Syllabus for 4 Year B. Tech Course in Computer Science and Engineering (Artificial Intelligence)

First Semester

Career Advancement & Skill Development – I: Communication Skill (TIU-UEN-S103)
Contact Hours/Week: 2–0–0 (L–T–P)
Credit: Sessional-2

Course Outcome

CO1	Remember different principles and usage of grammar.
CO2	Understand the use of effective communication, in both spoken and written English.
CO3	Comprehend the meaning and nuances of words in the use of vocabulary.
CO4	Apply techniques of oral communication in a variety of professional and academic situations.
CO5	Create individual expressions in facilitating the dynamics of written communication

Course Content

Section A (Lecture topics): Introduction to communication theory, Language and grammar skills, Speaking skills, Writing skills.

Section B (Sessional): Building Vocabulary, Building sentences, Grammar, Pronunciation drills, consonants, Conversational skills, The Writing Process, Writing a Paragraph, Linking Paragraph.

Recommended Books:
Main Reading
1. Rizvi Ashraf, Effective Technical Communication, Tata McGraw-Hill.
2. Lata, Pushp, Communication Skills, Oxford University Press.

Supplementary Reading
1. Viswamohan Aysha, English for Technical Communication, Tata McGraw-Hill.
2. Gregory Bassham, William Irwin, Henry Nardone & James M. Wallace. Critical Thinking: A Student's Introduction, Tata McGraw Hill.
3. CIEFL, Hyderabad, Exercises in Spoken English. Parts.I-III. Oxford University Press
4. Robin Torres- Gouzerh. Intermediate English Grammar for ESL Learners. Tata McGraw Hill.
5. Christopher Davies. Divided by a Common Language. Houghton Mifflin Company.

Mathematics-I (TIU-UMA-T101)
Contact Hours/Week: 3–1–0 (L–T–P)

Credit: 4

<u>**Course Outcome**</u>

CO1	To learn the behavior and the nature of the curve with calculus of one variable
CO2	To develop a basic understanding of functions of several variables and their properties.
CO3	To use Determinants and Matrices; solve system of linear equations and eigen value/vector problems.
CO4	To learn the concepts of sequence and infinite series and their convergence.
CO5	Students learn the solution procedures of differential equations.

<u>**Course Content**</u>

Module-1

Differential Calculus (Functions of one variable): Rolle's theorem (statement only), Cauchy's mean value theorem (Lagrange's mean value theorem as a special case), Taylor's and Maclaurin's theorems with remainders, indeterminate forms, concavity and convexity of a curve, points of inflexion, asymptotes and curvature.

Differential Calculus (Functions of several variables): Limit, continuity and differentiability of functions of several variables, partial derivatives and their geometrical interpretation, differentials, derivatives of composite and implicit functions, derivatives of higher order and their commutatively, Euler's theorem on homogeneous functions, harmonic functions, Taylor's expansion of functions of several variables, maxima and minima of functions of several variables – Lagrange's method of multipliers.

Module-2

Ordinary Differential Equations: Formation of differential equation, First order differential equations - exact, linear and Bernoulli s form, second order differential equations with constant coefficients, method of variation of parameters, general linear differential equations with constant coefficients, Euler's equations, system of differential equations.

Module-3

Sequences and Series: Sequences and their limits, convergence of series, comparison test, Ratio test, Root test, Absolute and conditional convergence, alternating series, Power series.

Module-4

Matrix and Determinant: Revision of matrix and determinant, Eigenvalues and eigen vectors, rank and nullity, Cayley-Hamilton Theorem, transformation of matrices, adjoint of an operator, normal, unitary, hermitian and skew-hermitian operators, quadratic forms.

Recommended Books:
Main Reading
1. Higher Engineering Mathematics, B. S. Grewal
2. Advanced Engineering Mathematics, Kreyszig

3. A TextBook of Engineering Mathematics, Rajesh Pandey
4. Engineering Mathematics, B. K. Pal, K. Das

Physics (TIU-PPH-T104)
Contact Hours/Week: 3–1–0 (L–T–P)
Credit: 4
Course Outcome

CO1	The understanding of vector calculus and mechanics will enable students to resolve various engineering challenges.
CO2	The students will be able to apply the notion to many actual systems with the aid of their understanding of the fundamentals of acoustics, interference, diffraction, polarisation, and LASER.
CO3	The course exposes students to electromagnetic phenomena and teaches them how to apply them to engineering challenges.
CO4	The fundamentals of Quantum Mechanics will provide exposure to numerous applications.
CO5	The understanding of the fundamentals of heat, thermodynamics and statistical mechanics will facilitate the students to solve the relevant engineering problems.
CO6	The course also teaches students how to analyse crystal structure and the idea of magnetic characteristics.

Course Content

Module-1: Mechanics: Vector Calculus- gradient, divergence, curl; Frame of references, Mechanics of a single particle - conservative and non-conservative forces, potential energy function F= -grad V;
Module-2: Acoustics: Simple harmonic oscillator, damped and forced motion and resonance; wave motion and equation.
Module-3: Optics: Interference - overview of interference phenomena, interference due to thin films- Newton's ring; Diffraction - single slit, double slit and grating; Polarization: introduction, polarization by reflection, scattering of light, circular and elliptical polarization, optical activity; Lasers - principle and working of laser, population inversion, pumping, various modes, threshold population inversion with examples.
Module-4: Wave mechanics: Introduction to quantum physics, wave functions and Schrodinger equation, probability interpretation, elementary concepts of particle in a 1D box, quantum harmonic oscillator and Hydrogen atom problem.
Module-5: Thermal physics: Black body radiation, 1st and 2nd law of thermodynamics, concept of entropy.
Module-6: Statistical Mechanics: Qualitative ideas about phase space, macrostates and microstates, density of states, qualitative discussion on Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein Statistics.
Module-7: Electromagnetism: Introduction (qualitative discussion), Maxwell's equations, wave equation, plane electromagnetic waves, Poynting's theorem.

Module-8: Solid state physics: Introduction of crystal structure, Bragg's law; Properties and applications of dielectric materials, Magnetisation- permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

Recommended Books:
Main Reading
1. Dattu R Joshi,
2. H. K. Mallik and A K Singh
3. Resnick Halliday

Supplementary Reading
1. David J Griffiths, Introduction to Electrodynamics
2. David J Griffiths, Introduction to Quantum Mechanics
3. B. Ghosh, Acoustics
4. B. Ghosh, A text book on Light
5. C Kittel, Solid State Physics
6. A. B. Gupta, H. P. Roy, Thermal Physics

Introduction to Computing (TIU-UCS-T105)
Contact Hours/Week: 3–0–0 (L–T–P)
Credit: Theory–3

Course Outcome

CO1	To understand the basic knowledge of Computer fundamentals and its application in computers
CO2	To understand the number systems, coding schemes, error detection mechanisms in data transmission
CO3	To understand the basic concepts of operating system, instruction cycle and Von-Neumann architecture
CO4	To understand concept of algorithms and flowcharts
CO5	To understand the basic concepts of C programming language
CO6	To design and develop various programming problems using C programming

Course Content

Module-1:
An overview of a computer system, Input devices, Output devices, Storage Units, Central processing unit, memory and Processor, Classification of Computers.
Communicating with a Computer: Binary Number System, Binary to Decimal Conversion, and vice-versa, BCD Code, ASCII Code, An overview of Computer Arithmetic, von Neumann Architecture.

Module-2:

Overview of Operating System: What is an operating system? Role of operating systems. Name of some operating systems. An overview of DOS, Windows, Linux environments: Their workings, Commands.

Overview of Hardware / Software Interface: From machine language to high level language. An overview of processor instruction set, and assembly language. Role of various system software in executing an application. Name of some high-level languages. An overview of how Computer Applications are developed.

Module-3:

Problem Solving Skill: Deriving logic from the computational problem, drawing flowchart and writingalgorithm.

Module-4:

C Fundamentals: The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements

Operators & Expressions: Arithmetic operators, relational and logical operators, type, conversion, increment and decrement Operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Input and Output: Standard input and output, formatted output -- printf, formatted inputscanf.

Flow of Control: Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels.

Recommended Books:
Main Reading
1. Computer Organization and Design, 5th Ed, D.A Patterson and J.L Hennessy
2. R. G. Dromey, How to Solve it by Computer, Pearson, 2014
3. Ravi Kant Taxali, Computer Course, McGraw Hill Education.
4. B W Kernighan and D.M. Ritchie, the C Programming Language, Prentice Hall of India.

Supplementary Reading
1. Turban, Mclean and Wetherbe, Information Technology and Management, Second Edition, 2001, John Wiley & Sons.
2. H. Scheldt, C: The Complete Reference, 4th Edition, McGrawHill

Anita Goel, "Computer Fundamentals", Pearson Education India.