Shri Vile Parle Kelavani Mandal's
DWARKADAS J.SANGHVI COLLEGE OF ENGINEERING
(Empowered Autonomous College Affiliated to the University of Mumbai)

Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Empowered Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus (D26)

First Year B. Tech.

in

Artificial Intelligence (AI) and Data Science Engineering

(Semester I)

With effect from the Academic Year: 2026-2027

Shri Vile Parle Kelavani Mandal's
DWARKADAS J.SANGHVI COLLEGE OF ENGINEERING
(Empowered Autonomous College Affiliated to the University of Mumbai)

Branch: - Artificial Intelligence (AI) and Data Science Engineering, Sem I

			Teaching Scheme				Semester End Assessment (A)						Continuous Assessment (B)						Aggregate (A+B)	Credits Earned
Sr. No	Course Code	Subject	Theory	Practical	Tutorial	Credit	Duration (hrs.)	Theory	Oral	Pract.	Oral & Pract.	SEE Total (A)	Term Test 1 (TT1)	Term Test 2 (TT2)	Assignment/ course project/ group discussion/ presentation / quiz/ any other	Total (TT1, TT2 & Assignment)	Term Work Total	CA Total (B)		
1	D26SBS101	Engineering Mathematics	3			3	2	60				60	15	15	10	40		40	100	4
	D26SBS101T	Engineering Mathematics Tutorial			1	1											25	25	25	
2	D26SBS102	Quantum Physics	2			2	2	60				60	15	15	10	40		40	100	3
	D26SBS102L	Quantum Physics Laboratory		2		1											25	25	25	
3	D26SES101	Structured Programming using C	2			2	2	60				60	15	15	10	40		40	100	3
	D26SES101L	Structured Programming using C Laboratory		2		1	2				25	25					25	25	50	
4	D26SES102	Applied Mechanics and Robotics	2			2	2	60				60	15	15	10	40		40	100	3
	D26SES102L	Applied Mechanics and Robotics Laboratory		2		1											25	25	25	
5	D26SHS101	Engineering Communication and Lean Thinking	1			1							15	15	10	40		40	40	2
	D26SHS101L	Engineering Communication and Lean Thinking Laboratory		2		1											50	50	50	
6	D26SSC101L	Ideation and Innovation Laboratory		2		1											25	25	25	1
7	D26SHS102T	Indian Knowledge Systems			2	2											50	50	50	2
8	D26SLL101T	Health and Wellness			2	2											50	50	50	2
9	D26SSC149	Version Control Fundamentals*	1			1							15	15	10			40	40	1

* Online Course to be completed on Coursera

Semester End Assessment (A):

Course	Assessment Tools	Marks	Time (hrs.)
Theory / * Computer based	Written paper based on the entire syllabus.	60	2
	* Computer based assessment in the college premises.		
Oral	Questions based on the entire syllabus.	25	As applicable
Practical	Performance of the practical assigned during the examination and the output / results obtained.	25	2
Oral & Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the examination and on the entire syllabus.	As per the scheme	2

Continuous Assessment (B):

Course	Assessment Tools	Marks	Time (mins)
Theory	a. Term Test 1 (based on 50 % syllabus)	15	45
	b. Term Test 2 (on next 50 % syllabus)	15	45
	c. Self-learning (Assignment / course project / group discussion / presentation / quiz/ any other.)	10	--
	Total marks (a + b + c)	40	--
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	As applicable
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial & / assignment.	25	
Laboratory &Tutorial	Performance in the laboratory and tutorial.	50	

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech.	Semester: I
Course: Engineering Mathematics (D26SBS101)		
Course: Engineering Mathematics Tutorial (D26SBS101T)		

Pre-requisites: -- Knowledge of

1. Inverse of a matrix, addition, multiplication and transpose of a matrix.
2. Algebra of Complex Numbers. Geometric representation of complex numbers. Cartesian, polar and exponential form of complex numbers. Complex conjugate.
3. Basics of Differential Calculus.

Objectives:

1. To develop the fundamental mathematical skills required for understanding and solving engineering problems.
2. To strengthen analytical thinking and logical reasoning through the application of mathematical concepts.
3. To provide a foundation in mathematical methods that support advanced studies in various branches of engineering and technology.
4. To enable students to formulate and solve real-life engineering problems using appropriate mathematical techniques.
5. To enhance the ability to represent and interpret mathematical concepts through graphical and visual approaches.
6. To provide exposure to visualization tools such as R Programming, SciLab, Desmos, and GeoGebra for graphical representation and better understanding of mathematical ideas.

Outcomes: On completion of the course, the learner will be able to:

1. Apply matrix operations to determine rank and echelon forms of matrices and solve systems of simultaneous linear equations.
2. Apply the concepts of complex numbers to solve problems involving hyperbolic functions and logarithmic functions.
3. Expand functions using appropriate mathematical techniques and evaluate their applicability in engineering problems.
4. Apply the principles of partial differentiation to determine maxima, minima, and Jacobians of multivariable functions.
5. Use R Programming/SciLab/Desmos/GeoGebra for graphical visualization and interpretation of mathematical concepts and solutions.

Engineering Mathematics (D26SBS101)		
Unit	**Description**	**Duration**
1	**Matrices:** • Types of Matrices: Symmetric, Skew- Symmetric, Hermitian, Skew-Hermitian, Unitary, Orthogonal Matrices. Rank of a matrix using Echelon form. • System of homogeneous and non–homogeneous equations, their consistency and solutions. Linear dependent and independent vectors.	**8**

2	**Complex Numbers, Hyperbolic function and Logarithm of Complex Numbers:** • Review statement of D'Moivre's Theorem. • Application of D'Moivre's Theorem: Find expansion of $\sin^n\theta, \cos^n\theta$ in terms of sines and cosines of multiples of θ, expansion of sin nθ, cos nθ in powers of sin θ, cos θ and to find sum of the trigonometric series. • Roots of complex number. • Circular functions of complex number and Hyperbolic functions. Inverse Circular and Inverse Hyperbolic functions. Separation of real and imaginary parts of all types of functions. • Logarithmic functions, Separation of real and Imaginary parts of Logarithmic functions.	**12**
3	**Expansion of Function:** • Taylor's Theorem (Statement only), Taylor's series and Maclaurin's series (Statement only). Expansion of standard functions.	**4**
4	**Partial Differentiation:** • Partial Differentiation: Function of several variables, Partial derivatives of first and higher order, Differentiation of composite function, Total differentials and Implicit functions. • Euler's Theorem on Homogeneous functions with two and three independent variables (with proof). Deductions from Euler's theorem. **Applications of Partial Differentiation:** • Maxima and Minima of a function of two independent variables. • Jacobian's of two and three independent variables.	**14**
5	**Numerical Solutions of Transcendental Equations, System of Linear Algebraic Equations, Curve fitting:** • Solution of Algebraic and Transcendental Equations by: Newton Raphson Method. • Solution of system of linear algebraic equations by Gauss Seidal Iteration Method. • Curve fitting: Fitting a straight line, Quadratic curve.	**4**
	Total	**42**

Engineering Mathematics Tutorial (D26SBS101T)	
Sr. No.	**Tutorial Title**
	Tutorials for Theoretical and Conceptual Learning
1	Matrices.
2	Complex Numbers.
3	Hyperbolic and Logarithm of complex numbers.
4	Expansion of Function.
5	Partial Differentiation.
6	Application of Partial Differentiation.
	Hands-on Tutorials using R Programming/SciLab/Desmos/GeoGebra
7	Matrices.
8	Solution of Transcendental Equations by Newton Raphson Method.

9	Solution of system of linear algebraic equations by Gauss Seidal Iteration Method.
10	Curve Fitting.

A minimum of eight tutorials (including R programming language/SciLab/Desmos/GeoGebra) from the above-suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept learnt.

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice having sub questions as appropriate), total summing up to 60 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Continuous Assessment (B):

Theory: (Term test: 40 Marks)

1. Assessment consists of two class tests of 15 marks each and self -learning assessment (SLA) of 10 marks. The first-class test (TT1) is to be conducted when approx. 50% syllabus is completed and second-class test (TT2) when rest 50% syllabus is completed.
2. Total duration allotted for writing each of the class tests is 45 mins.
3. The SLA of 10 marks is based on self- learning topics conducted as Assignments, Case study, Report writing, Quiz etc. and the distribution of marks will be as per Self-learning Rubrics designed by the subject teacher.

Tutorial (Term work: 25 Marks)

1. Term work shall consist of Tutorials with submission.
2. Batch wise Tutorials are to be conducted to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies. Students must be encouraged to perform minimum eight experiments and submit the Term Work.
3. An additional laboratory/tutorial activity based on self-learning topics in the form of Lab demonstration experiment, Virtual Lab, Simulation Lab, extra tutorial, case study should be conducted and assessed.
4. The distribution of 25 marks for term work should be as per the Rubrics designed for the Laboratory work by the subject teacher.

Books Recommended:

Textbooks:

- Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication.
- Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright.
- Andrie de Vries and Joris Meys, R Programming for Dummies, 2nd Edition, Wiley.

Reference Books:

- Foundations of Complex Analysis, S. Ponnusamy, Narosa Publications.
- Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
- Advanced Engineering Mathematics by H. K. Dass, 28th edition, S. Chand 2010.
- Introductory Methods of Numerical Analysis, S.S. Sastry, Eastern Economy Edition.
- Numerical Methods, M. K. Jain, R. K. Jain, S. R. K. Iyengar, New Age International Publishers.
- Matrices, Shanti Narayan, S. Chand publication.
- Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.
- Elementary Linear Algebra with Application by Howard Anton and Christ Rorres, 6th edition, John Wiley & Sons, INC.
- Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, 2nd Edition, Addison-Wesley Data & Analytics Series.

Web References:

- Engineering Mathematics - I: (https://onlinecourses.nptel.ac.in/e-learning/preview/noc26ma133)
- Advanced Calculus for Engineers : (https://onlinecourses.nptel.ac.in/elearning/preview/noc26ma130)
- Calculus of One Real Variable: (https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma91)
- Calculus of Several Real Variables: (https://onlinecourses.nptel.ac.in/e-learning/preview/noc26ma92)

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech.	Semester: I
Course: Quantum Physics (D26SBS102)		
Course: Quantum Physics Laboratory (D26SBS102L)		

Pre-requisites:

Foundations of physics and mathematics till H. Sc or equivalent is necessary to comprehend engineering physics curriculum effectively.

Objectives:

1. Identify and understand the fundamental physical principles underlying engineering technologies—a prerequisite to become successful engineer.
2. To provide inclusive knowledge of fundamental physical principles encouraging engineering students to venture into the research field.
3. To equip students with the basic principles of quantum mechanics needed to analyze microscopic phenomena and understand their significance in contemporary scientific and engineering fields.
4. To provide awareness of contemporary technologies derived from quantum physics and their role in addressing modern engineering challenges.

Outcomes: After successful completion of the course, students will be able to:

1. Explain fundamental concepts of quantum mechanics and wave-particle duality.
2. Apply Schrödinger's equations and quantum operators to simple quantum systems.
3. Analyse quantum models and phenomena including confinement, tunnelling, spin and harmonic oscillator.
4. Explain the principles and characteristics of lasers and optical fibre communication.
5. Evaluate basic quantum technologies and their applications in computing, tunneling and superconducting devices.

Quantum Physics (D26SBS102)		
Unit	**Description**	**Duration**
1	**Physical fundamentals of Quantum Mechanics** • Matter waves & its properties, De Broglie hypothesis. • Concept of Phase velocity and group velocity and relation with particle velocity, Wave Packet. • Heisenberg's Uncertainty Principle • Wave function; Conditions for well-behaved wave-functions, Physical interpretation of wave function. • Normalization of wave functions.	**5**
2	**Schrodinger Wave Mechanics:** • Schrodinger's time dependent wave equation & Significance • Schrodinger's time independent wave equation & Significance • Comparison of TDSE & TISE • Properties of Schrodinger's equations	**6**

	• Quantum Mechanical Operators & its properties, Types of operators: Space coordinate, Energy, Momentum, Hamiltonian • Eigenfunctions, Eigenvalues, Expectation value of dynamical variables, Ehrenfest Theorem.	
3	**Quantum Physical Models** • Free particle • Particle trapped in a 1D potential well and its extension in 3D (Energy, Wavefunctions & Probability density) • Probability Current Density, Equation of Continuity in Quantum Mechanics • Potential Step (Both cases: $E>V_0$. $E<V_0$) • Quantum Tunneling, Barrier Penetration (Rectangular Potential) • Quantum Harmonic Oscillator (Qualitative Treatment)	**6**
4	**Physical Fundamentals of Quantum Photonics** • Absorption, Spontaneous emission and Stimulated emission; Einstein's coefficients, Metastable state, Resonant cavity, Population inversion, Laser beam characteristics. • Numerical aperture, acceptance angle, Optical fibre specifications, Single mode & Multimode, Step index and Graded index optical fibres, Modes of optical signal propagation, Dispersion of signal, Attenuation of signal, V number, Optical fibre transmission.	**6**
5	**Quantum systems & Applications** • Introduction to Quantum Computing: Difference between classical computing and quantum computing, Physical Concept of Qubits, Concept of Quantum Superposition theorem and Quantum Entanglement (Spooky action at a distance). • Quantum Tunneling Devices: Tunnel Field effect Transistors (TFETs), Tunnel Diode, Tunneling Magneto resistance Sensors (TMRs), Scanning Tunneling Microscope (STM), Concept of BCS cooper pairs and DC-AC Josephson junctions, Superconducting Quantum Interference Devices (SQUIDs).	**5**
	Total	**28**

Quantum Physics Laboratory (D26SBS102L)	
Sr. No.	**Experiment Title**
1	Determination of Planck's constant using LED.
2	Determination of wavelength of LASER using single slit diffraction
3	Determination of Planck's constant using Photodiode.
4	Study of divergence of LASER beam.
5	Determination of Numerical Aperture of an optical fiber.
6	Study of Zener diode as a Voltage regulator.
7	Characterization study of Diffraction Optics
8	Characterization study of Polarization Optics
9	Determination of Numerical Aperture of an optical fiber.
10	Determination of wavelength of a Laser source using Diffraction grating.
11	Study of Optical fibre specifications.
12	Characteristic Study of TMR (Tunneling Magneto resistance Sensors).
13	Characteristics study of Tunnel Diodes.

14	Characteristics study of Tunnel Field effect Transistors (TFETs)
Performance-Based Experiments (Hands-on and Simulation Tools)	
15	Simulation studies on visualization of wavefunctions for free particle and particle in a box.
16	Simulations on quantum tunneling demonstration experiments
17	Simulation study of optical devices.
18	Simulation study of Quantum Systems.

Minimum eight experiments as laboratory work from the above suggested list or any other experiment based on syllabus mentioned above will be conducted batch wise to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies.

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice having sub questions as appropriate), total summing up to 60 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Continuous Assessment (B):

Theory: (Term test: 40 Marks)

1. Assessment consists of two class tests of 15 marks each with self -learning assessment (SLA) of 10 marks. The first-class test (TT1) is to be conducted when approx. 50% syllabus is completed and second-class test (TT2) when rest 50% syllabus is completed.
2. Total duration allotted for writing each of the class tests is 45 mins.
3. The SLA of 10 marks is based on self- learning topics conducted as Assignments, Case study, Report writing, Quiz etc. and the distribution of marks will be as per Self-learning Rubrics designed by the subject teacher.

Laboratory (Term work: 25 Marks)

1. Term work shall consist of Laboratory work with submission.
2. Batch wise laboratory work/Tutorial work is to be conducted to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies. Students must be encouraged to perform minimum eight experiments and submit the laboratory Journal.
3. An additional laboratory/tutorial activity based on self-learning topics in the form of Lab demonstration experiment, Virtual Lab, Simulation Lab, case study should be conducted and assessed.
4. The distribution of 25 marks for term work should be as per the Rubrics designed for the Laboratory work by the subject teacher.

Books Recommended:

Textbooks:

- M. N. Avadhanulu, P. G. Kshirsagar and T. V. S. Arun Murthy, A Textbook of Engineering Physics, S. Chand Publishing, New Delhi, 2022.
- D. K. Bhattacharya and Poonam Tandon, A Textbook of Engineering Physics, Oxford University Press, New Delhi, 2024.
- Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson India Education Services Pvt. Ltd., Chennai, 2018.
- Wiley Editorial, Engineering Physics, Wiley India Pvt. Ltd., New Delhi, 2014.
- V. Rajendran, Engineering Physics, McGraw Hill Education, New Delhi, 2014.
- N. Subrahmanyam, Brij Lal and M. N. Avadhanulu, A Textbook of Optics, S. Chand & Company Pvt. Ltd., New Delhi, 2012.

Reference Books:

- Ajoy Ghatak and S. Lokanathan, Quantum Mechanics: Theory and Applications, Springer, Dordrecht, 2004.
- V. Devanathan, Quantum Mechanics, Narosa Publishing House, New Delhi, 2005.
- David J. Griffiths and Darrell F. Schroeter, Introduction to Quantum Mechanics, Cambridge University Press, Cambridge, 2018.
- R. Shankar, Principles of Quantum Mechanics, Springer, New York, 1994.
- Arthur Beiser, Concepts of Modern Physics, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.
- A. S. Vasudeva, Modern Engineering Physics, S. Chand Publishing, New Delhi, 2013.
- Albert D. Helfrick and William David Cooper, Modern Electronic Instrumentation and Measurement Techniques, PHI Learning Pvt. Ltd., New Delhi, 2014.
- Francis A. Jenkins and Harvey E. White, Fundamentals of Optics, McGraw-Hill Education, New York, 2001.
- Michael A. Nielsen and Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, Cambridge, 2010.
- Nouredine Zettili, Quantum Mechanics: Concepts and Applications, Wiley, Hoboken, 2022.
- Jack D. Hidary, Quantum Computing: An Applied Approach, Springer, Cham, 2021.
- Ciaran Hughes, Joshua Isaacson, Anastasia Perry, Ranbel F. Sun and Jessica Turner, Quantum Computing for the Quantum Curious, Springer, Cham, 2021.

Web References:

- Quantum Mechanics – An Introduction — **https://nptel.ac.in/courses/115106066**
- NOC: Quantum Mechanics-I — **https://nptel.ac.in/courses/115101107**
- NOC: Applied Optics — **https://onlinecourses.nptel.ac.in/noc22_ph32/preview**
- NOC: Introduction to LASER — **https://onlinecourses.nptel.ac.in/noc21_ph01/preview**
- NOC: Fiber Optics — **https://onlinecourses.nptel.ac.in/noc20_ph07/preview**
- NOC: Introduction to Photonics — **https://onlinecourses.nptel.ac.in/noc24_ee144/preview**
- Introduction to Quantum Computing — **https://nptel.ac.in/courses/106106232**
- Quantum Entanglement: Fundamentals, Measures and Applications — **https://onlinecourses.nptel.ac.in/noc26_ph14/preview**
- Physics of Nanoscale Devices — **https://onlinecourses.nptel.ac.in/noc25_ee62/preview**

- Introduction to Semiconductor Devices — **https://onlinecourses.nptel.ac.in/noc25_ee92/preview**
- Concepts in Magnetism and Superconductivity — **https://onlinecourses.nptel.ac.in/noc25_ph49/preview**
- A Brief Course on Superconductivity-**https://onlinecourses.nptel.ac.in/noc26_ph11/preview**

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech.	Semester: I
Course: Structured Programming using C (D26SES101)		
Course: Structured Programming using C Laboratory (D26SES101L)		

Pre-requisites: None

Objectives:

1. To familiarize with the logic of Computer Programming.
2. To provide exposure in developing algorithm, flowchart and thereby writing efficient codes for user defined problem.

Outcomes: After successful completion of the course, students will be able to:

1. Implement the programs in C.
2. Debug the C programs.

Structured Programming using C (D26SES101)		
Unit	**Description**	**Duration**
1	**Basics of Programming:** Introduction to programming paradigms, Structure of C program, Algorithm & Flowchart, Compilation process: Syntax and semantic errors, Character Set, Identifiers and keywords, Data types, Constants, Variables, Operators-Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, and other operators, precedence and associativity, Library Functions, Preprocessor, Data Input and Output – getchar (), putchar (), scanf (), printf (), fgets (), puts (), Structure of C program.	**04**
2	**Control Structures:** Decision making with Branching - If statement, If-else Statement, Switch case statement, Looping – while, do-while, for, Nested control structure, Continue statement, Break statement, goto statement.	**05**
3	**Functions and Parameter:** Function -Introduction of Function, defining a Function, accessing a Function, Function Prototype, Passing Arguments to a Function, Designing Recursive function, Storage Classes –Auto, Extern, Static, Register	**04**
4	**Arrays and its applications:** Array-Concepts, Declaration, Definition, accessing array element, One- dimensional and Multidimensional array, Passing Arrays to Function, Sorting algorithms: Bubble sort, Insertion sort, Selection sort, radix sort Searching algorithms: Linear search, Binary search, String- Basics of String, Functions in string.h, user defined function for string handling	**07**
5	**Structures and Unions:** Declaration, Initialization, structure within structure, Operation on structures, Array of Structure, Structure padding, Union, comparison of Structures and Union	**04**

6	**Pointers and File handling:** Introduction to Pointers, Pointer Declaration, Call by Value, Call by Reference, Opening and closing files, reading and writing to files, operations on files.	04
	Total	**28**

A) Course: Structured Programming using C Laboratory (D26SES101L)	
Exp.	**Suggested experiments**
1	Write a program to swap two variables values with and without using third variables. Write algorithm and draw flowchart for the same.
2	Write a program to check odd or even number: (a) using modulus operator (b) using conditional operator.
3	Design and develop a C program to read a year as an input and find whether it is leap year or not. Also consider the end of the centuries. Write algorithm and draw flowchart for the same.
4	Write a C program to find the sum of individual digits of a 3-digit number.
5	Design and develop a flowchart or an algorithm that takes three coefficients (a, b, and c) of a Quadratic equation ($ax^2 + bx + c = 0$) as input and compute all possible roots. Implement a C program for the developed flowchart/algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.
6	Write a program to count the number of digits in a given integer.
7	Write a menu driven program to perform simple arithmetic operations based on the user's choice. The user will indicate the operation to be performed using the signs e.g. + for addition, etc. Write an algorithm and draw flowchart for same.
8	Write a program to read a number of more than one digit, reverse the number and display the sum of digits of numbers. Write algorithm and draw flowchart for the same.
9	Write programs to display each of the following patterns. **B)** 1 2 1 3 2 1 4 3 2 1 5 4 3 2 1 **B)** A ABA ABCBA ABCDCBA ABCDEDCBA
10	Write a C program to find maximum and minimum between two numbers using functions. Write algorithm and draw flowchart for the same.
11	Write C program to find GCD of two integers by using recursive function.
12	Write a C program to find both the largest and smallest number in a list of integers. Write algorithm and draw flowchart for the same.
13	Develop, implement and execute a C program that reads two matrices A (m x n) and B (p x q) and Compute product of matrices A and B. Read matrix A and matrix B in row major order and in column major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only.
14	Write a Program for deletion of an element from the specified location from Array.

15	Write a C program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii)Insertion sort
16	Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: i) Linear search ii) Binary search
17	Write a C program using user defined functions to determine whether the given string is palindrome or not.
18	Create a structure named "Employee" to store employee details such as employee ID, name, and salary. Write a program to input data for three employees, find the highest salary employee, and display their information.
19	Demonstrate Union for displaying student record.
20	Demonstrate the concept of Call by Value and Call by Reference in C programming by passing variables to functions and observing the effect of modifications on the original variables.
21	Read any text file (e.g. info.txt) and write its content to a new file (no_vowels.txt), excluding all lowercase and uppercase vowels (A, E, I, O, U, a, e, i, o, u).

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice having sub questions as appropriate), total summing up to 60 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Continuous Assessment (B):

Theory: (Term test: 40 Marks)

1. Assessment consists of two class tests of 15 marks each with self -learning assessment (SLA) of 10 marks. The first-class test (TT1) is to be conducted when approx. 50% syllabus is completed and second-class test (TT2) when rest 50% syllabus is completed.
2. Total duration allotted for writing each of the class tests is 45 mins.
3. The SLA of 10 marks is based on self- learning topics conducted as Assignments, Case study, Report writing, Quiz etc. and the distribution of marks will be as per Self-Learning Rubrics designed by the subject teacher.

Laboratory (Term work: 25 Marks)

1. Term work shall consist of Laboratory work with submission.
2. Batch wise laboratory work/Tutorial work is to be conducted to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies. Students must be encouraged to perform all experiments and submit the laboratory Journal.

3. An additional laboratory/tutorial activity based on self-learning topics in the form of Lab demonstration experiment, Virtual Lab, Simulation Lab, case study should be conducted and assessed.
4. The distribution of 25 marks for term work should be as per the Rubrics designed for the Laboratory work by the subject teacher.

Books Recommended:

Textbooks:

- MASTERING C" by K.R.Venugopal and Sudeep R.Prasad , Tata McGraw-Hill Publications.
- "A Computer Science –Structure Programming Approaches using C", by Behrouz Forouzan, Cengage Learning.
- Schaum's outlines "Programming with C", by Byron S. Gottfried, Tata McGraw-Hill Publications.

Reference Books:

- "Basics of Computer Science", by BehrouzForouzan , Cengage Learning.
- "Programming Techniques through C", by M. G. Venkateshmurthy, Pearson Publication.
- "Programming in ANSI C", by E. Balaguruswamy, Tata McGraw-Hill Education.
- "Programming in C", by Pradeep Day and Manas Gosh, Oxford University Press.
- "Let Us C", by Yashwant Kanetkar, BPB Publication.

Web References:

- Problem Solving Through Programming In C-https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs53

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech.	Semester: I
Course: Applied Mechanics and Robotics (D26SES102)		
Course: Applied Mechanics and Robotics Lab (D26SES102L)		

Pre-requisites:

1. Fundamentals of Engineering Mathematics and Physics.
2. Basic mechanics concepts: force, motion, and energy.

Objectives:

1. To understand the principles of coplanar force systems, including resultant forces, moments, couples, and force-couple systems for concurrent, parallel, and non-concurrent non-parallel configurations.
2. To apply the conditions of equilibrium to analyse coplanar force systems, free body diagrams, and support reactions for simply supported, overhanging, and cantilever beams under various loading conditions.
3. To introduce the structure, types, components, and degrees of freedom of robotic systems, including sensors, actuators, controllers, and end effectors used in planar and spatial robots.
4. To develop an understanding of robot kinematics, coordinate transformations, homogeneous transformation matrices, and the D-H convention for forward kinematics of planar robotic manipulators.
5. To analyse the velocity and acceleration of end effectors in robotic systems using the Jacobian matrix formulation for planar robot motion.

Outcomes: On completion of the course, the learner will be able to:

1. Explain the principles of resultant force systems for concurrent, parallel, and non-concurrent non-parallel coplanar forces, applying Varignon's theorem, couples, and the force-couple system to solve practical problems.
2. Apply equilibrium conditions to analyse free body diagrams and determine support reactions for simply supported, overhanging, and cantilever beams subjected to concentrated, uniformly distributed, and uniformly varying loads.
3. Identify the structure, types, and degrees of freedom of robotic systems, and describe the role of sensors (proximity, ultrasonic, camera), actuators (DC and servo motors), controllers (microcontrollers, Arduino), and end effectors in planar and spatial robots.
4. Apply homogeneous transformation matrices and the D-H convention to determine the forward kinematics and positioning of planar robotic manipulators using coordinate transformation principles.
5. Analyse the velocity and acceleration of end effectors in robotic manipulators using the Jacobian matrix formulation, and evaluate the kinematic performance of planar robot configurations.

Applied Mechanics and Robotics (D26SES102)		
Unit	**Description**	**Duration**
1	**Resultant of Coplanar Force Systems.** Resultant of concurrent, parallel, and non-concurrent non-parallel force systems; moment of a force about a point; Varignon's Theorem; couples; force-couple system; distributed forces on a plane.	**6**

2	**Equilibrium of Coplanar Force Systems.** Conditions of equilibrium for concurrent, parallel, and general (non-concurrent non-parallel) force systems; free body diagrams; types of supports and loads on beams; determination of support reactions for simply supported, overhanging, and cantilever beams under concentrated, uniformly distributed, and uniformly varying loads (excluding internal hinges).	**6**
3	**Fundamentals of Robotics: Structure, Types, and Components.** Introduction to robots and their applications. Types of robots: planar and spatial robots. Basic structure of robots including links, joints, and Degrees of Freedom (DOF). Components of robotic systems: sensors (proximity, ultrasonic, and camera basics), actuators (DC motors and servo motors), controllers (basic concept of microcontrollers and Arduino), and end effectors (grippers/tools).	**6**
4	**Robot Kinematics and Coordinate Transformations.** Coordinate systems and robot positioning. Concept of orientation and movement of robotic arms. Homogeneous transformation matrices. D-H convention for robot configuration. Introduction to forward kinematics without derivation. Simple applications of forward kinematics for planar robot motion.	**6**
5	**Velocity and Acceleration of Robotic Manipulators.** Basic concept of velocity and acceleration in robotic systems. Velocity and acceleration of end effector using matrix form for planar robot motion (Jacobian).	**4**
	Total	**28**

Applied Mechanics and Robotics Laboratory (D26SES102L)	
Sr. No.	**Experiment Title**
1	Verification of Polygon law of coplanar forces.
2	Verification of law of Momentum using Bell crank lever.
3	Determination of Support reaction for beam.
4	Determination of coefficient of friction using Inclined plane.
5	Verification of Lami's theorem using Jib crane.
6	Resultant of non-concurrent non-parallel coplanar force system.
7	Determination of coefficient of restitution for Collision of elastic bodies (Law of conservation of momentum).
8	Programming exercises on determination of Resultant of Coplanar Force System.
9	Programming exercises on determination of Support Reaction.
10	Programming exercises on Friction.

A minimum of eight experiments from the above-suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept.

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 4 questions (All compulsory, but with internal choice having sub questions as appropriate), total summing up to 60 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Continuous Assessment (B):

Theory: (Term test: 40 Marks)

1. Assessment consists of two class tests of 15 marks each with self -learning assessment (SLA) of 10 marks. The first-class test (TT1) is to be conducted when approx. 50% syllabus is completed and second-class test (TT2) when rest 50% syllabus is completed.
2. Total duration allotted for writing each of the class tests is 45 mins.
3. The SLA of 10 marks is based on self- learning topics conducted as Assignments, Case study, Report writing, Quiz etc. and the distribution of marks will be as per Self-learning Rubrics designed by the subject teacher.

Laboratory / Tutorial (Term work: 25 Marks)

1. Term work shall consist of Laboratory work & Tutorial work with submission.
2. Batch wise laboratory work/Tutorial work is to be conducted to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies. Students must be encouraged to perform minimum eight experiments and submit the laboratory Journal.
3. An additional laboratory/tutorial activity based on self-learning topics in the form of Lab demonstration experiment, Virtual Lab, Simulation Lab, extra tutorial, case study should be conducted and assessed.
4. The distribution of 25 marks for term work should be as per the Rubrics designed for the Laboratory work by the subject teacher.

Books Recommended:

Textbooks:

- Engineering Mechanics by A K Tayal, Umesh Publication.
- Engineering Mechanics by S Ramamrutham, Dhanpat Rai Publishing Company.

Reference Books:

- Engineering Mechanics by R. C. Hibbeler, Pearson Education.
- Engineering Mechanics by Beer & Johnston, Tata McGraw Hill.
- Engineering Mechanics by Bhattacharya B, Oxford University Press.
- Engineering Mechanics by Nelson and McLean, Tata McGraw Hill.
- Industrial Robotics: Technology, Programming and Applications by M.P. Groover, M. Weiss, R.N. Nagel, and N.G. Odrey, McGraw-Hill.

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech.	Semester: I
Course: Engineering Communication and Lean Thinking (D26SHS101)		
Course: Engineering Communication and Lean Thinking Laboratory (D26SHS101L)		

Pre-requisites:

1. Basic understanding of communication and language skills

Objectives:

1. Understand the fundamentals and process of effective communication in academic and professional environments.
2. Develop active listening and verbatim note-taking skills for factual understanding and communication.
3. Build observation and awareness abilities using Lean Thinking and Gemba-based approaches.
4. Differentiate between facts, assumptions, and opinions while analyzing observations.
5. Apply structured thinking tools such as 4W1H and Ladder of Abstraction for professional reporting and communication.

Outcomes: On completion of the course, the learner will be able to:

1. Explain the fundamentals and barriers of communication in professional environments
2. Demonstrate active listening, verbatim note-taking, and observation skills in academic and workplace situations.
3. Apply observation principles and appreciative enquiry for factual analysis and interpretation.
4. Use structured communication and reporting tools for reflection, discussion, and professional interaction.
5. Illustrate basic systems thinking concepts and communicate system relationships using simple system dynamic models.

Engineering Communication and Lean Thinking (D26SHS101)		
Unit	**Description**	**Duration**
1	**Basics of Communication Skills:** Fundamentals of communication; Process of communication; Verbal and non-verbal communication; Active listening skills; Verbatim note-taking; Barriers to communication; Professional interaction basics; Introduction to workplace communication; AI assisted communication practices; Communication for value creation and waste elimination.	**3**
2	**Observation and Awareness Skills:** Importance of observation in engineering and daily life; seeing vs observing; Attention, approach and analysis; Visible, invisible and unknown observations; Fishbowl concept and Gemba observation; Observation without assumptions; Qualitative vs quantitative observations; Appreciative enquiry; Observation in human behaviour and surroundings.	**3**
3	**Analytical Thinking and Principles of Observation:** Six Principles of Observation: Observe the Periphery, See the Unusual, look for Shadows, look for Missing, Identify Symbols, Make Comparisons. Facts vs Opinions, Observation-based analysis and interpretation.	**2**

4	**Communication, Reflection and Professional Skills:** Language of affection vs Language of report; 4W1H methodology; Ladder of Abstraction; Structured thinking and reporting; Reflection writing; Writing symbol words; Communication through factual observations. Introduction to visual communication.	**4**
5	**Systems Thinking and System Dynamics:** Concept of systems; Components and interactions; Cause-and-effect relationships; Feedback loops; Introduction to Systems Thinking; Basics of System Dynamics Model Diagram; Simple engineering and daily-life system examples; Presentation skills through system model presentations and team discussions.	**2**
	Total	**14**

Engineering Communication and Lean Thinking (D26SHS101L)	
Sr. No.	**Experiment Title**
1	Active listening and verbatim note-taking exercise
2	Observation activity inside campus/workplace environment
3	Gemba observation and reporting activity
4	Facts vs opinions identification exercise
5	Reflection writing activity
6	4W1H analysis activity
7	Visual communication activity using symbols/images
8	Team-based system dynamics model presentation
9	Role play using non-verbal communication
10	Email writing
11	Case studies in workplace communication
12	Comprehension and summarization writing
13	Public Speaking

A minimum of eight experiments from the above-suggested list or any other experiment based on the syllabus will be included, which would help the learner to apply the concept.

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Continuous Assessment (B):

Theory: (Term test: 40 Marks)

1. Assessment consists of two class tests of 15 marks each with self -learning assessment (SLA) of 10 marks. The first-class test (TT1) is to be conducted when approx. 50% syllabus is completed and second-class test (TT2) when rest 50% syllabus is completed.
2. Total duration allotted for writing each of the class tests is 45 mins.
3. The SLA of 10 marks is based on self- learning topics conducted as Assignments, Case study, Report writing, Quiz etc. and the distribution of marks will be as per Self-learning Rubrics designed by the subject teacher.

Laboratory (Term work: 25 Marks)

1. Term work shall consist of Laboratory work with submission.
2. Batch wise laboratory work is to be conducted to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies. Students must be encouraged to perform minimum eight experiments and submit the laboratory Journal.
3. An additional laboratory activity based on self-learning topics in the form of Lab demonstration experiment, Virtual Lab, Simulation Lab, extra tutorial, case study should be conducted and assessed.
4. The distribution of 25 marks for term work should be as per the Rubrics designed for the Laboratory work by the subject teacher.

Mini-Project (25 Marks)

Students will undertake a mini-project based on the concepts and skills acquired through the various modules of the syllabus and present their project findings in groups.

Books Recommended:

Reference Books:

- James P. Womack and Daniel T.Jones, Lean Thinking: Banish Waste and Create Wealth in Your Corporation, Revised and Updated. Free Press, New York, 2003
- Peter M. Senge, The Fifth Discipline: The Art and Practice of The Learning Organization, Crown Currency, United States, 2006
- Shoji Shiba & David Walden, Breakthrough Management: Principles, Skills, and Patterns for Transformational Leadership, Confederation of Indian Industry, New Delhi, 2008
- Samuel I. Hayakawa, Language in Thought and Action, Harcourt Brace International, India, 1991
- P. D. Hemphill, D. W. McCormick & R. D Hemphill, Business Communication with Writing Improvement Exercises, Pearson, Upper Saddle River, NJ: Prentice Hall, 2001
- Kitty O. Locker & Stephen Kyo Kacmarek, Business Communication: Building Critical Skills, McGraw-Hill, 2019
- Meenakshi Raman & Sangeeta Sharma, Technical Communication: Principles and Practice, New Delhi, Oxford University Press, 2016
- Asha Kaul, Effective Business Communication, Prentice-Hall of India, 2015
- M. Ashraf Rizvi & Priyadarshi Patnaik, Effective Technical Communication: A guide for scientists and engineers, New Delhi, Tata McGraw Hill, 2010
- Norman Lewis, Word Power Made Easy, Random House USA, 2014
- Sanjay Kumar & Pushp Lata Communication skills. New Delhi, Oxford University Press, 2018
- Shirley Mathew, Effective Communication Skills, Nirali Prakashan, 2025
- Smita Rane & Chumki Biswas, Professional Communications and Ethics, Himalaya Publishing House, 2025
- Jacqueline Farrington, The Non-Obvious Guide to Better Presentations: How to Present Like a Pro (Virtually or in Person), Ideapress Publishing, 2023
- Aruna Koneru, Professional Communication, McGraw Hill, 2018

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech.	Semester: I
Course: Ideation and Innovation Laboratory (D26SSC101L)		GROUP A

Pre-requisites: Nil

Objectives:

1. Provide first-year engineering students with experiential, hands-on learning in electronics, mechanical fabrication, and prototyping.
2. Encourage innovation and problem-solving by integrating ideation, design, and fabrication in practical activities.
3. Develop critical thinking, teamwork, and collaborative learning through hands-on engineering activities

Outcomes: Learners are expected to:

1. Demonstrate the ability to identify and use basic electronic instruments and mechanical tools safely and effectively for measurement and testing purposes.
2. Construct, solder, and house electronic circuits by interpreting schematics and applying fabrication skills for functional prototyping.
3. Design and assemble a wired two-wheeled robotic system with motor controls, demonstrating integration of mechanical and electronic components.

Ideation and Innovations Laboratory (D26SSC101L)		
Unit	**Description**	**Duration**
1	**Project-Based Learning Activity 1: Introduction to Tools, Equipment, and Component Identification** • **Objective:** To familiarize the learners with laboratory experimentation, design, debugging, and micro-manufacturing tools & equipment through a structured sequence of short instructional videos. • **Outcome:** Learners engage in a series of guided activities using concise instructional videos to understand the functionality of various instruments. They demonstrate their learning by performing tasks such as recording observations, tabulating readings, and drawing conclusions. The activity covers key instruments including: · Cathode Ray Oscilloscope · Function Generator · Multimeter · Power Supply · Laser Cutter · 3D Printer	**10**
2	**Project-Based Learning Activity 2: Breadboarding, Soldering, and Circuit Housing** • **Objective:** To develop hands-on skills in component identification, circuit schematic	**10**

	interpretation, breadboarding, soldering, and circuit housing through a structured learning approach. • **Outcome:** · Learners identify and differentiate resistor and capacitor values and types, as well as recognize and utilize an LSI IC (e.g., IC 555). They assemble a 555 timer-based astable multivibrator circuit on a breadboard with a known oscillation frequency. · Learners apply soldering techniques by mounting and soldering the evaluated circuit onto a general-purpose PCB and verifying its functionality. · A CAD file (.stl format) for the circuit housing is processed into a .gcode file using slicer software, followed by 3D printing of the housing. · The circuit is securely mounted within the housing using basic workshop techniques, including cutting, smoothing with a flat file, and fixing components with self-threading screws.	
3	**Project-Based Learning Activity 3: Wired Two-Wheeled Robot** • **Objective:** To introduce learners to the design and operation of a two-wheeled robotic vehicle with a caster wheel pivot, enabling motion control using DC motors and a reversible mechanical switch. • **Outcome:** · Learners assemble a two-wheeled robot using a metal chassis, rubber-cushioned wheels, and a single caster wheel for stability. · Motion is initiated using geared DC motors, with directional control implemented via a reversible mechanical joystick switch. · Learners understand and apply the principles of reversing a DC motor for bidirectional movement. · Learners analyze the function of a DC motor speed-reduction gearbox, evaluating its advantages and limitations.	**08**
	Total	**28**

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Continuous Assessment (B):

Laboratory (Term work: 25 Marks)

1. Term work shall consist of Laboratory work with submission.
2. Batch wise laboratory work/Tutorial work is to be conducted to develop a rational temperament for scientific observations which lead to constructive inferences essential for technology studies. Students must be encouraged to perform minimum six experiments (project based learning activities) and submit the laboratory journal.
3. An additional laboratory/tutorial activity based on self-learning topics in the form of Lab demonstration experiment, Virtual Lab, Simulation Lab, case study should be conducted and assessed.

4. The distribution of 25 marks for term work should be as per the Rubrics designed for the Laboratory work by the subject teacher.

Reference Books:

- Paul Horowitz and Winfield Hill, "The Art of Electronics" Cambridge University Press, 3rd Edition, 2015.
- Paul Scherz and Simon Monk, "Practical Electronics for Inventors" McGraw Hill Education, 4th Edition, 2016.
- Charles K. Alexander and Matthew N. O. Sadiku, "Fundamentals of Electric Circuits" McGraw Hill Education, 4th Edition, 2016.

Online Resources:

- Online repository and community for sharing and exploring 3D-printable designs and open-hardware projects. - https://www.thingiverse.com/
- Step-by-step learning resource for developing Android applications using MIT App Inventor. - http://www.appinventor.org/book2
- Official resource for ESP32 development boards, hardware, software frameworks, documentation and IoT development resources. - https://www.espressif.com/
- Visual, beginner-friendly platform for learning mobile app development through hands-on application building, tutorials and educational resources. - https://appinventor.mit.edu/
- Practical tutorials and project resources for ESP32, ESP8266, Arduino, Raspberry Pi, IoT, web servers and related embedded applications. - https://randomnerdtutorials.com/

Program: Artificial Intelligence and Data Science	First Year B. Tech.	Semester: I
Course: Indian Knowledge System (D26SHS102T)		

Pre-requisites: NIL

Objectives:

1. To impart knowledge about basic principles of thought process, reasoning, and inferencing.
2. To make students aware of Indian Traditional knowledge Systems connecting society and nature.
3. To acquaint students with holistic lifestyle of yogic science and wisdom in modern society with rapid technological advancements and societal disruptions.
4. Develop ethical values, critical thinking, and holistic perspectives through Indian traditions.
5. Explore Indian Knowledge Systems and their contributions to society and civilization.

Outcomes: On completion of the course, the learner will be able to:

1. Understand the history of Indian education system.
2. Learn about Indian Scientists and their inventions.
3. Understand and appreciate the various art forms and architecture in India.
4. Illustrate the classic literature written in Indian languages.
5. Know the various religions followed in India and their philosophies.

Unit	Description	Duration
1	**Indian Education System** • Gurukul system • Ancient Universities (Nalanda, Takshashila,Vikramshila,Vallabhi, Nagarjuna,etc.)	4
2	**Indian Scientists and Their inventions** • Patanjali, • Aryabhatta, • Bhaskaracharya, • Charaka, Brahmagupta, • Varahmitra, • Sushruta, • Kanada • Baudhyana, etc.	6
3	**Indian art and architecture** • Mughal Paintings, Tanjore Paintings, Madhubani Paintings, Warli Paintings, etc. • Harrappa and Mohenjo-Daro Civilization • Temples and other religious places • Buddhist stupas • Forts and monuments	8
4	**Indian Classic Literature** • Puranas • Epics (Ramayana, Mahabharata, Shakuntala, Meghdoota, Arthashastra,Sangam Literature, Malavikagnimitram etc.)	6

5	**Religion and Philosophy** • Vedas • Buddhism Jainism and other religions	**4**
	Total	**28**

Sr. No.	Tutorial Title
	Interactive/Participative Learning Assignments
1	**Indian Education System** • Group discussions/debates on various education systems.
2	**Indian Scientists and Their inventions** • Group presentations on various Indian scientists • An assignment on different inventions by Indians and their impact on world.
3	**Indian art and architecture** • Group Poster project on different painting forms and Harappa and Mohenjo-Daro civilization. • Group presentation on different archaeological structures in India
4	**Indian Classic Literature** • An assignment on review of any one of the Indian classic literatures. • Group discussion/Debate on the importance of the Indian classic literature in spreading the awareness about the importance of Indian culture and traditions. • Dramatic Adaptations: a scene or act from Indian classical literature into a dramatic performance.
5	**Religion and Philosophy** • A group discussion/debate on the various religions and their philosophies

A minimum of eight experiments from the above-suggested list or any other tutorial based on the syllabus will be included, which would help the learner to apply the concept.

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Tutorial (Term work: 25 Marks)

1. Term work shall consist of Tutorial work with submission.
2. Batch wise Tutorial work is to be conducted to develop a rational temperament for scientific observations, which lead to constructive inferences essential for technology studies. Students must be encouraged to perform minimum eight experiments and submit the tutorial.
3. An additional tutorial activity based on self-learning topics in the form of extra tutorial/case study should be conducted and assessed.
4. The distribution of 25 marks for term work should be as per the Rubrics designed for the tutorial work by the subject teacher.

Mini project Report Presentation (25 Marks)

1. Students in team will select a topic related to Indian Knowledge System and prepare a 30-page report. Each group will present the problem identified, objectives, methodology, key findings, proposed solution, and conclusion in a clear and structured manner. Students must use PPT slides to present.

Books Recommended:

- B. Mahadevan, V. R. Bhat, Nagendra Pavana, '*Introduction to Indian Knowledge Systems: Concepts and Applications',* PHI Learning Publications, Delhi, 2022.
- Satishchandra Chaterjee, Dheerendramohan Datta, *An Introduction to Indian Philosophy,* Motilal Banarsidass Publishing House, New Delhi, 2016
- V.Sivaramakrishnan (Ed.), *'Cultural Heritage of India-course materia'l*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition,2014

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech.	Semester: I
Course: Health and Wellness (D26SLL101T)		

Pre-requisites: Nil

Objectives:

1. To understand principles of physical, mental, social and spiritual wellness.
2. To understand the significance of digital health.
3. To practice stress management and emotional resilience.
4. To develop healthy lifestyle habits for good health.
5. To impart strategies to solve community or campus health challenges.

Outcomes: On completion of the course, the learner will be able to:

1. Understand the multidimensional nature of health and its role in engineering careers.
2. Use digital wellness and fitness platforms effectively.
3. Employ personal development (both physical & emotional) strategies for better living.
4. Create a plan for good health through a positive mindset.
5. Design simple digital solutions(posters) to address community or campus health challenges.

Health And Wellness (D26SLL101T)		
Unit	**Description**	**Duration**
1	**Foundations of Health & Wellness** • WHO definition — dimensions of health • Physical, mental, social & spiritual wellness • Health vs. disease continuum • Role of lifestyle in engineering careers	**4**
2	**Digital Health and Wellness** • Introduction to digital health • Telemedicine and e-health systems • Wearable health devices • Fitness trackers and smart watches	**6**
3	**Mental Health and Stress Management** • Stress, anxiety, and burnout • Time management for students • Yoga for mind and body (Mindfulness and Meditation) • Building resilience	**6**
4	**Nutrition and Healthy Lifestyle** • Balanced diet and nutrition basics • Food habits and metabolism • Exercise and fitness principles • Sedentary lifestyle risks for students • Ergonomics & posture at workstations • Hydration & sleep hygiene • Substance abuse awareness	**6**
5	**Community & Environmental Health** • Environmental pollution & health impacts	**4**

	• Sustainable living & green habits • Campus health resources • Social responsibility in public health	
	Total	**26**

Health And Wellness (D26SLL101T)	
Sr. No.	**Tutorial**
1	Fundamentals of Good Health
2	Create a Personalized Health Goal Plan
3	Lifestyle choice (Healthy or Unhealthy) to explore
4	Skit on Health and Disease Prevention
5	Role-play techniques to promote awareness regarding Digital health and disease prevention
6	Yoga Activity for Mind and Body-Mindfulness & Meditation
7	Stress Management-Group Discussion
8	Real-world nutrition design task
9	Mind Management (Case Study)
10	Create a digital awareness poster
11	Nutrition and Healthy Lifestyle
12	Digital journaling for mood tracking
	Mini Project – Community Health and Wellness Initiative
1	**Research and Assess Community Needs:** • Conduct surveys or interviews to assess the health and wellness needs of your community. • Identify specific areas where improvements can be made, such as physical fitness, mental health, social connections, or access to healthcare resources.
2	**Fitness and Recreation Events:** • Arrange fitness events, such as community walks or runs, group exercise classes, yoga sessions, or sports tournaments.
3	**Health Education Campaigns:** • Launch health education campaigns to raise awareness about specific health issues relevant to your community. • This could include distributing informational pamphlets, organizing educational talks, etc. • Creating Social Media Campaigns to share important health messages. Develop a plan to sustain the project beyond its initial phase.
4	**Health and Wellness Advocacy:** • Choose a health issue you are passionate about and design a health and wellness advocacy project. • Students can create a Persuasive Video, Infographic or Social Media Campaign to raise awareness and mobilize support for their chosen cause.

A minimum of eight assignments & a mini-Project from the above-suggested list or any other assignment based on the syllabus will be included, which would help the learner to apply the concept.

Self -Learning Plan:

The subject teacher will identify the self-learning topics and ensure that students develop a deeper understanding of their relevance to industry and society. Further, the details of the self-learning activity, assessment methods, and rubrics will be provided in the self-learning plan of the course.

Evaluation Scheme:

Tutorial (Term work: 25 Marks)

1. Term work shall consist of Tutorial activities (25marks) and Mini Project (15marks).
2. Batch wise Tutorial Activities are to be conducted to develop a deep understanding of Healthy Life which will help the students to apply various aspects of health. Students must be encouraged to perform minimum eight activities and submit the written assignments on it.
3. An additional tutorial activity based on self-learning (10marks) topics in the form of demonstration, extra tutorial, case study etc. should be conducted and assessed.
4. The distribution of 25 marks for term work should be as per the Rubrics designed for the Tutorial work by the subject teacher.

Reference Books:

- C. Bouchard, S. N. Blair, and W. L. Haskell, Eds., *Physical Activity and Health*. Champaign, IL, USA: Human Kinetics, 2012.
- E. Attached and M. Fernandez, *Mental Health Workbook*, 2021.
- N. Lorick, *Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Well-Being*, 2022.
- C. Nyambichu and J. Lumiri, *Lifestyle Diseases: Lifestyle Disease Management*, 2018.
- A. Clow and S. Edmunds, *Physical Activity and Mental Health*. Champaign, IL, USA: Human Kinetics, 2013.
- B. K. S. Iyengar, *Yoga for Beginners: A Practical Guide*. London, U.K.: Dorling Kindersley, 2006.
- D. Goleman, *Emotional Intelligence: Why It Can Matter More Than IQ*. New York, NY, USA: Bantam Books, 2006.
- J. Clear, *Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones*. New York, NY, USA: Penguin Books, 2018.
- S. Lin (Ed.), *Digital Health*. Brisbane, Australia: Exon Publications, 2022.
- S. Syed-Abdul, X. Zhu, and L. Fernandez-Luque (Eds.), *Digital Health: Mobile and Wearable Devices for Participatory Health Applications*. Amsterdam, Netherlands: Elsevier, 2020.
- D. Patel (Ed.), *Digital Health: Telemedicine and Beyond*. Cambridge, MA, USA: Academic Press, 2024.
- E. Topol, *Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again*. New York, NY, USA: Basic Books, 2019.
- P. Lee, C. Goldberg, and I. Kohane, *The AI Revolution in Medicine: GPT-4 and Beyond*. New York, NY, USA: Pearson, 2023.

Web References:

- Physiopedia — The Concept of Wellness (dimensions of health vs. wellness) — https://www.physio-pedia.com/The_Concept_of_Wellness
- Thomas Jefferson University — 8 Dimensions of Wellness — https://www.jefferson.edu/life-at-jefferson/health-wellness/fitness/8-dimensions-wellness.html

- Open Medscience — Wearable Devices and Apps in Healthcare (role in telemedicine) — https://openmedscience.com/wearable-devices-and-apps-a-growing-partnership/
- Meegle — Wearable Tech for Telemedicine — https://www.meegle.com/en_us/topics/wearable-technology/wearable-tech-for-telemedicine
- Mindful.org — How to Manage Stress with Mindfulness and Meditation — https://www.mindful.org/how-to-manage-stress-with-mindfulness-and-meditation/
- PMC/NIH — Mindfulness-Based Approaches for Stress, Anxiety & Depression in Health Students — https://pmc.ncbi.nlm.nih.gov/articles/PMC8435111/
- College Ave — Effective Time Management for Students — https://www.collegeave.com/articles/effective-time-management-for-students/
- Harvard T.H. Chan School of Public Health — Healthy Eating Plate — https://nutritionsource.hsph.harvard.edu/healthy-eating-plate/
- Health Discovery — Ergonomics & Nutrition (posture, workstation health) — https://healthdiscovery.org/nutrition/ergonomics-nutrition-combo/
- PMC/NIH — Diet and Sleep Behaviors in Student-Athletes (sleep hygiene study) — https://pmc.ncbi.nlm.nih.gov/articles/PMC12472328/
- PAHO/WHO — Environmental Determinants of Health — https://www.paho.org/en/topics/environmental-determinants-health
- PMC/NIH — Environmental and Health Impacts of Air Pollution: A Review — https://pmc.ncbi.nlm.nih.gov/articles/PMC7044178/
- Frontiers in Public Health — Greening Public Health (embedding sustainability in practice) — https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2026.1888689/full

Program: Artificial Intelligence (AI) and Data Science	First Year B. Tech	Semester: I
Course: Version Control Fundamentals (D26SSC149)		

Pre-requisites:

Basic knowledge of operating systems and file management.

Objectives:

1. To understand the fundamentals and importance of Version Control Systems (VCS).
2. To learn and apply Git for tracking and managing code changes.
3. To develop skills in branching, merging, and resolving conflicts in collaborative development.
4. To use GitHub for remote repository management and team collaboration.

Outcomes: On completion of the course, the learner will be able to:

1. Explain the role and working of Version Control Systems, Git.
2. Perform basic Git operations such as repository creation, commit, clone, push, and pull.
3. Apply branching and merging techniques to manage software development effectively.
4. Create and manage remote repositories on GitHub for collaboration and portfolio development.

Version Control Fundamentals (D26SSC149)		
Unit	**Description**	**Video Lecture Duration**
1	**Introduction to Version Control and Git:** Introduction to Version Control Systems (VCS), Keeping Historical Copies, Diffing Files, Applying Changes using diff and patch, Practical applications of diff and patch, Version Control and Automation, Introduction to Git, Installing and Configuring Git, First Steps with Git, Tracking Files, Basic Git Workflow, Anatomy of a Commit Message. **Practical Components:** Git installation and setup, creating repositories, tracking and committing files, using diff and patch tools, and performing basic Git operations.	**5**
2	**Using Git Locally and Branch Management:** Skipping the Staging Area, Viewing and Analysing Changes, Deleting and Renaming Files, Undoing Changes Before Commit, Amending Commits, Rollbacks and Commit History, Identifying Commits, Introduction to Branches, Creating and Working with Branches, Merging Branches, Handling Merge Conflicts. **Practical Components:** Managing local repositories, undoing and restoring changes, creating and merging branches, resolving merge conflicts, tracking commit history.	**5**
3	**Working with Remote Repositories and GitHub:** Introduction to GitHub, Remote Repositories and their Importance, Basic Interaction with GitHub, Working with Remotes, Fetching and Updating Changes, Pull-Merge-Push Workflow, Pushing Remote Branches, Rebasing Changes, Conflict Resolution during Collaboration, Best Practices for Team Collaboration using Git. **Practical Components:** Creating and managing remote repositories, synchronizing local and remote repositories, pushing and pulling changes, rebasing commits, resolving remote conflicts, and collaborative workflows using GitHub.	**5**

4	**Collaboration and Code Review using GitHub:** Introduction to Collaborative Development, Pull Requests on GitHub, Pull Request Workflow, Updating Existing Pull Requests, Squashing Commits, Code Reviews and Review Workflow, Using Code Reviews in GitHub, Managing Team Collaboration, Tracking Issues, Introduction to Continuous Integration (CI). **Practical Components:** Creating and reviewing pull requests, updating collaborative projects, performing code reviews, managing issues, and integrating collaborative workflows using GitHub.	**5**
	Total	**20**

Evaluation Scheme:

Continuous Assessment:

1. The identified courses shall focus on developing AI-related competencies and skills among students. Each selected course shall carry one (1) credit.
2. Faculty members shall act as mentors for the Coursera courses identified for various semesters of the program.
3. One faculty mentor shall be assigned to each division of the program for effective coordination and monitoring of this activity.
4. The assigned faculty mentor shall complete and review the course content before assigning the course to students.
5. The term work for these one-credit courses shall form a part of the Internal Continuous Assessment (ICA) component.
6. The Term work (ICA) component shall carry **40 marks**

The distribution of marks for term work shall be as follows:

- **15 Marks**: Coursera Course Completion and Certification
- **15 Marks**: Faculty-curated quiz conducted through the Coursera/Any other platform
- **10 Marks**: Internal faculty evaluation through quizzes, assignments, presentations, or Project

Suggested Coursera Mapping: Introduction to Git and GitHub