,2016.
4	James,G.,"AdvancedModernEngineeringMathematics",3rd Edition,PearsonEducation,2007.
5	Ramana.B.V.,"HigherEngineeringMathematics",McGrawHillEducationPvt.Ltd,NewDelhi,2016.
6	Wylie, R.C.andBarrett,L.C.,"AdvancedEngineeringMathematics"TataMcGrawHillEducation Pvt.Ltd,6thEdition,NewDelhi,2012.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Solvethegivenstandardpartialdifferentialequations.	K3
CO2	Applytheknowledgeofdifferentialequationsin Fourierseries analysis.	K4
CO3	Appreciate the physical significance of Fourier series techniques in solving oneandtwodimensionalheatflowproblemsandone-dimensionalwaveequations.	K4
CO4	Analysethemathematicalprinciplesontransformsandpartialdifferentialequations.	K4
CO5	Create the effective mathematical tools for the solutions of partial differential equationsby using Z transformtechniques for discrete time systems.	K4

MappingwithProgramOutcomes

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

AE24301-FLUIDMECHANICSANDPUMPS								
Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3			

Course Objective

- To familiarize students with the properties and behavior of fluids under various conditions, application of conservation laws, dimensional analysis, flow through pipes and open channels, flow measurementtechniques, and theclassification, workingprinciples, anddesignofcentrifugalpumps.

UNITI-FLUIDPROPERTIESANDFLUIDSTATICS Concept of Continuum - Properties of Fluid - Classification of fluids -Types of fluid flow Streamline, Streamlines, and path line. Pascal's Law and Hydrostatic Law, Pressure and its variation in a static Fluid, Measurement of fluid pressure- Manometers- Buoyancy and meta-Centre-Stability analysis and applications.	**9**
UNITII-FLUIDFLOWANALYSIS Typesoffluidflow–velocityandaccelerationofafluidparticle-Rotational–irrotational circulation and vorticity - Flow pattern – stream line – equipotential line – stream tube path line – streak line –flow net – velocity potential – stream function. Principles of conservation of mass – energy – momentum – continuity equation in Cartesian co-ordinates - Euler's equation of motion.	**9**
UNITIII-FLOWTHROUGHPIPESANDMODEL STUDIES Reynolds experiment - Laminar flow through circular pipe - Darcy-Weisbach equation - Moody diagram - Major and minor losses in pipe flow – Total energy line – Hydraulic grade line – Siphon - Pipes in series and parallel- Equivalent pipes- Fundamental dimensions - Dimensional homogeneity - Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.	**9**
UNITIV-OPENCHANNELFLOWS Types of flow – Characteristics of open channel - Chezy's equation - Manning equation – Hydraulically efficient channel sections - Critical depth – Specific energy application to channel transitions – Flow measurement in channels – Notches – Weirs - Parshall flume -Flow measurement in natural streams – float method – current meter.	**9**

UNITV-PUMPS Types of pumps – Head of pump – Losses and efficiencies -Selection of pump capacity - Centrifugalpump–Components–Workingprinciple–Typesofimpellers-Priming–NPSH - Cavitation – Minimum speed to start the pump - Specific speed – Characteristics curves - Turbine pump - Submersible pump - Jet pump – Air lift pump - Reciprocating pump - Sludge pump.	**9**
TotalHours	**45**

Textbook(s)	
1	Streeter,V.L.Wylie,E.B.andBedfordK.W,FluidMechanics,McGrawHillEducation(India) Pvt.Ltd.,NewDelhi,2017.
2	ModiP.NandSethHydraulicsandFluidMechanics includingHydraulicMachines, StandardBookHouse,NewDelhi, 2019.

Reference(s)	
1	JainA.K.FluidMechanicsincludingHydraulicMachines,KhannaPublishers,NewDelhi, 2014.
2	SKSom;GautamBiswasandSChakraborty,IntroductiontoFluidMechanicsandFluid Machines,McGrawHillEducation(India)Pvt.Ltd.,2017.
3	ChandramouliPN,AppliedHydraulicEngineering,YesDeePublisher,2017
4	VenTe Chow,OpenChannelHydraulics,McGrawHill,NewYork,2009.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		**Level**
CO1	Demonstratethepropertiesoffluidanditsbehaviourinstaticconditions alongwithpressuremeasurements.	K2
CO2	Applytheconservationlawsapplicabletofluidflowsanditsapplication throughfluidkinematicsand dynamics.	K3

CO3	Estimatelossesin pipelinesforboth laminarand turbulentconditionsand analysisofpipesconnectedinseriesandparallelandtounderstandthe conceptofapplicationofdimensionalanalysisinmodelstudies.	K4
CO4	Analyzethesteadyuniformflowwithhydraulicallyefficientchannel sectionsandtomeasurethe flowsinartificial/naturalchannels.	K4
CO5	Designvariousprinciplestoselect,analyze,andoptimizethepumpsystems forvariousapplications.	K4

MappingwithProgramOutcomes

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

AE24302- SOILSCIENCEANDENGINEERING

Semester	Hours/Week			Total	Credit	MaximumMarks		
	L	T	P	Hours	C	CA	ES	Total
III	3	0	0	45	3			

Course Objective

- To expose the students to the fundamental knowledge on Soil physical parameters, Permeability – Compaction, Bearing Capacity and types and methods of soil survey and

interpretative groupings	
UNITI–PHYSICAL PROPERTIES Soil physical properties and their significance – Soil texture and textural classes – soil structureandclassification–soilconsistence. Bulkdensity, particledensityandporosity–soil color-significance – causes and measurement. Soil temperature – Soil air – soil water – Measurements – Soil water potentials – Soil moisture constants – Movements of soil water – saturated and unsaturated flow – infiltration, hydraulic conductivity, percolation, permeability anddrainage.	**9**
UNITII-SOILCLASSIFICATIONANDSURVEY Soil taxonomy – Soils of Tamil Nadu and India. Soil survey - types and methods of soil survey – Field mapping- mapping units - base maps -preparation of survey reports - conceptsanduses-LandCapabilityClassesandsubclasses-soilsuitability-Problemsoils – Reclamation.	**9**
UNITIII-PHASERELATIONSHIPANDSOILCOMPACTION Phase relations-Gradation analysis-Atterberg LimitsandIndices-Engineering Classificationof soil– Soilcompaction-factorsaffectingcompaction-fieldandlaboratory methods.	**9**
UNITIV-ENGINEERINGPROPERTIESOFSOIL Shear strength of cohesive and cohesionless - Mohr-Coulomb failure theory-Measurement ofshearstrength,direct shear, Triaxialand vanesheartest--Permeability-CoefficientofPermeability-Darcy'slaw-fieldandlabmethods-Assessmentofseepage-Compressibility.	**9**
UNITV-BEARINGCAPACITYANDSLOPESTABILITY BearingcapacityofsoilsFactorsaffectingBearingCapacity-Shallowfoundations-Terzaghi'sformula- BIS standards - Slope Stability-Analysis of infinite and finite slopes-friction circle method- slope protection measures.	**9**
TotalHours	**45**
Textbook(s)	

1	NyleC.Brady,"TheNatureandPropertiesofSoil",MacmillanPublishingCompany,10th Edition,NewYork, 2008.
2	Punmia,B.C.,"SoilMechanicsandFoundation"LaxmiPublishers,NewDelhi,2007.
Reference(s)	
1	EdwardJ.Plaster.,"SoilScience", CengageLearningIndiaLtd,NewDelhi,2009.
2	Arora, K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers andDistributors,NewDelhi,2007.
3	Murthy, V.N.S. "Soil Mechanics and Foundation Engineering", UBS Publishers andDistributors,NewDelhi,2007.
4	Sehgal,S.B.,"TextBookofSoilMechanics", CBSPublishersandDistributorsNewDelhi,2007.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Understandthefundamentalknowledge ofsoilphysicalparameters.	K2
CO2	Performsoilsurveyandclassifysoilbasedonits characteristics	K2
CO3	Explainthephaserelationshipandsoilcompaction.	K3
CO4	AnalyzeEngineeringpropertiesofsoil	K4
CO5	EvaluatetheConceptsofbearingcapacityandslopestability.	K4

MappingwithProgramOutcomes

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

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

AE24303- DRONE TECHNOLOGY IN AGRICULTURE								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	2	60	4			

Course Objective

- To provide a comprehensive understanding of drone technology, including its history, regulations, and components and to analyse the future scope of drone technology, highlighting trends, innovative roles, and market opportunities

UNIT I – INTRODUCTION TO DRONES Introduction to drones and their applications: Drone definition, drone history, India and drones - Rules and Regulations DGCA, GOVT OF INDIA - Structural categorization of drones - Components of drones.	**9**
UNIT II – DRONE INDUSTRY OVERVIEW: SERVICES TO ECOSYSTEM CONSULTING Drone Services - Drone Assembly - Drone Software Development - Drone Accessories and Add-ons - Drone Training and Education - Drone Rental and Leasing - Drone Maintenance and Repair - Drone Insurance and Risk Management - Drone-Based Applications Development - Drone Ecosystem Consulting.	**9**
UNIT III - DRONE-BASED ENTREPRENEURSHIP OPPORTUNITIES IN AGRICULTURE Introduction to Precision Agriculture - Precision Agriculture Services Offered by Drone Pilots - Drone Technology and Tools for Precision Farming - Data Collection and Analysis in Precision Agriculture - Marketing and Sales Strategies for Drone Services - Case Studies of Successful Drone Pilots in Precision Agriculture - Developing a Business Plan for a Drone Pilot Service in Agriculture.	**9**

UNIT IV - ENTREPRENEURIAL OPPORTUNITIES FOR DRONE PILOTS IN INDUSTRIAL APPLICATIONS Introduction to Drones in Industrial Applications - Key Industrial Sectors Utilizing Drones - Drone Technology and Equipment for Industrial Use - Data Collection and Analysis in Industrial Applications - Service Offerings for Industrial Drone Pilots - Marketing and Business Development for Industrial Drone Services - Case Studies of Successful Industrial Drone Pilots - Developing a Business Plan for Industrial Drone Services.	**9**
UNIT V - FUTURE SCOPE OF ENTREPRENEURSHIP OPPORTUNITIES Introduction to Drone Industry Entrepreneurship - Emerging Trends in Drone Technology - Future Applications for Drone Pilots - Innovative Roles for Drone Engineers - Growth Areas in Drone Services - Advancements in Drone Hardware and Software - Regulatory Changes and Their Impact - Global Market Opportunities - Challenges and Solutions for Future Entrepreneurs - Investment and Funding Trends - Strategic Planning for Future Opportunities.	**9**
Total Hours	**45**
List of Experiments	
1. Familiarization with Agricultural Drone Components **2.** Drone Flight Training and Basic Maneuvers in Farm Fields **3.** Aerial Mapping of Agricultural Land Using RGB Camera **4.** NDVI Mapping for Crop Health Monitoring **5.** Crop Spraying Using Agricultural Drones **6.** Weed Detection Using Aerial Imagery **7.** Plant Population Counting and Canopy Estimation **8.** Soil Moisture and Irrigation Stress Mapping Using Thermal Sensors **9.** 3D Terrain Modeling and Contour Mapping for Land Leveling 10. Post-Disaster Crop Damage Assessment Using Drone Imagery	**15**
Total Hours	**60**

Textbook(s)

1	"Drone Technology: A Complete Guide for Beginners and Experts" by John Baichtal.

2	"Introduction to Unmanned Aircraft Systems" by Douglas M. Marshall, Richard K. Barnhart, and Eric Shappee.
Reference(s)	
1	"Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs" by John Baichtal and Terry Kilby.
2	"Small Unmanned Aircraft: Theory and Practice" by Randal W. Beard and Timothy W. McLain.
3	"Drones for Dummies" by Mark LaFay and Kraig Becker.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		**Level**
CO1	Understanddronetypes,regulations,andcomponents.	K2
CO2	Createopportunitiesinthedroneindustry.	K3
CO3	Analyzedrone-basedservicesforagriculture.	K4
CO4	Evaluatebusinessplans fordroneservices.	K4
CO5	Formulate futuretrendsandstrategiesindrone Technology.	K6

MappingwithProgramOutcomes

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

AE24321-SURVEYINGANDPRACTICES								
Semester	Hours/Week			Total	Credit	MaximumMarks		
	L	T	P	Hours	C	CA	ES	Total
III	3	0	2	60	4			

Course Objective

- Tointroducetheprincipleofsurveying,variousmethodsandapplicationstoAgricultural &Irrigation Engineering projects.

UNITI - FUNDAMENTALSANDCHAINSURVEYING Definition-Classifications -Basicprinciples –Equipmentandaccessoriesforrangingand chaining – Methods of ranging - well conditioned triangles – Errors in linearmeasurement and their corrections - Obstacles - Traversing – Plotting – applications-enlargingandreducingfigures-Areasenclosedbystraightlines-Irregularfigures-	**6**
UNITII- COMPASSAND PLANETABLESURVEYING Compass – Basic principles - Types - Bearing – Systems and conversions – Sources of Errors-Localattraction-MagneticDeclination-Dip-Traversing-Plotting-Adjustmentof closing error — applications - Plane table and its accessories - Merits and demerits - Radiation –Intersection-Resection–Traversing-sourcesoferrors–applications.	**6**
UNITIII - THEODOLITE Theodolite - Types - Description - Horizontal and vertical angles - Temporary and Permanent adjustments – Heights and distances– Tangential and Stadia Tachometry – Subtense methods - Stadia constants - Anallactic lens – Traversing.	**6**
UNITIV - LEVELLING Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments — Methods of leveling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling - sources of errors in leveling- Precise levelling - Types of instruments - Adjustments - Field procedure.	**6**

UNITV - MODERN SURVEYING TotalStation–DGPS–DroneSurveying–RemoteSensing&GIS–LIDAR- Photogrammetry–MobileMapping–Digital Levelling–DEM –Digital Planimeter	**6**

PRACTICALS:	
CHAINSURVEYING • Ranging,ChainingandPacing • Chaintraversing	**6**
COMPASSSURVEYING • TriangulationProblem • Compasstraversing	
PLANETABLESURVEYING • RadiationIntersection- TriangulationProblemPlanetabletraversing	**6**
THEODOLITESURVEYING • Measurementofhorizontal&verticalangles • Tangential & Stadia Tacheometry	**6**
LEVELLING • FlylevellingusingDumpyLevel • FlylevellingusingTiltingLevel • Checklevelling • BlockLevellingRadial Contouring	**6**
DEMONSTRATIONOFTOTALSTATIONANDGPS	**6**
TotalHours	**60**

Textbook(s)	
1	JamesM.AndersonandEdwardM.Mikhail,Surveying,TheoryandPractice,SeventhEdition, McGrawHill2001.
2	BannisterandS.Raymond,Surveying,SeventhEdition,Longman2004.
Reference(s)	
1	S.K.Roy,FundamentalsofSurveying,SecondEdition,Prentice HallofIndia2004.
2	A.M.Chandra,PlaneSurveying,NewAgeInternationalPublishers2002.
3	AlakDe,PlaneSurveying,S.Chand&CompanyLtd.,2000.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Understandtheknowledgeontheusageofbasicsurveying.	K2
CO2	Preparelevellinginstrumentforsurveyingoperations	K2
CO3	Analyzetheuseoftheodoliteforvarioussurveyingoperations	K4
CO4	Evaluatenecessarysurveysforsocialinfrastructures	K4
CO5	Formulateandprepareplanimetricmaps	K6

MappingwithProgramOutcomes

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

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

AE24322-MECHATRONICSINAGRICULTURALENGINEERING								
Semester	Hours/Week			Total	Credit	MaximumMarks		
	L	T	P	Hours	C	CA	ES	Total
III	3	0	0	45	3			

Course Objective

- Developacomprehensiveunderstandingofmechatronicsprinciplesandtheirapplicationin Agricultural Engineering.

UNITI-INTRODUCTION Definition of mechatronics, -measurement system, control systems, microprocessor-based controllers, mechatronics Approach-Sensors and transducers, performance terminology, Displacement-Position&ProximitySensors,photoelectrictransducers,flowtransducers, opticalsensorsand transducers	**9**
UNITII-MICROPROCESSORCONTROL System interfacing-instrumentation, and control systems- Input/output signals of amechatronic system, signal conditioning-microprocessor control, microprocessor-numerical control, microprocessor input/output control.	**9**
UNITIII-TECHNOLOGIESOF ROBOT Sub systems, transmission system(Mechanics)-power generation and storage system, sensors, electronics, algorithms and Software-Servo motor drives types and applications. Steppermotor and itsconcept.IndustrialRobots-Classificationand subsystems - Defining workspace area	**9**

UNITIV- APPLICATIONOFROBOTSIN AGRICULTURE Harvesting and picking - weed control, autonomous mowing, pruning, and seeding, spraying and thinning, phenoltyping, sorting and packing -Utilityplatforms. Use ofdifferent agro bots in agriculture.	**9**
UNIT5-ADVANCEDAGRICULTURALMECHATRONICSANDFUTURE TRENDS AI-driven decision-making in Agriculture-Renewable energy applications in agricultural Automation-Post-harvestautomationandfoodprocessingMechatronics-Challengesandfuture scope of mechatronics in Agriculture-Case studies and emerging trends in Aggrotech	**9**
TotalHours	**45**

Textbook(s)	
1	AlciatoreDGandHistandMB.2002.IntroductiontoMechatronicsandMeasurementSystem. McGrawHillPvtLimited,New Delhi.
2	RobertHB.2002. MechatronicHandBook.CRCPress.

Reference(s)	
1	ShakhatrehandFareed.2011.TheBasicsofRobotics.LahtiUniversityofAppliedSciences MachineandProductionTechnology
2	Wolfram,Stadler.1995.AnalyticalRoboticsandMechatronics.McGrawHillPvtLimited,NewDelhi.
3	Bolton,W.2010.Mechatronics.PearsonEducationAsia

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		**Level**
CO1	Acquireknowledgeonthebasicconceptsofsensors,transducers,andmicroprocessors.	K1
CO2	Understandthemechatronicssystemsusedinagriculturalengineering.	K2

CO3	Differentiatethetechnologiesofrobot.	K2
CO4	CreatenecessaryrobotsforAgriculturalPractices	K6
CO5	Developcriticalthinkingandproblem-solvingskillsinthecontextof mechatronicsinagriculturalengineering.	K6

MappingwithProgramOutcomes

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

AE24311-FLUIDMECHANICSLABORATORY								
Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	0	0	4	60	2			

Course Objective

- Studentsshouldabletoverifytheprinciplesstudiedintheorybyperformingthe experiments in the laboratory

LISTOF EXPERIMENTS	
1. FlowMeasurement • CalibrationofRotameter • FlowthroughVenturimeter • FlowthroughacircularOrifice • DeterminationofmeanvelocitybyPitottube • FlowthroughaTriangularNotch • FlowthroughaRectangular Notch	**60**
2. LossesinPipes • Determinationoffrictioncoefficientinpipes • Determinationoflossesduetobends, fittingsandelbows	
3. Pumps • CharacteristicsofCentrifugalpump • CharacteristicsofSubmersiblepump • CharacteristicsofReciprocatingpump	
TotalHours	**60**

Reference(s)

1	HydraulicLaboratoryManual,CentreforWaterResources,AnnaUniversity,2015.
2	ModiP.N.andSethS.M.,HydraulicsandFluidMechanics.StandardBookHouse.NewDelhi,2017.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	ApplyBernoulliequationfor calibrationofflowmeasuring devices.	K3
CO2	Measure friction factorinpipesandcomparewithMoodydiagram	K3
CO3	Determinetheperformancecharacteristicsofroto-dynamicpumpsand positivedisplacementpump.	K4

MappingwithProgramOutcomes

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

AE24312-SOILSCIENCELABORATORY

Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	0	0	4	45	2			

Course Objective

- Studentsshouldableto verifyvariousqualityaspectsofsoilandwaterstudied in theory by performing experiments in the laboratory.

LISTOF EXPERIMENTS	
1. Identificationofrocksandminerals 2. Collectionandprocessingofsoilsamples 3. Determinationofsoilmoisture,ECandpH 4. FielddensitydeterminationbyCoreCutterandSandReplacement method 5. SpecificgravitydeterminationbyPycnometer	**45**

6. TexturalanalysisofsoilbyInternationalPipettemethod 7. GrainsizeanalysisbyusingMechanicalshaker 8. DeterminationofOrganiccarbon 9. EstimationofGypsumrequirements	
TotalHours	**45**

Reference(s)

1	Punmia,B.C,"SoilMechanicsandFoundationEngineering",LaxmiPublishers,NewDelhi. 2007.
2	LaboratoryManual,CentreforWaterResources,AnnaUniversity,Chennai.2012.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Explain soilphysicalpropertiesandcomparethepropertiesbasedonsoiland watersystem	K3
CO2	Analysethesoilchemicalpropertiestoclassifythearableandproblem soilstodevelopdifferentreclamationpractices	K3

MappingwithProgramOutcomes

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

SEMESTERIV

AE24401-STRENGTHOFMATERIALS								
Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4			

Course Objective

- Tounderstand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNITI-STRESS,STRAINANDDEFORMATION OFSOLIDS Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains.	**12**
UNITII-ANALYSISOFPLANE TRUSSES Determinate and indeterminate plane trusses –determination of member forces by method of joints, method of sections and method of tension coefficient.	**12**
UNITIII-TRANSVERSELOADINGANDSTRESSESIN BEAM Beams – types transverse loading on beams – Shear force and bending moment in beams– Theorem of three moments – Cantilevers – Simply supported beams and over-hanging beams. Theory of simple bending– bending stress distribution – Shear stressdistribution-Flitchedbeams–carriagesprings.	**12**
UNITIV- TORSION Torsionformula-stressesanddeformationincircularandhollowsshafts– Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflectionofhelicalsprings-carriagesprings.	**12**
UNIT V-DEFLECTIONOFBEAMS Computationofslopesanddeflectionsindeterminatebeams-DoubleIntegration method – Macaulay's method – Area moment method – Conjugate beam method.	**12**
TotalHours	**60**

Textbook(s)

1	Bansal,R.K.,"StrengthofMaterials",LaxmiPublications(P) Ltd.,2007
2	JindalU.C.,"StrengthofMaterials",AsianBooksPvt.Ltd.,NewDelhi,2007

Reference(s)	
1	Egor.P.Popov“Engineering MechanicsofSolids”Prentice HallofIndia,NewDelhi,2001
2	SubramanianR.,"StrengthofMaterials",OxfordUniversityPress,OxfordHigherEducation Series,2007.
3	Hibbeler,R.C.,"MechanicsofMaterials", PearsonEducation,LowPriceEdition, 2007
4	Egor.P.Popov“Engineering MechanicsofSolids”Prentice HallofIndia,NewDelhi,2001

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Calculatethestressdistributionandstrainsinregularandcompositestructuressubjectedtoaxialloads.	K3
CO2	Evaluatethestressesinplanetrusses	K3
CO3	Assesstheshearforce,bendingmomentandbendingstressesinbeams	K4
CO4	Applytorsionequationindesignofcircularshaftsandhelicalsprings	K4
CO5	Evaluatetheslopeanddeflectionofbeamsandbucklingloadsofcolumnsunderdifferentboundaryconditions	K4

MappingwithProgramOutcomes

	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PO 11**	**PS O1**	**PS O2**	**PS O3**
CO1	3	1	1	1	-	-	-	1	-	1	1	3	3	1
CO2	3	2	2	1	-	-	-	1	-	-	1	3	3	1
CO3	3	2	2	1	-	-	-	1	-	1	1	3	3	1
CO4	3	1	2	1	-	-	-	1	-	1	1	3	3	1
CO5	3	2	2	1	-	-	-	1	-	1	1	3	3	1
3 – Strong,2–Medium,1–Low														

AE24402- ROBOTICS AND AUTOMATION IN AGRICULTURE

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3			

Course Objective

- To introduce the students about the principles and applications of Robotics and Automation in Agriculture, focusing on the use of sensors, control systems and intelligence machines to improve efficiency, productivity, and sustainability in Agriculture.

UNIT I - INTRODUCTION TO ROBOTICS History of Mechanized Agriculture - Farming Operations and Related Machines - Tillage, Planting Cultivation, and Harvesting, Agricultural Automation - Agricultural Vehicle Robot.	**9**
UNIT II - PRECISION AGRICULTURE Sensors – types and agricultural applications, Global Positioning System (GPS) - GPS for civilian use, Differential GPS, Carrier-phase GPS, Real-time kinematic GPS, Military GPS, Geographic Information System, Variable Rate Applications and Controller Area Networks	9
UNIT – III TRACTION AND TESTING Hitching- Principles of hitching, Types of hitches, Hitching and weight transfer, Control of hitches, Tires and Traction models, Traction predictor spread sheet, Soil Compaction, Traction Aids, Tractor Testing.	9
UNIT – IV SOIL TILLAGE AND WEED MANAGEMENT Tillage Methods and Equipment, Mechanics of Tillage Tools, Performance of Tillage Implements, Hitching of Tillage Implements, Weed Management - Conventional Cropping Systems, Tools, Crop Rotation, Mechanical Cultivation	9
UNIT – V MACHINERY SELECTION Screw Conveyors, Pneumatic Conveyors, Bucket Elevators, Forage Blowers and Miscellaneous Conveyors, Machinery Selection - Field Capacity and Efficiency, Draft and Power Requirements, Machinery Costs.	9
Total Hours	**45**

Textbook(s)

1	Ajit K. Srivastava, Carroll E. Goering, Roger P. Rohrbach, Dennis R. Buckmaster, "Engineering Principles of Agricultural Machines", ASABE Publication, 2012.
2	Myer Kutz , "Handbook of Farm, Dairy and Food Machinery Engineering", Academic Press, 2019.
Reference(s)	
1	Qin Zhang, Francis J. Pierce, "Agricultural Automation Fundamentals and Practices", CRC Press, 2016.
2	Stephen L Young, Francis J. Pierce, "Automation: The Future of Weed Control in Cropping Systems", Springer, Dordrecht Heidelberg New York London, 2014.
3	R.A. Kepner, Roy Bainer, E.L. Barger, "Principles of Farm Machinery", 3rd Edition, CBS Publishers, New Delhi, 2005.
4	Guangnan Chen, "Advances in Agricultural Machinery and Technologies", 1st Edition, CRC Press, 2021.

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

Course Outcome		Level
CO1	Recognize the areas in agricultural process where robotics can be applied.	K2
CO2	Integrate sensor and system for a required specific process in agricultural applications.	K3
CO3	Apply Mechanics to the design various robot parameters	K4
CO4	Convert various mechanisms into robot by providing actuation at specific links and joints of the mechanism.	K4
CO5	Develop suitable robotic system for specific agricultural tasks.	K5

`Mapping with Program Outcomes

	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PO 11**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	2		2		1				1	3		1
CO2	3	2	2		2		1				1	3		1
CO3	3	2	2		2		1				1	3		1
CO4	3	2	2		2		1				1	3		1
CO5	3	2	2		2		1				1	3		1

3 – Strong, 2 – Medium, 1 – Low

AE24403 - CROPPRODUCTION TECHNOLOGY

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3			

Course Objective

- Tointroducethestudentsaboutprinciplesofagriculturalandhorticulturalcropproductionandtointroducethe productionpracticesofcrops and todelineatetheroleofagriculturalandirrigationengineersinrelationtovariouscropproductionpractices.

UNIT I – INTRODUCTION TO CROP PRODUCTION Importance and scope of crop production in India. Factors affecting crop growth – soil,-water, temperature, light, and nutrients - Classification of crops (based on season, purpose, and morphology)- Agro-climatic zones of India and Tamil Nadu-Cropping systems – monocropping, multiple cropping, intercropping, relay cropping-Role of agricultural engineering in improving crop productivity.	**9**
UNIT II – TILLAGE AND SEED BED PREPARATION Objectives and principles of tillage-Types of tillage – primary, secondary, and inter-tillage-Implements used – ploughs, harrows, cultivators, rotavators-Concepts of zero tillage and conservation tillage-Preparation of seedbeds for major crops (paddy, maize, pulses)-Sowing and planting methods – broadcasting, dibbling, drilling, transplanting, line sowing-Seed rate and spacing – importance and calculations.	**9**
UNIT III – CROP MANAGEMENT PRACTICES Irrigation scheduling and critical stages of water requirement- Nutrient management – organic and inorganic fertilizers, fertilizer application methods-Integrated Nutrient Management (INM)-Weed management – mechanical, chemical, and biological control-Pest and disease management – integrated pest management (IPM)-Use of sensors and automation in crop management (Irrigation scheduling, NPK sensors).	**9**
UNIT IV – PRODUCTION TECHNOLOGY OF MAJOR CROPS Cereals: Rice, Maize, Sorghum, Wheat-Pulses: Black gram, Green gram, Red gram-Oilseeds: Groundnut, Gingelly, Sunflower-Commercial crops: Sugarcane, Cotton.-Vegetables and fruits: Tomato, Brinjal, Banana-Improved varieties, cropping calendar, irrigation, fertilizer schedule, and yield.	**9**
UNIT V – MODERN TRENDS IN CROP PRODUCTION Precision farming: GIS, GPS, drone-based crop monitoring, and variable rate application-Protected cultivation:Polyhouse and greenhouse farming-Hydroponics and vertical farming systems-Organic farming: principles, certification, and advantages-Sustainable and climate-smart agriculture-Use of IoT, AI, and automation in modern crop production systems.	**9**
Total Hours	**45**

Textbook(s)	
1	RajendraPrasad,TextBookofFieldCropProduction.DirectorateofInformationandPublication,KrishiAnusandhanBhavan,Pusa,New Delhi,2015.
2	ReddyT.SankaraG.H.YellamandaReddi,PrinciplesofAgronomy,KalyaniPublishers,NewDelhi,2005.
3	Handbookof Agriculture.ICARPublications,NewDelhi, 2011.
Reference(s)	
1	BoseT.K.and L.P.Yadav. CommercialFlowers,NayaPrakash, Calcutta.1989.
2	CropProductionGuide,TamilNaduAgriculturalUniversityPublication,Coimbatore. 2005
3	Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices,plantationcrops,medicinalandaromaticplants.RajalakshmiPublications,Nagercoil.1993.
4	Kumar, N. "Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 7th edition,2015.
5	Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications,NewDelhi.1989.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Acquire knowledge oncropproduction	K1
CO2	Interpretthemethodsofcropselectionandits establishment.	K2
CO3	ExplaincropmanagementPracticesinthefieldofAgriculture	K2
CO4	Illustrateproductionpracticesofagriculturalcrops.	K2
CO5	ApplyKnowledge onthe productionofhorticulturalcrops.	K4

MappingwithProgramOutcomes

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	3		3						2					2
CO2	3		3											2
CO3	3	2	3	2	1		3			3			2	3
CO4						1	2	1		2		1	3	3
CO5						1	2	1		2	1	1	3	3

3 – Strong,2–Medium,1–Low

AE24404-ENVIRONMENTALINSTRUMENTATION

Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3			

Course Objective

- Toprovide students with a comprehensive understanding ofenvironmental monitoring techniques and instrumentation methodologies, covering the measurement of water quality parameters, groundwater monitoring, wastewater and air quality monitoring, and flow measurement systems, with a focus on applying these technologies to assess and manage environmental systems effectively.

UNITI- INSTRUMENTATION METHODOLOGIES Case study on measurement of various environmental parameters, Influence of regulatory requirements on instrumentation design, In situ Vs extractive measurement, online analysis of environmental samples, Ultra violet analysis of water and waste water.	**9**
UNIT II-WATERQUALITY PARAMETERS Thermalconductivitydetectors,TemperatureMonitors,Phanalyzers,Turbiditymonitoring, Watershed Scale, Water Quality Monitoring.	9
UNITIII-GROUNDWATERMONITORING LevelMeasurementsingroundwatermonitoringwells,techniquesofgroundwater sampling, Soil permeability and dispersion analysis, instrumentation for assessment of oil and groundwater pollution.	**9**

UNITIVWASTEWATERMONITORING ANDAIRMONITORING Automatic waste water sampling systems, Waste water level measurement techniques, data acquisitionsystemsforambientair monitoring, air pollutioncontrolsystems, measurementof ambient air quality.	**9**
UNITV FLOWMONITORING Airflowmeasurement,Gasflowmeasurement,Non-openchannelflowmeasurement, Open channel waste water flow measurement.	9
TotalHours	**45**

Textbook(s)

1	EnvironmentalInstrumentationandAnalysisHandbook,RandyDDownandJayHLehr,Wiley,2004Karunya University2017ElectronicsandInstrumentationEngineering.
2	MeasuringtheNaturalEnvironment, IanStrangeways,CambridgePress, 2003.

Reference(s)

1	Foodandagriculturalwastewaterutilizationandtreatment,SeanXLiu,BlackwellPublishing,2007.
2	EnvironmentalInstrumentation,Fritschen,Leo,Gay,Lloyd,Springeradvancedtext in lifesciences.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Acquireknowledgeoninstrumentation methodologies.	K1
CO2	Estimatethewaterqualityparameters.	K4
CO3	Analyzegroundwatermonitoring.	K4
CO4	Evaluatethewastewaterandair qualityparameters.	K5
CO5	Createtheflowmonitoringmodels.	K6

MappingwithProgramOutcomes

	PO 01	**PO 02**	**PO 03**	**PO 04**	**PO 05**	**PO 06**	**PO 07**	**PO 08**	**PO 09**	**PO 10**	**PO 11**	**PS O1**	**PS O2**	**PS O3**

CO1	3	2	2		2		1				1	3		1
CO2	3	2	2		2		1				1	3		1
CO3	3	2	2		2		1				1	3		1
CO4	3	2	2		2		1				1	3		1
CO5	3	2	2		2		1				1	3		1
3 – Strong,2–Medium,1–Low														

AE24421-UNITOPERATIONSINAGRICULTURALPROCESSING

Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	2	0	2	60	3			

Course Objective

- The students would be exposed to the fundamental knowledge in Evaporation, Filtration, Sedimentation, Processing, Sieve analysis, Crystallization and Distillation in processing of agricultural produce.

UNITI-EVAPORATION ANDCONCENTRATION Unit operations in food processing –conservation of mass and energy – overallview of an engineering process-dimensions and units – dimensional and unit consistency – dimensionlessratios-evaporation – definition – liquid characteristics– single and multiple effect evaporation- performance of evaporators and boiling pointelevation– capacity – economy and heat balance-types of evaporators –once through and circulation evaporators – short tube evaporators and long tube evaporators – agitated film evaporator	**6**
UNITII-MECHANICALSEPARATION Filtration–definition–filtermedia –typesandrequirements-constant rate filtration – constant pressure filtration – filter cake resistance-filtration equipment – rotary vacuum filter – filter press-sedimentation – gravitational sedimentation of particles ina fluid – Stoke's law, sedimentation ofparticles in gas-cyclones – settling under sedimentation and gravitational sedimentation-centrifugal separations – rate of separations – liquid – liquid separation – centrifuge equipment.	6

UNITIII-SIZE REDUCTION Size reduction – grinding and cutting – principles of comminuting – characteristics ofcomminutedproducts – particle size distribution in comminuted products-energy andpowerrequirementsincomminuting–crushingefficiency–Rittinger's,Bond's and Kick's laws for crushing-size reduction equipment – crushers – jaw crusher, gyratory crusher-crushing rolls – grinders – hammer mills – rolling compression mills-attrition,rod, ballandtubemills –constructionandoperation.	**6**
UNITIV- CONTACTEQUILIBRIUMSEPARATION Contactequilibriumseparationprocesses–equilibriumprocesses-gasabsorption–rateof gas absorption – stage – equilibrium gas –absorption equipment-properties of tower packing–types–construction–flowthroughpackedtowers-extraction–rate of extraction - stageequilibriumextraction-equipmentforleachingcoarsesolids–intermediatesolids - basketextractor-extractionoffinematerial – Dorragitator– continuousleaching-decantationsystems–extraction towers-washing– equipment	**6**
UNITV- CRYSTALLISATIONANDDISTILLATION Crystallization-Equilibrium –Rate of crystal growth stage- Crystallizers- Equipment-Classification- Construction and operation – Crystallizers- Tank-Agitated batch- Swenson-Walker and Vacuum crystallizers-Distillation-Binary mixtures-Flash and differential distillation-Steam distillation –Theory-Continuous distillation with rectification –Vacuum distillation - Batch distillation-Operation and process-Advantages and limitation-Distillationequipment- Constructionand operation- Factors influencing the operation.	**6**
TotalHours	**30**
PRACTICAL	
1. Determinationofthermalefficiencyandeconomyof evaporator 2. Determinationofseparation efficiencyofcentrifugalseparator 3. Determinationofcollectionefficiencyincyclone separator 4. Determinationofefficiencyofliquid-solidseparationbyfiltration 5. Determinationofabsorptionefficiencyinapackingtower 6. Performance evaluation of a sieve and determination of particle size of granular foods bysieve analysis 7. Determinationofenergyrequirementinsize reductionusingtheburrmill 8. Determinationofenergyrequirement insizereductionusingtheballmilland hammer mill 9. Determinationofmixingindexforsolids	

10. Determinationofeconomyandthermalefficiencyof rotaryflashevaporator for 11. Concentrationofjuice 12. Performanceevaluationofasteamdistillationprocess	
TotalHours	**30**

Textbook(s)	
1	Earle,R.L.,"UnitoperationsinFoodProcessing",PergamonPress,Oxford,U.K, 1985.
2	McCabe,W.L.,andSmith,J.C.,"UnitOperationsofChemicalEngineering",Mc-GrawHillInc.,KosaidoPrintingLtd.,Tokyo,1990.
3	Geankoplis,C.J."TransportProcessesandSeparationProcessPrinciples",4th Edition,PrenticeHall,2003.
Reference(s)	
1	Coulson,J.MandJ.F.Richardson.ChemicalEngineering.VolumeItoV.ThePergamonPress.NewYork,1999.
2	AlbertIbarz andGustavoV.Barbosa-Cánovas.UnitOperationsinFoodEngineering.CRCPressLLC,Florida, 2003.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Examinetheevaporationprocessandtypesofevaporatorsforfoodindustry	K2
CO2	Analyzetheprinciplesoffiltrationandmechanical separationequipment	K3
CO3	Identifysizereductionandgrindingequipmentandunderstandthefactorsaffectingthe process	K3
CO4	Identifythegas-liquidandsolid-liquidequilibriumconceptsandfactorsinfluencingequilibrium separationprocess.	K3
CO5	Differentiate crystallizationanddistillationprocesses andidentifyprocessingequipment.	K3

MappingwithProgramOutcomes

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS O3

	01	02	03	04	05	06	07	08	09	10	11	O1	O2	
CO1	2	3	1	2	1	1	1	-	-	-	1	1	1	1
CO2	2	3	1	2	1	1	-	-	-	-	1	1	1	1
CO3	2	3	1	1	1	1	1	-	-	-	1	1	1	1
CO4	2	3	1	1	1	1	1	-	-	-	1	1	1	1
CO5	2	3	1	2	1	1	1	-	-	-	1	1	1	1

3– Strong,2–Medium,1–Low

AE24405-LIFESCIENCEFORENGINEERS

Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	2	0	0	45	0			

UNITI-INTRODUCTIONTO BIOLOGY Comparison of Biological organisms with manmade systems- eye and camera, flying bird and aircraft.Classification of living organisms- Cellular basis of life, differences between prokaryotes and eukaryotes, classification	**9**
UNITII-BIOMOLECULES Structureandfunctionsofproteinsandnucleicacids,hemoglobin,antibodies.Enzymes- Industrial applications, Fermentation and its industrial applications	**9**
UNITIII- BIOENERGETICSAND RESPIRATION GlycolysisandTCAcycle,Electrontransportchainandoxidativephosphorylation, Mechanism of photosynthesis. Human physiology.	**9**
UNITIV-GENETIC ENGINEERING Mendel'slaws,genemapping,MitosisandMeiosis,Epistasis,singlegenedisordersin humans. Genetic code.	**9**
UNITV-RECOMBINANTDNATECHNOLOGY Recombinantvaccines,transgenicmicrobes,plantsandanimals.Animalcloning,biosensors, biochips.	**9**
TotalHours	**45**

Textbook(s)	
1	N.A.Campbell,J.B.Reece,L.Urry,M.L.CainandS.A.Wasserman,"Biology:Aglobalapproach",PearsonEducationLtd,2018.
2	ArthurTJohnson,BiologyforEngineers,CRCpress,2011.
Reference(s)	
1	Albertsetal.,Themolecularbiologyofthecell,6/e,GarlandScience,2014.
2	E.E.Conn,P.K.Stumpf,G.BrueningandR.H.Doi,"OutlinesofBiochemistry",JohnWileyandSons,2009.
3	JohnEnderleandJosephBronzinoIntroductiontoBiomedicalEngineering,3/e,2012.

Onthesuccessfulcompletionofthecourse, studentswillbeableto

Course Outcome		Level
CO1	Knowandillustratebio-engineering field.	K1
CO2	Applytheprinciplesofbiologytocreatetangibleandeconomicallyviable engineeringgoods	K4
CO3	Analysetheimportanceofbioenergeticsandapplytheknowledgeto improvethelivingstandardsofsocieties.	K4
CO4	Applytheknowledge oflifescienceingenetic engineering.	K4
CO5	Designanddevelopnewtechnologiesingeneticindustrialfield.	K5

MappingwithProgramOutcomes

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PS O1	PS O2	PS O3
CO1	2	3	1	2	1	1	1	-	-	-	1	1	1	1
CO2	2	3	1	2	1	1	-	-	-	-	1	1	1	1
CO3	2	3	1	1	1	1	1	-	-	-	1	1	1	1

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

AE24411-STRENGTHOFMATERIALSLABORATORY								
Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	0	0	4	60	2			

Course Objective

- Toexposethestudentstothetestingofdifferentmaterialsundertheactionofvarious forces and determination of their characteristics experimentally.

LISTOFEXPERIMENTS	
1. Tensiontestonsteelrod 2. Compressiontestonwood 3. Doublesheartestonmetal 4. Torsiontestonmildsteelrod 5. Impacttestonmetalspecimen(IzodandCharpy) 6. Hardnesstestonmetals(RockwellandBrinellHardnessTests) 7. Deflectiontestonmetalbeam 8. Compressiontest onhelicalspring 9. Deflectiontestoncarriagespring	**60**
TotalHours	**60**

Reference(s)

1	StrengthofMaterialsLaboratoryManual,AnnaUniversity,Chennai-600025.
2	IS1786-2008(FourthRevision,Reaffirmed2013),'Highstrengthdeformedbarsandwiresfor concretereinforcement–Specification',2008.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

Course Outcome		Level
CO1	Calculatethestressdistributionandstrainsinregularandcomposite Structure subjectedtoaxial loads.	K4
CO2	Assesstheshearforce,bendingmomentandbendingstressesinbeams	K4
CO3	Applytorsionequationindesignofcircularshaftsandhelicalsprings	K4

MappingwithProgramOutcomes

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

AE24412-CADFORAGRICULTURALENGINEERING

Semester	Hours/Week			Total Hours	Credit	MaximumMarks		
	L	T	P		C	CA	ES	Total
III	0	0	4	60	2			

Course Objective

- To draftthe agriculturalengineering relatedmachineries and structures manuallyand also bycomputer aided methods.

LISTOFEXPERIMENTS	
1. DesignandDrawing ofUndergroundpipeline system 2. DesignandDrawing ofCheckdam 3. DesignandDrawingofMouldboardplough 4. DesignandDrawingofDiskplough 5. DesignandDrawing ofPost-harvesttechnologyunits(threshersandwinnowers)	**60**

6. DesignandDrawingofBiogasplant. 7. Introduction&demonstrationon3Dmodelingsoftwarelike Pro/E, Creo, Solid works,Solid Edge etc.	
TotalHours	**60**

Reference(s)

1	Garde,R.J.,FluidMechanicsthroughproblems.NewAgeInternationalPublishers(P)Ltd.,NewDelhi,2002.
2	MichaelA.M.andS.D.Khepar,WaterWellandPumpEngineering.TataMcGrawHillCo.NewDelhi,2005.

Onthesuccessfulcompletionofthecourse,studentswillbeableto

CourseOutcome		**Level**
CO1	Understandtheplanandlayoutofundergroundpipes,postharvestingunitsandcheck dams.	K4
CO2	Designanddrawthecomponentsusingcomputeraidedmethods.	K4

MappingwithProgramOutcomes

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

3 – Strong,2–Medium,1–Low