SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY

Scheme of Teaching and Evaluation 2025-2029 (As per NEP-2020)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(Effective from the Academic year 2025-2026)

I-SEMESTER B.Tech. Artificial Intelligence and Data Science

S.N.	Course Code	Course Title	Teaching Hours/Week			Examination				Credits
			Theory Lectures	Tutorial	Practical/ Drawing	Examination in Hours	CIA Marks	SEA Marks	Total Marks	
			L	**T**	**P**					
1	AMUATB4	Engineering Mathematics – B	3	1	-	03	40	60	100	4
2	PPUATB2	Engineering Physics	3	1	-	03	40	60	100	4
3	ITUATE3	Introduction to Artificial Intelligence: Concepts and Applications	3	-	-	03	40	60	100	3
4	EEUATE1	Introduction to Electrical Engineering	3	-	-	03	40	60	100	3
5	ELUATH1	English for Communication	3	-	-	03	40	60	100	3
6	ECUATH2 / CSUATH2 / ITUATH2	Human Values & Ethics	1	-	-	02	50	-	50	1
7	PPUALB2	Engineering Physics Laboratory	-	-	2	03	25	25	50	1
8	MEUALL1	Engineering Graphics	1	-	3	03	25	25	50	3
9	ITUALE3	Artificial Intelligence Fundamentals Laboratory	-	-	2	03	25	25	50	1
10	NSUALS1	NSS			2	01	25	25	50	1
Total			17	2	9	27	350	400	750	24

Note: AM: Mathematics, PP: Physics, ME: Mechanical Engineering, IP: Industrial & Production Engineering, CE: Civil Engineering, CS: Computer Sc. & Engg., IT: Information Technology, PE: Physical Education, NS: NSS, U: Undergraduate, T: Theory, L: Laboratory

BASIC SCIENCE (B)	ENGINEERING SCIENCE (E)	SKILL ENHANCEMENT COURSE (L)	HUMANITIES SCIENCE (H)	MANDATORY COURSE (C)	EXTRA-CURRICULAR ACTIVITIES (S)
1. Engineering Mathematics -B **2. Engineering Physics** **3. Engineering Physics Laboratory**	**1. Introduction to Artificial Intelligence: Concepts and Applications** **2. Introduction to Electrical Engineering** **3. Artificial Intelligence Fundamentals Laboratory**	**1. Engineering Graphics**	**1. English for Communication** **2. Human Values and Ethics**		**1. NSS**

Credit Definition:
- ➢1-hour lecture (L) per week per semester = 1Credit
- ➢1-hour tutorial (T) per week per semester = 1Credit
- ➢2-hour Practical/Drawing(P) per week per semester = 1 Credit

- ➢ Four credit courses are to be designed for 50 hours of Teaching-Learning process.
- ➢ Three credit courses are to be designed for 40 hours of Teaching-Learning process.
- ➢ Two credit courses are to be designed for 30 hours of Teaching-Learning process.
- ➢ One credit courses are to be designed for 15 hours of Teaching-Learning process

Note: The above is applicable only to THEORY courses

AICTE Activity Points to be earned by students admitted to B.Tech. programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines):
Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.
The activities can be spread over the years, any time during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression.

Eligibility for UG Certificate:

A. Undergraduate Certificate course will be offered by all departments of SoS(E&T), GGV.

B. For applicability of UG Certificate, the candidate who wants to exit after completing 1st year (02 semesters) BTech degree with 10 credits of skill-based courses lasting two months, including at least 06 credits job specific internship/apprenticeship with NHEQF level 5/UCF level 4.5.

C. A student shall report to the concerned Head on or before the date notified by the Department/School/University, if he/she is interested to exit with UG Certificate

SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY

Scheme of Teaching and Evaluation 2025-2029 (As per NEP-2020)

Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

(Effective from the Academic year 2025-2026)

II-SEMESTER B.Tech. Artificial Intelligence and Data Science

S.N.	Course Code	Course Title	Teaching Hours/Week			Examination				Credits
			Theory Lectures	Tutorial	Practical/ Drawing	Examination in Hours	CIA Marks	SEA Marks	Total Marks	
			L	T	P					
1	AMUBTB1	Engineering Mathematics – A	3	1	-	03	40	60	100	4
2	CYUBTB3	Engineering Chemistry	3	-	-	03	40	60	100	3
3	ITUBTE3	Introduction to Data Science & Exploratory Data Analysis	3	-	-	03	40	60	100	3
4	ECUBTE7	Introduction to Electronics & Communication Engineering	3	-	-	03	40	60	100	3
5	LAUBTC1	Indian Constitution	1	-	-	01	50	-	50	1
6	FOUBTC2	Environmental Science and Ecology	2	-	-	03	40	60	100	2
7	CYUBLB3	Engineering Chemistry Laboratory	-	-	2	03	25	25	50	1
8	IPUBLL2	Engineering Workshop Practices	-	-	2	03	25	25	50	1
9	ITUBLE3	Data Science Tools Lab	-	-	2	03	25	25	50	1
10	PEUBLS2	Sports and Yoga	-	-	2	-	25	25	50	1
Total			15	1	8	25	350	400	750	20

Note: AM: Mathematics, PP: Physics, ME: Mechanical Engineering, IP: Industrial & Production Engineering, CE: Civil Engineering, CS: Computer Sc. & Engg., IT: Information Technology, PE: Physical Education, NS: NSS, U: Undergraduate, T: Theory, L: Laboratory

BASIC SCIENCE (B)	ENGINEERING SCIENCE (E)	SKILL ENHANCEMENT COURSE (L)	HUMANITIES SCIENCE (H)	MANDATORY COURSE (C)	EXTRA-CURRICULAR ACTIVITIES (S)
1. Engineering Mathematics – A **2. Engineering Chemistry** **3. Engineering Chemistry Laboratory**	**1. Introduction to Data Science & Exploratory Data Analysis** **2. Introduction to Electronics & Communication Engineering** **3. Data Science Tools Lab**	**1. Engineering Workshop Practices**		**1. Indian Constitution** **2. Environmental Science and Ecology**	**1.Sports and Yoga**

Credit Definition:
- ➢1-hour lecture (L) per week per semester = 1Credit
- ➢1-hour tutorial (T) per week per semester = 1Credit
- ➢2-hour Practical/Drawing(P) per week per semester = 1 Credit

- ➢ Four credit courses are to be designed for 50 hours of Teaching-Learning process.
- ➢ Three credit courses are to be designed for 40 hours of Teaching-Learning process.
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- ➢ One credit courses are to be designed for 15 hours of Teaching-Learning process

Note: The above is applicable only to THEORY courses

AICTE Activity Points to be earned by students admitted to B.Tech. programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines):
Over and above the academic grades, every regular student admitted to the 4 years Degree program and every student entering 4years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.
The activities can be spread over the years, any time during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression.

Eligibility for UG Certificate:

A. Undergraduate Certificate course will be offered by all departments of SoS(E&T), GGV.

B. For applicability of UG Certificate, the candidate who wants to exit after completing 1st year (02 semesters) BTech degree with 10 credits of skill-based courses lasting two months, including at least 06 credits job specific internship/apprenticeship with NHEQF level 5/UCF level 4.5.

C. A student shall report to the concerned Head on or before the date notified by the Department/School/University, if he/she is interested to exit with UG Certificate

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	**AMUBTB4**	L	T	P	CT - 1	CT - II	Attendance & Assignments	TOTAL	60	100	04
Subject:	**ENGINEERING MATHEMATICS - B**	3	1	-	15	15	10	40			

Course Objectives:

1.To study the concepts of vector space, linear transformation, matrices and system of linear equations.

2.To find the roots of equations i.e. quadratic and bi-quadratic equations.

3.To study the concept of gradient, divergence, curl, Green's theorem, Gauss's theorem and Stokes's theorem and their applications.

4.To study the properties of complex numbers and to establish the relation between exponential, hyperbolic and logarithm functions.

5.To test the nature of infinite series i.e. convergence, divergence and oscillatory.

UNIT-1: Linear Algebra

Vector space, linear dependence and linear independence of vectors, linear transformations, rank and inverse by elementary transformations, system of linear equations – consistency and inconsistency, eigen value and eigen vectors, Caley-Hamilton theorem and its application to find the inverse.

UNIT-2: Theory of Equations

Polynomial and polynomial equations, division algorithms, roots of equations, remainder theorem, factor theorem, synthetic division, fundamental theorem of algebra, multiplication of roots, Descarte's rule of sign, Descarte's method.

UNIT-3: Vector Calculus

Vector functions, differentiation of vectors, velocity and acceleration, scalar and vector field gradient of scalar field, directional derivative, properties of gradient, divergence of vector, curl of vector, point function, properties of divergence and curl, integration of vector function, line integral, surface integral, Green's theorem, gauss theorem, Stoke's theorem (without proof) and their simple applications,

UNIT-4: Complex Number

Complex numbers and its properties, conjugate complex numbers, standard form of complex numbers, De-Moivre's theorem, Roots of complex numbers, exponential function of complex variable, circular form of complex variable, Hyperbolic function of complex numbers, Logarithmic function of complex numbers.

UNIT-5: Infinite Series

Sequence, convergent, divergent, oscillating sequence, infinite series, behavior of infinite series, ratio test, root test, comparison test, Raabe's test, Logarithmic test.

Recommended Books:

1. N.P. Bali, A Textbook of Engineering Mathematics, Laxmi publications, 10th edition, 2016.
2. H.K. Das, Higher Engineering Mathematics, S. Chand, 2014

3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition

Course Outcomes: After completion of this course, the students will be able:

1. To know the concept of vector space, matrices and their various properties and also be able to solve the system of linear equations.
2. To solve the quadratic and bi-quadratic equations.
3. To solve the problems of gradients, divergent, curl and the applications of vector calculus.
4. To find the roots of complex numbers with the help of De-Moivre's theorem.
5. To know the convergence and divergence of infinite series using various type of tests.

Course Outcomes and their Mapping with Programme Outcomes: ENGINEERING MATHEMATICS – B (AMUBTB4)

CO	PO												PSO		
	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	2
CO2	3	2		1	1				1	2		2	1	1	2
CO3	2	2		1	1				1	2		2	1	1	2
CO4	2	2		1	1				1	2		2	1	1	2
CO5	2	2		1	1				1	2		2	1	1	2

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	PPUATB2	L	T	P	CT - 1	CT - II	Attendance & Assignments	TOTAL	60	100	04
Subject:	ENGINEERING PHYSICS	3	1	-	15	15	10	40			

Course Objectives:

1.To know the basic principles, effects and applications such as physical, optical parameters used for engineering applications.

2.To learn about various laws and applications of electromagnetic theory.

3.To know the basic structure, working principles and applications of lasers and optical fibre communication.

4.To know the basics of semiconductor physics, semiconductor materials and devices and its characterization for advance technological applications

5.To familiarize the basis of quantum theory and to make students to solve the physical problems for advancement of the technology.

Unit 1: Optics: Interference and Diffraction

Introduction, Young's experiment theory of interference, Coherent and non-coherent sources, Fresnel's Bi- prism and Newton's ring experiment.

Diffraction of light, Fresnel and Fraunhofer's diffraction, diffraction due to plane diffraction grating.

Unit 2 Electromagnetic Theory

Coulomb's law electrostatics field and potential, electric flux, Gauss' law, Poisson's and Laplace's equation. Equation of continuity for charge conservation, Ampere's and Faraday's laws, Maxwell's Electromagnetic equations.

Unit 3 Laser and Fiber optics

Introduction, elementary idea of spontaneous and stimulated emission, active medium population inversion, Einstein's coefficients, Types of lasers and important applications of lasers. Introduction to optical fibers, basic principles of optical fiber, critical angle numerical aperture, maximum acceptance angle, classification of optical fiber.

Unit 4 Semiconductor physics and Devices

Formation of energy in solids, Energy band gap of metals, insulators and semiconductors, classification of semiconductors: Intrinsic and Extrinsic semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, Electrical conductivity in conductors and semiconductors, working of P-N junction diodes and bipolar junction transistor.

Unit 5 Introduction to Quantum Mechanics

Introduction to Quantum Mechanics, photoelectric effect, Compton effect, wave-particle duality, uncertainty principle, wave function, De-Broglie waves, phase and Group velocity, Davisson and Germer experiment, Schrodinger wave equation, particle in a box (I-Dimensional)

Course Outcome: At the end of the course, students will be able to:

1. Student's ability to understand the basic principles and applications of physical optics for

physical parameters measurements such as length, thickness, aperture size etc.
2. Student's will be able to design, characterized the lasers and optical fibers and their effective utilization in optical communications, imaging etc.
3. Students demonstrate appropriate competence and working knowledge of laws of electromagnetic theory and semiconductor physics and devices for their advance applications

Textbooks/References:

1. Applied physics-I and II By Navneet Gupta, Dhanpat Rai &Co.
2. Engg. Physics by S.K. Srivastava and R.A. Yadav, New Age Pub. New Delhi
3. Engg. Physics by Uma Mukherjee, Narosa Publication.
4. Engg. Physics by M.N. Avadhanulu, S. Chand Pub.
5. Electricity and Magnetism by Rangwala and Mahajan, Tata McGraw Hill.1998
6. Concepts of Physics Part-II by H.C. Verma, Bharati Bhawan (P&D),1998
7. Modern physics by Beiser, McGraw Hill Inc. New York, Publication1995
8. Modern physics by Mani and Mehta, East-West PressPvt.Ltd.1998
9. Introduction to Electrodynamics, David Griffith
10. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
11. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons.Inc.2007).
12. S.M. Sze, Semiconductor Devices: physics and Technology, Wiley (2008)
13. Yariv and P. yeh, Photonics Optical Electronics in Modern Communications, Oxford University press, New York(2007)
14. P. Bhattacharya, Semiconductor Optoelectronic Devices, prentice Hall of India(1997)
15. Online course: "Semiconductor Optoelectronics" by M. R. Shenoy on NPTEL.
16. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak on NPTEL.

Course Outcomes and their Mapping with Programme Outcomes: ENGINEERING PHYSICS (PPUATB2)

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

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ITUATE3	L	T	P	CT-1	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	INTRODUCTION TO ARTIFICIAL INTELLIGENCE : CONCEPTS AND APPLICATIONS	3	-	-	15	15	10	40			

Course Objective:

1.To introduce the fundamental concepts of Artificial Intelligence (AI)
2.To understand the basic building blocks of AI applications
3.To explore real-world applications of AI in various domains
4.To develop a foundation for further study in AI-related courses

UNIT I: Foundations of Artificial Intelligence

Artificial Intelligence definition, History and evolution of AI, Scope and goals of AI, Types of AI (Narrow, General, Super AI), Intelligent agents and environments, Components of intelligent systems, Rationality, PEAS framework, AI in Indian context.

UNIT II: Problem Solving and Search Strategies

Problem-solving as search, State-space representation, Uninformed search: BFS, DFS, DLS, IDS, Informed search: Greedy, A*, Heuristics, Constraint satisfaction problems, Game playing: Minimax, Alpha-beta pruning, Real-life applications: Route planning, Game AI.

UNIT III: Knowledge Representation and Logic

Knowledge-based agents, Propositional logic, First-order predicate logic, Syntax and semantics, Inference and resolution, Rule-based systems, Forward and backward chaining, Semantic networks, Frames, Ontologies, Uncertainty and probabilistic reasoning.

UNIT IV: Basics of Machine Learning

Introduction to machine learning, Supervised learning: Linear regression, Decision trees, Unsupervised learning: Clustering, K-means, Reinforcement learning basics, Neural networks introduction, Activation functions, AI tools: Python, Scikit-learn, Weka, Google Colab.

UNIT V: AI Applications and Ethical Perspectives

AI in robotics, healthcare, education, agriculture, transportation, AI in smart cities and governance, AI for social good, Bias and fairness in AI, Privacy and surveillance, Employment and automation, Indian AI policy and initiatives, Responsible AI and SDGs.

Course Outcome:

By the end of this course, students will be able to:
1.Understand the evolution and scope of Artificial Intelligence.
2.Apply foundational AI techniques such as search and logic.
3.Demonstrate understanding of basic Machine Learning principles.
4.Evaluate AI applications in fields like healthcare, robotics, and education.

5.Identify societal and ethical considerations in AI systems.

TEXT/ REFERENCE BOOKS:

Text Books

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, 4th Edition, 2021.
2. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 3rd Edition, 2009.
3.Dr. S. R. Jangid, Artificial Intelligence, Wiley India Pvt Ltd, 2022.

Reference Books

1.Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education India, 2013.
2.Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann, 1998.
3.Padhy, N.P., Artificial Intelligence and Intelligent Systems, Oxford University Press, 2005.
4.M. Tim Jones, Artificial Intelligence: A Systems Approach, Jones and Bartlett Publishers, 2008.
5. Satish Kumar, Neural Networks: A Classroom Approach, McGraw Hill Education India, 2nd Edition, 2017.

Course Outcomes and their Mapping with Programme Outcomes: INTRODUCTION TO ARTIFICIAL INTELLIGENCE: CONCEPTS AND APPLICATIONS (ITUATE3)

CO	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2				1						1	3	2
CO 2	1	1	3	2	2	1	1					1	3	2	1
CO 3	3	3	2	3	3	2	2			1		1	3	2	1
CO 4	2	2	3	1	3	3	2		1	2	2	2	2	3	2
CO 5	1	1			1	3	3	3	2	2	1		1	2	2

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	EEUATE1	L	T	P	CT- 1	CT - II	Attendance & Assignments	TOTAL	60	100	03
Subject:	INTRODUCTION TO ELECTRICAL ENGINEERING	3	-	-	15	15	10	40			

Course Objective:

- To analyze basic concepts of DC and AC circuits.
- To explain construction and operation of transformers,
- To explain the concept and working of DC machines and Induction motor.
- To explain electric installation, wiring, billing and safety measures.

UNIT I: DC CIRCUITS: Electrical circuit elements (R, L and C), voltage and current sources, Ohms Law, Kirchhoff"s current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits. Mesh & nodal analysis, Star- Delta transformation and circuits.

UNIT II: AC CIRCUITS: Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. Three-phase power measurement- Two- Wattmeter method.

UNIT III: ELECTROMAGNETISM: Concept of Magnetic effect of electric current, faraday"s law of electromagnetism. BH curve, Analogy of Electric and magnetic Circuits. Concept of flux flow in magnetic circuits. TRANSFORMERS Construction, classification, ideal and practical transformer, equivalent circuit, losses in transformers, tests, voltage regulation and efficiency. Introduction to three phase transformers.

UNIT IV: DC AND AC MACHINES: Construction, Working Principle, losses and efficiency of DC Machines and three phase Induction Machine, Torque Equations, DC motor: Principle of operation, speed control.

UNIT V: ELECTRICAL INSTALLATIONS& SAFETY: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, Earthing – Types of earthing and its importance. Electrical wiring: Conduit and concealed wiring, Two way and Three-way control of lamps. Safety precautions for electrical appliances. Calculations for energy consumption and billing.

Course Outcome: At the end of the course, the student will be able to :

CO1: Analyse basic DC and AC electric circuits.

CO2: Explain the working principles of transformers and its tests.

CO3: Explain the concepts of DC and AC machines and their applications

CO4: Understand the wiring methods, working principles of circuit protective devices, electrical billing and safety measures.

TEXT/ REFERENCE BOOKS:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. B L Theraja and AK Theraja," A Textbook of Electrical Technology- Vol-I & II, S. CHAND &Co ltd, 2013.

4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. P.V. Prasad et al., Basic Electrical Engineering, Cengage 2019

Course Outcomes and their Mapping with Programme Outcomes: INTRODUCTION TO ELECTRICAL ENGINEERING (EEUATE1)

CO	PO1	PO 2	PO3	PO 4	PO 5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2									3	2	1
CO 2	2	2	3	1									3	2	1
CO 3	2	3	3	2	1								3	2	2
CO 4	1	2	2	2		3	3	2					2	3	2

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ELUATH1	L	T	P	CT - 1	CT - II	Attendance & Assignments	TOTAL	60	100	03
Subject:	ENGLISH FOR COMMUNICATION	3	0	-	15	15	10	40			

Course Objectives

To build up word power, to brush up the knowledge of English grammar, to develop good writing and speaking skills in the students

Unit 1: -Vocabulary Building

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

Unit 2: -Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, creating coherence, organizing principles of paragraphs in documents, Techniques for writing precisely

Unit 3: -Identifying Common Errors in Writing

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

Unit 4: -Nature and Style of sensible Writing

Describing, Defining, Classifying, providing examples or evidence, Writing introduction and conclusion.

Unit 5: -Writing Practices

Comprehension, Précis Writing, Essay Writing.

Oral Communication (This unit involves interactive practice sessions in Language Lab)

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues Communication at Workplace, Interviews, Formal Presentations

Course Outcome:

1. At the end of the course students will be able learn a lot of new words. They also learnt the particularities and peculiarities of English grammar. As a result, they could speak and write English with the least possible error

Textbooks/References:

1. Practical English Usage. Michael Swan. OUP.1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book.2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.
4. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press.2011.
5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford UniversityPress

Course Outcomes and their Mapping with Programme Outcomes: ENGLISH FOR COMMUNICATION (ELUBTH1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1	1	1	2	1		1	3	3	2	3			1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ECUATH2 (for ECE) CSUATH2 (for CSE) ITUATH2 (for IT)	L	T	P	CT-1	CT-II	Attendance & Assignments	TOTAL	-	50	1
Subject:	HUMAN VALUES & ETHICS	1	0	-	20	20	10	50			

Course Objective:

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

COURSE OUTCOME:

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

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

UNIT I: Introduction to Value Education

1. Value Education, Definition, Concept and Need for Value Education.
2. The Content and Process of Value Education.
3. Basic Guidelines for Value Education.
4. Self-exploration as a means of Value Education.
5. Happiness and Prosperity as parts of Value Education.

UNIT II: Harmony in the Human Being

1. Human Being is more than just the Body.
2. Harmony of the Self ('I') with the Body.
3. Understanding Myself as Co-existence of the Self and the Body.
4. Understanding Needs of the Self and the needs of the Body.
5. Understanding the activities in the Self and the activities in the Body.

UNIT III: Harmony in the Family and Society and Harmony in the Nature

1. Family as a basic unit of Human Interaction and Values in Relationships.
2. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love.
3. Comprehensive Human Goal: The Five Dimensions of Human Endeavour.
4. Harmony in Nature: The Four Orders in Nature.
5. The Holistic Perception of Harmony in Existence.

UNIT IV: Social Ethics

1. The Basics for Ethical Human Conduct.
2. Defects in Ethical Human Conduct.
3. Holistic Alternative and Universal Order.
4. Universal Human Order and Ethical Conduct.
5. Human Rights violation and Social Disparities.

UNIT V: Professional Ethics

1. Value based Life and Profession.
2. Professional Ethics and Right Understanding.
3. Competence in Professional Ethics.
4. Issues in Professional Ethics – The Current Scenario.
5. Vision for Holistic Technologies, Production System and Management Models.

COURSE OUTCOME:

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

1.Understand the significance of value inputs in a classroom and start applying them in their life and profession

2.Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.

3.Understand the role of a human being in ensuring harmony in society and nature.

4.Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

TEXT BOOKS

1.A. N.Tripathy, New Age International Publishers, 2003.
2.Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004
3.Bertrand Russell Human Society in Ethics & Politics

REFERENCE BOOKS

1. Corliss Lamont, Philosophy of Humanism
2. Gaur. R.R., Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3. Gaur. R.R., Sangal. R, Bagaria. G.P, Teachers Manual Excel Books, 2009.
4. I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar
5. Mortimer. J. Adler, – Whatman has made of man
6. William Lilly Introduction to Ethic Allied Publisher

Course Outcomes and their Mapping with Programme Outcomes: HUMAN VALUES AND ETHIC ITUATH2 (for IT)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								3	3						
CO2								3	3						
CO3								3	3						
CO4								3	3						

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	PPUALB2	L	T	P	IA	MSE	TOTAL	25	50	01
Subject:	ENGINEERING PHYSICS LABORATORY	-	-	2	25	--	25			

Course Objectives:

1. To learn and perform the various practical related to optics and its related phenomena's like interference, diffraction and polarization.
2. To apply basic optical phenomena's for measurements such as thickness, refractive index, dispersive power, aperture size etc.
3. To characterized various optical sources such as laser, mercury light, sodium light, gratings, prism and lens.
4. To characterize various semiconductor materials and devices (PN Jn., Transistor, LED and Solar Cell) for their energy band gap, resistivity and IV characteristics.

LIST OF PRACTICALS:

1. To determine the wavelength of sodium light with help of Fresnel's Bi-prism.
2. To determine the refractive index and dispersive power of the material of prism with the help of spectrometer.
3. To determine the sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating using spectrometer.
5. To demonstrate the diffraction pattern and determine the wavelength of different colours of mercury (white) light using plane diffraction grating and spectrometer.
6. To determine the wavelength and number of line per cm on a diffraction grating using semiconductor laser diode.
7. To determine the specific rotation of sugar solution with the help of polarimeter.
8. Determine the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
9. To determine the energy band gap (E_g) of a semiconductor material using P-N junction diode.
10. To determine the e/m ratio by the Thomson's method.
11. To study the P-N junction diode characteristics, in forwarded and reverse bias conditions.
12. To study the Zener diode characteristics.
13. To study the characteristics and gain of Transistor in C-B and C-E mode.
14. Determine the Planck's constant.

Course Outcomes: On completion of the course, the students would be able to:

1. Know about basic optical facts and phenomenon, characterization of optical components and devices
2. To know the basic semiconductor materials and devices and their applications
3. To know how the performance of semiconductor devices can be improved.

Course Outcomes and their Mapping with Programme Outcomes: ENGINEERING PHYSICS LABORATORY (**PPUBLB2**)

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

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	MEUALL1	L	T	P	IA	MSE	TOTAL	25	50	03
Subject:	ENGINEERING GRAPHICS	1	-	3	25	--	25			

Course Objectives:

1. To learn the basic of Engineering Drawing and Orthographic Projections
2. To learn the Sections and Sectional Views of Right Angular Solids
3. To learn the Isometric Projections covering and overview of Computer Graphics

UNIT 1: Introduction Engineering Graphics and Engineering Curves: Principles of engineering graphics and their significance – drawing instruments and their use – conventions in drawing – lettering – BIS conventions. Dimensioning rules, geometrical construction. Engineering Curves - Conic Sections, Special Curves-Cycloids, Epicycloids, Hypocycloids, Involutes and trochoid.

UNIT 2: Projection of Points, Straight lines and Planes: Principles of orthographic projections – conventions – first and third angle projections. Projections of points and lines inclined to both the planes. Projections of regular planes, inclined to both planes

UNIT 3: Projections Solids: Introduction, Type of solid, Projections of solids in simple position, Projection of solids with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P.

UNIT 4: Section of Solids and Development of Surfaces: Sectioning of regular solids - Section planes perpendicular to one plane and parallel or inclined to other plane - Development of surfaces of right, regular solids – development of prisms, cylinders, pyramids, cones and their parts.

UNIT 5: Isometric Projections and Orthographic Views: Principles of Isometric Projections-Isometric Scale- Isometric Views Conventions-Plane Figures, Simple and Compound Solids. Conversion of isometric views to orthographic views. Conversion of orthographic views to isometric projections, vice- versa. Introduction to perspective projection.

Computer Aided Drafting: Introduction to computer aided drafting package to make 2-D drawings. Demonstration purpose only - not to be included in examinations.

Textbooks/References:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. CAD Software Theory and User Manuals

Course Outcomes:

At the end of the course, the student shall be able to

1. Describe the fundamentals of engineering drawing and construct basic engineering curves.
2. Enhance visualization skill using projections of points, lines and planes.
3. Enhance visualization skill using projections of solids.
4. Enhance visualization skill using construction of sections of solids and development of surfaces.
5. Comprehend the theory of Orthographic and Isometric projections and views

Course Outcomes and their Mapping with Programme Outcomes: ENGINEERING GRAPHICS (MEUBLL1)

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

Weightage: 1-Sightly; 2-Moderately; 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	ITUALE3	L	T	P	IA	MSE	TOTAL	25	50	01
Subject:	ARTIFICIAL INTELLIGENCE FUNDAMENTALS LABORATORY	-	-	2	25	--	25			

Course Objective:

1.To introduce students to array and matrix manipulation using NumPy for AI problem solving.
2.To enable students to process, clean, and analyze data using Pandas DataFrames.
3.To develop a strong understanding of fundamental operations including data selection, transformation, and aggregation.
4.To implement basic AI-related computations like linear regression, clustering, and evaluation metrics from scratch.
5.To encourage manual implementation of AI logic using core Python libraries (NumPy, Pandas) without external ML libraries.

List of Experiments

1 Introduction to NumPy: Creating arrays, array indexing, slicing, reshaping
2 NumPy Arithmetic: Element-wise operations, broadcasting, matrix operations
3 NumPy Linear Algebra: Dot product, transpose, inverse, solving equations
4 Introduction to Pandas: Creating Series and DataFrames
5 DataFrame Operations: Indexing, selection, filtering, and sorting
6 Data Cleaning: Handling missing data, fillna(), dropna()
7 Descriptive Statistics using Pandas: mean(), median(), std(), describe()
8 Grouping and Aggregation in Pandas: groupby(), aggregate(), pivot_table()
9 Data Merging and Joining: merge(), concat(), join() in Pandas
10 Data Visualization (optional basic): plot(), histogram() using Pandas
11 Reading and Writing CSV files using Pandas
12 Simple Linear Regression using NumPy arrays (manual formula)
13 K-Means Clustering (basic 2D) from scratch using NumPy
14 Calculating Confusion Matrix and Accuracy manually using Pandas

Course Outcome: After completing this course, students will be able to:
1. Create and manipulate arrays using NumPy including indexing, slicing, reshaping, and matrix operations.
2. Perform mathematical and linear algebra operations using NumPy such as dot product, inverse, and system solving.
3. Construct and manipulate Pandas Series and DataFrames to handle tabular data effectively.
4. Execute data cleaning, transformation, grouping, and aggregation operations using Pandas.
5. Visualize data and perform basic analysis through Pandas plotting and descriptive statistics functions.
6. Implement simple AI algorithms like linear regression, k-means clustering, and confusion matrix manually.

TEXT/ REFERENCE BOOKS:

1. Wes McKinney, Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython, 3rd Edition, O'Reilly Media, 2022.
2. Jake VanderPlas, Python Data Science Handbook: Essential Tools for Working with Data, O'Reilly Media, 2016.

3. Ashwin Pajankar, NumPy and Pandas Recipes: A Problem-Solution Approach, Apress, 2017.

Course Outcomes and their Mapping with Programme Outcomes: ARTIFICIAL INTELLIGENCE FUNDAMENTALS LABORATORY (ITUALE3)

CO	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2									3	2	1
CO 2	3	3	3	2									3	2	2
CO 3	2	2	3	2									3	2	2
CO 4	2	2	3	2									3	2	2
CO 5	2	2	2	1									2	3	2
CO 6	3	3	3	3									3	3	3

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE Viva/ Assessment	Grand total	Credits
Subject Code:	NSUALS1	L	T	P	Attendance	Activities	TOTAL	25	50	01
Subject:	NSS	-	-	2	5	20	25			

Course Objectives:

1. To develop Personality
2. To do Community Service
3. To do social Awareness and Empowerment
4. To enhance Skill
5. To work for National Integration

Program Head 1: Cleaning Program **(06 Hours/ Semester)**

Program Head 2: Plantation **(06 Hours/ Semester) Program Head 3:** Health Camp/Special Days celebration **(10 Hours/ Semester) Program Head 4:** Awareness program/Ralley **(06 Hours/ Semester)**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

1. Observe his/her internal ability and develop own personality.

2. Apply knowledge of the importance of cleanliness and hygiene in their surroundings and develop skills in waste management and recycling.

3. Apply knowledge towards the significance of greenery and environmental conservation, participate in tree plantation drives, and understand the process of nurturing and caring for plants.

4. Apply knowledge of health issues prevalent in the community and methods of prevention and organizing health camps and awareness programs on special days like World Health Day or World AIDS Day.

5. Express social issues and their impact on the community. Actively participate in awareness programs and rallies to create awareness about social problems like gender inequality, or environmental degradation.

Course Outcomes and their Mapping with Programme Outcomes: NSS (NSUALS1)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									1						
CO2			1			1	2								
CO3			1			1	2								
CO4			1			1	2								
CO5			1			1	2								

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	AMUBTB1	L	T	P	CT - 1	CT - II	Attendance & Assignments	TOTAL	60	100	04
Subject:	ENGINEERING MATHEMATICS - A	3	1	-	15	15	10	40			

Course Objectives:

1. To study the mean value theorem and nth derivative.
2. To study the indeterminate forms, partial and total differentiation.
3. To study the various concepts of integral calculus such as reduction formula, area, volume and length.
4. To study the ordinary and partial differential equations.
5. To study the applications of ordinary and partial differential equations

Differential Calculus

UNIT-1:
Leibnitz theorem, Roll's theorem, Lagrange's theorem, Mean value theorem, Expansions of functions by McLaurian and Taylor's series, Tangents and normal, Maxima and minima.

UNIT-2:
Indeterminate forms, Asymptotes, Radius of curvature, Partial differentiation, Total differentiation.

Integral Calculus

UNIT-3:
Reduction formulae, Curve tracing, Area, Volume, Length, Surface area, Double and triple integrals, Gamma and beta function.

Differential Equations

UNIT-4:
Differential equations of first order, Linear differential equation of higher order with constant coefficient, Equations reducible to linear equations with constant coefficients, Cauchy's homogeneous linear equations, Application of linear differential equations, Simultaneous differential equations.

UNIT-5:
Series solution of differential equations about ordinary point, Partial differential equations, linear homogeneous partial differential equations, application of partial differential equations: One dimensional heat equation and wave equation.

Recommended Books:

1. N.P. Bali, A Textbook of Engineering Mathematics, Laxmi publications, 10th edition, 2016.
2. H.K. Das, Higher Engineering Mathematics, S. Chand, 2014

3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th edition

Course Outcomes: After completing the course, the students will be able to:

1. Expand the function in Maclaurin's and Taylor's series.
2. Find the limit of some indeterminate forms and solve the problems of partial and total differentiation.
3. Solve the problems related to area, volume and length.
4. Solve the ordinary and partial differential equations.
5. Solve the engineering problems using differential equations.

Course Outcomes and their Mapping with Programme Outcomes: **ENGINEERING MATHEMATICS – A (AMUATB1)**

CO	PO												PSO		
	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	2
CO2	3	2		1	1				1	2		2	1	1	2
CO3	3	2		1	1				1	2		2	1	1	2
CO4	3	3		1	1				1	2		2	1	1	2
CO5	3	3		1	1				1	2		2	1	1	2

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	CYUATB3	L	T	P	CT - 1	CT - II	Attendance & Assignments	TOTAL	60	100	03
Subject:	ENGINEERING CHEMISTRY	3	-	-	15	15	10	40			

Course Objectives:

The objective of this Course is to:

- To make aware and enrich the students about the basic concept and understanding of chemical concepts of basic Chemistry and spectroscopic techniques.

Course Content:

UNIT 1: Concept of Quantum Energy and Spectroscopy: Quantization of Energy, Regions of spectrum. Electronic Spectroscopy: Electronic Transition, Woodward Fieser rules for calculating λ_{max} of conjugated dienes & α, β-unsaturated carbonyl compound, various shifts in λ_{max} and intensities. Infra-Red Spectroscopy: Conditions for Infra-Red Spectroscopy, Molecular vibrations
& factors affecting Infra-Red frequencies.

UNIT 2: Chemical Bonding in Molecules: Introduction of Chemical Bonding, VSEPER Theory, V.B. Theory and Molecular Orbital Theory. Energy level diagrams of diatomic molecules and ions.

UNIT 3: Concept of Chirality, Enantiomers, Diastereomers, Meso-compounds and Racemic mixtures. Conformation of Acyclic hydrocarbons (Ethane, Propane & n-Butane) and cyclic hydrocarbon (Cyclohexane), Plane of symmetry, Centre of symmetry, Absolute and Relative Configuration (R &S, D & L and E & Z).

UNIT 4: Reactivity of Organic Molecules, Factors influencing acidity, basicity and nucleophilicity of molecules, kinetic vs thermodynamic control of reactions.

UNIT 5: Strategy for Synthesis of Organic Compounds: Reaction intermediates: Stability of Free Radicle, Carbocation and Carbanion. Introduction to reaction eg. Elimination and Substitution, Mechanisms of some named reactions.

Course Outcomes: After completing the course, the students will be able to:

1.Understand about quantum energy, spectroscopy and spectroscopic analysis of molecules.
2.Have adequate knowledge regarding bonding in molecules and different theories for the same. The students will be able to predict the hybridization and geometry of any molecules.
3.Understand the concept of organic molecules with respect to chirality and stereo chemistry.
4.Predict organic reactions influencing parameters and develop some knowledge regarding kinetic vs thermodynamic control of reactions.
5.Design the strategy for performing organic reactions. They will have developed a now how regarding the reaction intermediate and their stability.

Textbooks/References:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015edition.
3. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition(second).
4. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015edition.
5. A textbook of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
6. Applied Chemistry by H.D. Gesser, Springer Publishers

7. Textbook of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM
8. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
9. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co, New Delhi, 12th Edition, 2006.
10. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
11. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

Course Outcomes and their Mapping with Programme Outcomes: ENGINEERING CHEMISTRY (CYUATB3)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2			1						1	1		
CO2	2	1	1									1	1		
CO3	2	1	1									1	1		
CO4	2	1	1									1	1		
CO5	2	1	1									1	1		

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ITUBTE3	L	T	P	CT-1	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	INTRODUCTION TO DATA SCIENCE & EXPLORATORY DATA ANALYSIS	3	-	-	15	15	10	40			

Course Objective:

- To introduce the fundamental concepts and processes of data science.
- To teach students how to clean, transform, and visualize data.
- To enable hands-on practice with real-world datasets using Python.
- To help students understand exploratory data analysis (EDA) as the foundation of analytics and AI.

UNIT I: Introduction to Data Science

Definition and importance of data science, Data science vs. traditional data analysis, Data science life cycle, Roles in data science, Data sources and types (structured, unstructured), Introduction to Python and Jupyter Notebook, Python libraries for data science: NumPy, Pandas, Matplotlib, Seaborn.

UNIT II: Data Wrangling & Cleaning

Data collection and importing, Understanding data frames, Handling missing values, Detection of outliers, Data type conversion, Duplicates and inconsistencies, Feature engineering basics (scaling, encoding), Data transformation using Pandas.

UNIT III: Exploratory Data Analysis (EDA) – Part I

Descriptive statistics: mean, median, mode, variance, standard deviation, Quantiles and IQR, Frequency tables and value counts, Correlation and covariance, Data summary reports, Skewness and kurtosis.

UNIT IV: Exploratory Data Analysis (EDA) – Part II

Univariate, bivariate, and multivariate analysis, Distribution analysis, Histogram, Box plot, Pair plot, Heatmaps, Scatter plots and trend lines, Categorical vs numerical visualization, Identifying patterns and anomalies.

UNIT V: Case Studies & EDA Projects

Real-world datasets: Titanic, Iris, Retail Sales, Air Quality, COVID data, EDA report generation, Data storytelling with visuals, Data science mini-project: end-to-end analysis and interpretation, Best practices in EDA.

Course Outcomes: At the end of the course students will be able to:

- Understand the data science life cycle and its real-world applications.
- Perform data wrangling and exploratory data analysis using Python libraries.
- Create visualizations to understand data distribution, relationships, and patterns.
- Apply basic statistical techniques and insights to interpret data.
- Develop Python-based data exploration projects using NumPy, Pandas, and Matplotlib.

TEXT/ REFERENCE BOOKS:

Textbooks

1. Joel Grus, Data Science from Scratch: First Principles with Python, 2nd Ed., O'Reilly, 2019
2. Allen B. Downey, Think Stats: Exploratory Data Analysis in Python, 2nd Ed., O'Reilly, 2014

Reference Books

1. Wes McKinney, Python for Data Analysis, 3rd Ed., O'Reilly Media, 2022
2. Cathy O'Neil & Rachel Schutt, Doing Data Science, O'Reilly Media, 2013
3. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Ed., O'Reilly, 2019
4. Dr. S. B. Rao, Data Science and Big Data Analytics, PHI Learning, 2020
5. K. Usha Rani, Introduction to Data Science, Cengage Learning India, 2021

Course Outcomes and their Mapping with Programme Outcomes: **INTRODUCTION TO DATA SCIENCE & EXPLORATORY DATA ANALYSIS (ITUBTE3)**

CO	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2									3	2	1
CO 2	3	3	3	2									3	2	2
CO 3	2	2	3	2									3	2	2
CO 4	2	2	3	2									3	2	2
CO 5	2	2	2	1									2	3	2
CO 6	3	3	3	3									3	3	3

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	ECUBTE7	L	T	P	CT-1	CT-II	Attendance & Assignments	TOTAL	60	100	03
Subject:	INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING	3	-	-	15	15	10	40			

Course Objective:

- To equip students with foundational knowledge and a comprehensive overview in the field of electronics and communication engineering.
- To provide students with a fundamental grounding in electronic engineering principles essential for understanding the functionality and utilization of electronic devices, circuits, logic design, and communication systems.
- To cultivate ethical and professional attitudes in first-year engineering students, creating an academic environment that encourages teamwork, the ability to contextualize engineering issues within a broader social framework, and the pursuit of lifelong learning essential for a successful professional career.

UNIT I: Introduction to Electronics Engineering: Outline, Scope and goal of learning electronics engineering, **Introduction to semiconductor devices:** Energy bands in solids, Semiconductor & its classification, Energy band model of semiconductor, Equilibrium carrier concentration inside the energy bands, Basic principle and operation of semiconductor devices-diode, bipolar junction transistor, field effect transistors, Introduction to VLSI.

UNIT II: Applications of Semiconductor Devices: Basic concepts of rectifiers, Filters, Voltage regulators, Amplifiers and Oscillators.

UNIT III: Introduction to Digital Systems: Numbers systems, Number base conversion, Complements, Basic theorems and properties of Boolean algebra, Boolean functions, Logic gates, Logic circuit implementation using diodes and transistors, Reduction of Boolean expressions and implementation with logic gates, Karnaugh"s Map and Combinational circuits.

UNIT IV: Transducers and Sensors: Introduction, Passive Electrical Transducers, Resistive Transducers, Resistance Thermometers, Thermistor. Active Electrical Transducers, Piezoelectric Transducer, Photoelectric Transducer.

UNIT V: Basics of Communication System: Definition of signal, Standard test signals, Signals operations and its representation: shifting, folding and scaling, Classification of signals, Definition of system, System classification, System properties: additivity and homogeneity, Causality, Stability, Invertibility. Electromagnetic spectrum used for communication, Fourier transform, Elements of a communication system-transmitter and receiver, Need of modulation, Introduction to analog and digital communication systems, Examples of telecommunication systems-telephone, radio, television, mobile communication and satellite communication.

Course Outcomes: At the end of the course students will be able to:

CO1 Describe the overview of electronics and illustrate the concepts of semiconductor devices.

CO2 Elucidate and analyze the application of semiconductor device.

CO3 Develop competence knowledge to construct basic digital circuit by use of basic gate & its

function.
CO4 Illustrates the principle of Transducers and sensors.
CO5 Comprehend the need of communication & explain the different modes of communications from wired to wireless and the computing involved.

TEXT/ REFERENCE BOOKS:

1. M. S. Tyagi, "Introduction to Semiconductor Materials and Devices" Wiley, 2008.
2. D. A. Neamen, "Electronic Circuits," Tata McGrawHill Education, 2006.
3. S. C. Lee, "Digital Circuits and Logic Design," PHI Learning, 2009.
4. J. G. Proakis and M. Salehi, "Fundamentals of Communication Systems," Prentice Hall, 2004.
5. G. Kennedy, B. Davis, "Electronic Communication Systems", TMH, 4th ed., 2008.
6. W. Tomasi, "Advanced Electronic Communication Systems", Pearson/Prentice-Hall, 6th ed., 2004.
7. A. K. Sawhney, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th ed., Dhanpat Rai & Company Private Limited, 2007.

Course Outcomes and their Mapping with Programme Outcomes: INTRODUCTION TO ELECTRONICS & COMMUNICATION ENGINEERING (ECUBTE7)

CO	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	3	2									3	2	1
CO 2	3	3	3	2									3	2	2
CO 3	2	2	3	2									3	2	2
CO 4	2	2	3	2									3	2	2
CO 5	2	2	2	1									2	3	2
CO 6	3	3	3	3									3	3	3

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	LAUBTC1	L	T	P	CT - 1	CT - II	Attendance & Assignments	TOTAL	-	50	01
Subject:	INDIAN CONSTITUTION	1	-	-	20	20	10	50			

COURSE OBJECTIVE:

1. To the importance of preamble of the constitution of India.
2. To understand the fundamental rights and duty as a citizen of India.
3. To understand the functioning of union and state government and their inter-relationship.

COURSE OUTCOME: At the end of the course students will be able to:

- Describe the salient features of the Indian Constitution
- List the Fundamental Rights and Fundamental Duties of Indian citizens
- Describe the Directive Principles of State Policy and their significance

UNIT I: Introduction: Constitution-meaning of the term, Sources and constitutional theory, Features, Citizenship. Preamble**.**

UNIT II: Fundamental Rights and Duties: Fundamental Rights, Fundamental Duties, Directive Principles of State Policy

UNIT III: Union Government: Structure of Indian Union: Federalism, Centre-State relationship President: Role. Power and position, Prime Minister and council of ministers, Cabinet and Central Secretariat, Lok Sabha. Rajya Sabha

UNIT IV: State Government: Governor: Role and position, Chief Minister and council of ministers, State Secretariat

UNIT V: Relationship between Centre and States: Distribution of Legislative Powers, Administrative Relations, Coordination between States

TEXT/ REFERENCE BOOKS:

1. Constitution of India, V.N. Shukla
2. The Constitutional Law of India, J.N. Pandey
3. Indian Constitutional Law. M.P. Jain

Course Outcomes and their mapping with Programme Outcomes: Indian Constitution (Lauatc1)

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

Weightage: **1-Sightly; 2-Moderately; 3-Strongly**

SYLLABUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)				ESE	Grand Total	Credits
Subject Code:	**FOUBTC2**	L	T	P	CT - 1	CT - II	Attendance & Assignments	TOTAL	60	100	02
Subject:	**ENVIRONMENTAL SCIENCE AND ECOLOGY**	2	-	-	15	15	10	40			

Course Objective:

- To understand the concept of ecosystem and environment and its importance for sustaining life on earth.
- To be aware of the various natural resources and different types of pollution and its management.
- To gain knowledge on the sources and different types of energy for meeting daily human needs.

Course Content

UNIT – I

Introduction: Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, Economic & Social Security. Definition, Scope and basic principles of ecology and environment, Fundamentals of Ecology and Ecosystem – Structural and Functional Components. Food chain & Food webs. Ecological pyramids; Energy flow.

UNIT – II

Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures.

UNIT-III

Solid Waste Management, E- Waste Management & Biomedical Waste Management-Sources, Characteristics & Disposal methods.

UNIT – IV

Natural Resources, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water, Mineral resources, Forest Wealth, Material Cycles
– Carbon Cycle, Nitrogen Cycle & Sulphur Cycle.

UNIT-V

Energy – Different types of energy, Conventional sources & Non-Conventional sources of energy: solar energy, Hydro-electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.

Text Books

1. Fundamentals of Ecology (3rd Ed.) 2001- MC Dash, Tata - McGraw Hill, New Delhi.
2. Introduction to Environmental Engg. (1991). - GM Masters, Prentice Hall of India.
3. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing

Company Limited.
4. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies",Wiley India Private Ltd., New Delhi.
5. R Rajagopalan, "Environmental Studies – From Crisis to Cure",Oxford University Press, 2005,
6. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012

Course Outcomes: At the end of the course students will be:

1. Acquainted with different types, needs and importance of ecosystem and environmental components on earth.
2. Aware of and able to sustainably manage the natural resources and different types of pollution caused by anthropogenic activities.
3. Able to identify and know the different types and sources of energy and the strategies to conserve the conventional energy.

Course Outcomes and their Mapping with Programme Outcomes: ENVIRONMENTAL SCIENCE AND ECOLOGY (FOUATC2)

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1							3		1			1			
CO2							3		1			1			
CO3							3		1			1			

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	CYUBLB3	L	T	P	IA	MSE	TOTAL	25	50	01
Subject:	ENGINEERING CHEMISTRY LABORATORY	-	-	2	25	--	25			

Course Objectives:

The Lab sessions would help in learning:
1. Application of iodometrically & titration in lab.
2. Recognition of different chemical reaction.
3. Advanced lab methods like Spectrophotometry and chromatography

Course Content:
Group – A:

1. Standardization of sodium thiosulphate solution by standard potassium dichromate solution.
2. To determine the Normality and Strength (g/L) of given Ferrous Ammonium Sulphate solution 'A' using standard Ferrous Ammonium Sulphate (N/30) solution 'B' taking KMnO4 solution as an intermediate.
3. To determine the concentration of hypo solution ($Na_2S_2O_3.5H_2O$) iodometrically with given Iodine (N/50) solution.
4. Find out the Temporary hardness of given water sample using 0.01M EDTA solution, buffer solution (pH-10) and EBT as an indicator.
5. To determine chloride ion in a given water sample by Argentometric method (Mohr's method)

Group – B:

6. Preparation of Urea Formaldehyde resin.
7. Acetylation of Primary Amine: Preparation of Acetanilide.
8. Base Catalyzed Aldol Condensation: Synthesis of dibenzal propanone.
9. [4+2] Cycloaddition Reaction: Diels-Alde reaction.
10. Preparation of aspirin and calculate its yield.

Group – C:

11. To calculate the λ_{max} of a given compound using UV-visible spectrophotometer.
12. To separate the metallic ions by paper chromatography.
13. To determine the surface tension of a liquid by stalagmometer.
14. To determine the percentage composition of the given mixture consisting of two liquids A and B (non- interacting system) by viscosity method.
15. To determine the relative viscosity of given liquids by Ostwald's viscometer.

Note: At least two Experiments from each group must be performed.

Course Outcomes: On completion of the course, the students will be able to
1. Have develop basics of volumetric analysis and required calculation ability.

2. Develop ability to perform organic reactions calculate their yields etc.
3. Develop knowledge regarding analytical tools and colligative properties of molecules.

Course Outcomes and their Mapping with Programme Outcomes: ENGINEERING CHEMISTRY LABORATORY (CYUBLB3)

CO	PO												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1						1			1	1		1
CO2	2	2	1						1			1			1
CO3	2	2	1	1	1				1			1	1		1

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNALASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	IPUBLL2	L	T	P	IA	MSE	TOTAL	25	50	01
Subject:	ENGINEERING WORKSHOP PRACTICES	-	-	2	25	--	25			

Course Objectives:

- To impart student knowledge on various hand tools for usage in engineering applications.
- Be able to use analytical skills for the production of components, electrical switch board wiring and logic gate.

Course Content:

1. Study of M/C tools in lathe machine
Demonstration of different operations of lathe machine Practice of facing plain turning, taper turning etc

2. Study of Carpentry tools, equipments and different jobs Practice of Lap joints, Butt joints, T-Lab joints

3. Practice of Lap joint, Butt Joint, T-joint

4. Preparation of ¥ shape, square shape, work pieces as per the given specification

5. Replacement of fuse, condenser of fan/motor and fan regulator; Installation of switch board with wiring;
Concepts of measuring instruments.

6. Identification of various electronics components and their terminals; Study of logic gates AND, OR, XOR and NOT, NAND, NOR; Study of Basic ICs.

Course Outcomes: At the end of the course, students will be able to:

1. Understand the appropriate tools, materials, instruments required for specific operations in workshop.

2. Understand the figures of the hand tools used in fitting, carpentry, welding shop and machine tools such as lathe machine.

3. Understand report of procedures followed for a given task in fitting, carpentry, welding and machine shops.

4. Basic understanding of electrical equipment fitting and understanding of electronic logic gates AND, OR, NOT and ICs.

5. Basic understanding of electrical equipment fitting and understanding of electronic logic gates AND, OR, NOT and ICs. Apply techniques to perform basic operations with hand tools and power tools such as center lathe machine, fitting shop, carpentry, welding using given job drawing.

Textbooks/References:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition,2002.
3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008. (iv)Roy A. Lindberg, "Processes and Materials of Manufacture", 4thedition, Prentice HallIndia, 1998.
4. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc-Graw Hill House,2017.

Course Outcomes and their Mapping with Programme Outcomes:: ENGINEERING WORKSHOP PRACTICES (IPUBLL2)

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

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	ITUBLE3	L	T	P	IA	MSE	TOTAL	25	50	01
Subject:	DATA SCIENCE TOOLS LAB	-	-	2	25	--	25			

Course Objective:

1. To familiarize students with key tools used in data science workflows.
2. To provide hands-on experience in data manipulation, analysis, and visualization.
3. To enable students to use open-source platforms and libraries for data science.
4. To train students in performing real-world data operations using Python-based tools.

COURSE OUTCOME: By the end of this lab course, students will be able to:

1. Install and configure data science environments using Jupyter, Anaconda, or Google Colab.
2. Use Python libraries (NumPy, Pandas, Matplotlib, Seaborn) for data manipulation and visualization.
3. Explore datasets, perform cleaning, and generate descriptive statistics.
4. Visualize trends and patterns using charts, heatmaps, and plots.
5. Work with CSV, Excel, and JSON files to extract meaningful insights.

List of Experiments

1. Introduction to Data Science Tools: Jupyter Notebook, Anaconda, Google Colab
2. NumPy Basics: Arrays, Indexing, Reshaping, Mathematical operations
3. Pandas Basics: Series and DataFrames, Accessing rows and columns
4. Data Cleaning: Handling missing values, duplicates, and data type conversion
5. Data Aggregation: GroupBy, sorting, filtering, and pivot tables
6. Importing and Exporting Data: Working with CSV, Excel, and JSON files
7. Data Visualization with Matplotlib: Line plot, bar plot, pie chart
8. Data Visualization with Seaborn: Histogram, box plot, scatter plot, pair plot
9. Exploratory Data Analysis: Summary statistics, correlation, and value counts
10. Working with Time-Series Data using Pandas
11. Mini-Case Study: Titanic dataset or Student Performance dataset
12. Using Google Colab for cloud-based data science
13. Creating and Sharing Notebooks with Markdown, comments, and outputs
14. Real-time Dataset Exploration and Report Generation
15. Mini Project: End-to-end EDA report using open dataset (group-wise submission)

Reference Books

1. Wes McKinney, Python for Data Analysis, 3rd Edition, O'Reilly Media, 2022
2. Jake VanderPlas, Python Data Science Handbook, O'Reilly Media, 2016
3. Ashwin Pajankar, Data Science Crash Course, BPB Publications, 2021
4. K. Usha Rani, Introduction to Data Science, Cengage Learning India, 2021

Course Outcomes and their Mapping with Programme Outcomes: DATA SCIENCE TOOLS LAB (ITUBLE3)

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

CO 3	2	3	3	2									3	2	2
CO 4	2	2	3	2									3	3	2
CO 5	3	2	3	2									3	3	2

Weightage: 1-Sightly, 2-Moderately, 3-Strongly

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ES Assessment	Grand total	Credits
Subject Code:	PEUBLS2	L	T	P	Attendance	Activities	TOTAL	25	50	01
Subject:	SPORTS AND YOGA	-	-	2	5	20	25			

Course Objectives:

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health, and fitness.
- To create a safe, progressive, methodical, and efficient activity-based plan to enhance improvement and minimize risk of injury.
- To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

Physical Fitness Tests

- AAHPER youth fitness test
- Cooper's 12 Minute run-walk test

General Introduction of games and sports

Fundamental skills, history and development of the following games and sports:

- Athletics
- Batminton
- Basketball
- Cricket
- Football
- Hockey
- Handball
- Kabaddi
- Kho-kho
- Volley-ball
- Yoga

Note:

1. Each student will have to clear one of the physical fitness tests by the end of the semester.
2. One project is to be prepared by the students at least for two games.

References:

1. Barron H M, McGhee R (1997) A Practical Approach to Measurement in Physical Education.
2. Kansal D K (1996), Test and Measurement in sports and physical education, New Delhi, D V S Publication

Course Outcomes:

On completion of the course, the student will be able to:

1. Apply warming up and warming down exercises in daily physical fitness activities
2. Apply stretching rotation and flexibility exercises in daily physical fitness activities.
3. Make use of acquired yoga asanas skill and pranayama method in daily lifestyle.

4. Utilize the acquired weight training skills for the development of muscular strength and development. Utilize the acquired skills in playing sports and games.

Course Outcomes and their Mapping with Programme Outcomes: SPORTS AND YOGA (PEUBLS2)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									3			3			
CO2									3						
CO3									3			3			
CO4									3			3			

Weightage: 1-Sightly, 2-Moderately, 3-Strongly