



D. Y. Patil Education Society

(Deemed To Be University)

School of Engineering & Management

Department of First-Year Engineering

Course Title: Engineering Mathematics-I	
Course Code: 26FYEUB101	Semester: I
Teaching Scheme L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE-I/MSE/ISE-II: 10/30/10	ESE Marks: 50

Prerequisites:	Algebra, Matrices, Derivatives, Integrations, Differential equations.
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Course Objectives:

1.	Develop the ability to solve systems of linear equations using matrix techniques and introduce eigenvalues and eigenvectors for engineering applications.
2.	Familiarize students with numerical methods for obtaining approximate solutions of systems of linear equations.
3.	Develop the mathematical skills required to formulate and solve ordinary differential equations arising in engineering problems.
4.	Introduce numerical techniques for solving differential equations and promote computational thinking for engineering analysis.

Curriculum Details:

Course Contents	Duration
Unit 1: Matrices and System of Linear Equations • Introduction to matrices, types of matrices • Rank of matrix by normal form and echelon form • Solution of simultaneous linear non-homogenous equations • Solution of simultaneous linear homogenous equations	07 Hrs
Unit 2: Eigen Values and Eigen Vectors • Definition of linear combination of vectors • Linear Dependence and independence of vectors • Eigen values and its properties • Eigen vectors and its properties • Cayley-Hamilton theorem	07 Hrs
Unit 3: Numerical Solutions of System of Linear equations • Introduction • Gauss – Elimination method • Gauss – Jordan method • Gauss – Seidel method • Jacobi's iterative method • Power method	07 Hrs

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Unit 4: Ordinary Differential Equations of First Order and First Degree • Definition of differential equation, order and degree of differential equation • Exact differential equations • Non - exact differential equations • Linear differential equations • Bernoulli's differential equations	07 Hrs
Unit 5: Applications of Ordinary Differential Equations • Introduction of variable separable form • Orthogonal trajectories (Cartesian form) • Applications to simple electrical circuits • Newton's law of cooling • Rate of decay and growth	07 Hrs
Unit 6: Numerical methods to solve Ordinary Differential Equations • Introduction • Picard's method • Taylor's series method • Euler's method • Runge - Kutta's method (Fourth order)	07 Hrs
Self-Learning Topic: History of Mathematics and Great Mathematicians • Introduction to the history and evolution of mathematics • Contributions of ancient Indian mathematicians: Aryabhata, Brahmagupta, and Bhaskaracharya • Contributions of Greek mathematicians: Euclid, Pythagoras, and Archimedes • Contributions of Euler, Gauss and Srinivas Ramanujan • Applications of mathematical discoveries in engineering and technology.	

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO's	Statements
101.1	Use matrix algebra to solve systems of linear equations and determine eigenvalues and eigenvectors for engineering applications.
101.2	Apply numerical methods to obtain approximate solutions of systems of linear equations and determine dominant eigenvalues using iterative techniques.
101.3	Solve first-order ordinary differential equations and apply them to simple engineering models.
101.4	Apply numerical methods to obtain approximate solutions of ordinary differential equations.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
101.1	2, 3	3	2									1
101.2	2, 3	3	2									1
101.3	3	3	2									1
101.4	3	3	2									1

Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	10 th	Erwin Kreyszig	Wiley India Pvt. Ltd.	2015
2	Higher Engineering Mathematics	44 th	B. S. Grewal	Khanna Publishers	2021
3	Introductory Methods of Numerical Analysis	6 th	S. S. Sastry	PHI Learning Pvt. Ltd.	2023
4	Elementary Differential Equations and Boundary Value Problems	11 th	S. C. Gupta, V. K. Kapoor	William E. Boyce, Richard C. DiPrima, Douglas B. Meade	2017

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5	Advanced Engineering Mathematics	8 th	Peter V. O'Neil	Cengage Learning	2017
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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Engineering Mathematics	5 th	B. V. Ramana	McGraw Hill Education	2019
2	Numerical Methods for Scientific and Engineering Computation	7 th	M. K. Jain, S. R. K. Iyengar, R. K. Jain	New Age International	2019
3	A Textbook of Engineering Mathematics	10 th	N. P. Bali, Manish Goyal	Laxmi Publications	2019
4	Advanced Engineering Mathematics	2 nd	H. K. Dass	S. Chand Publishing	2018
5	Linear Algebra and Its Applications	5 th	David C. Lay, Steven R. Lay, Judi J. McDonald	Pearson	2016

Useful Links/Web Resources:

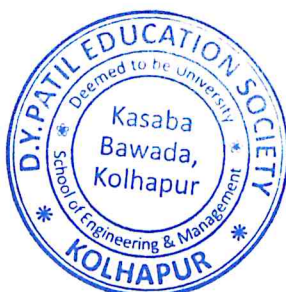
1. DELNET- <http://www.delnet.in>
2. NDL-<http://ndl.iitkgp.ac.in>
3. N-LIST- <http://www.nlist.inflib.ac.in>
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

Course Coordinator

Dr. A. R. Mali

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Mr. A. R. Matkar



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Department of First-Year Engineering

Course Title: Engineering Mathematics-I Tutorial	
Course Code: 26FYEUB102	Semester: I
Teaching Scheme L-T-P: 0-0-2	Credit: 01
Evaluation Scheme: ISE Lab	Total: 25 Marks

Prerequisites:	Algebra, Matrices, Derivatives, Integrations, Differential equations.
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Course Objectives:

1.	Develop the ability to solve systems of linear equations using matrix techniques and introduce eigenvalues and eigenvectors for engineering applications.
2.	Familiarize students with numerical methods for obtaining approximate solutions of systems of linear equations.
3.	Develop the mathematical skills required to formulate and solve ordinary differential equations arising in engineering problems.
4.	Introduce numerical techniques for solving differential equations and promote computational thinking for engineering analysis.

List of Tutorials:

Tut. No.	Title of Tutorials	Duration
01	Matrices and System of Linear Equations: Rank of a matrix (Normal Form and Echelon Form), Solution of Homogeneous and Non-homogeneous Systems of Linear Equations.	02 Hrs
02	Matrices and System of Linear Equations: Solution of Systems of Linear Equations using MATLAB.	02 Hrs
03	Eigen Values and Eigen Vectors: Linear Dependence and Independence of vectors, Eigen values, Eigen vectors, Cayley-Hamilton Theorem.	02 Hrs
04	Eigenvalues and Eigenvectors: Computation of Eigenvalues and Eigenvectors using MATLAB.	02 Hrs
05	Numerical Solution of System of linear Equations: Gauss – Elimination method, Gauss – Jordan method, Gauss – Seidel method.	02 Hrs
06	Numerical Solution of System of linear Equations: Jacobi's iterative method and Power Method using MATLAB.	02 Hrs
07	Ordinary Differential Equations of First Order and First Degree: Exact and non-exact differential equations.	02 Hrs
08	Ordinary Differential Equations of First Order and First Degree: Linear and Bernoulli's differential equations.	02 Hrs
09	Applications of Ordinary Differential Equations: Orthogonal Trajectories (Cartesian curves) and Applications to Simple Electrical Circuits.	02 Hrs
10	Applications of Ordinary Differential Equations: Newton's law of cooling and Model of Decay and growth.	02 Hrs

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3	A Textbook of Engineering Mathematics	10 th	N. P. Bali, Manish Goyal	Laxmi Publications	2019
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Useful Links/Web Resources:

1. DELNET- <http://www.delnet.in>
2. NDL-<http://ndl.iitkgp.ac.in>
3. N-LIST- <http://www.nlist.inflib.ac.in>
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

Course Coordinator

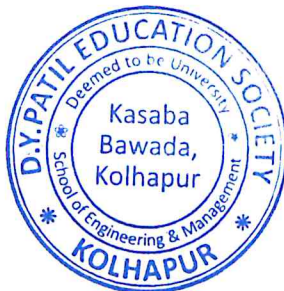
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Course Title: Applied Physics	
Course Code: 26FYEUB#01	Semester: I & II
Teaching Scheme: L-T-P:3-0-0	Credits: 03
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	ESE Marks: 50

Prior Knowledge of:	Fundamentals of optics, semiconductors, nature of radiation, differential equations, redox reactions.
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Course Objectives:

1.	To make students understand wave optics principles by exploring interference and diffraction, analysing the resolving power of plane diffraction gratings, and studying the experimental setup of Newton's rings to quantitatively determine both optical wavelengths and the radius of curvature of plano-convex lenses
2.	To provide students the knowledge of working principles of LASER and its applications
3.	To impart a foundational knowledge of quantum physics through the study of matter-wave dualism, uncertainty principles, and the derivation and application of one-dimensional Schrödinger equations to solve potential well problems
4.	To impart knowledge of band formation, temperature-dependent Fermi levels, and transport properties in semiconductors, while establishing their practical applications in electronic devices (diodes, BJTs, JFETs) and foundational digital logic circuits
5.	To introduce the fundamental principles of electrochemical cell operations, the structural and kinetic mechanisms of rechargeable batteries, and the analytical evaluation of crucial battery parameters and energy storage performance

Curriculum Details

Course Contents	Duration
Unit 1: Wave Optics • Introduction: interference, diffraction, review of geometric and optical path • Theory of plane diffraction grating and grating equation • Resolving power of plane diffraction grating • Newton's ring: Experimental arrangement • Diameter of bright and dark ring • Determination of wavelength of monochromatic light and radius of curvature of plano-convex lens using Newton's rings • Numerical	07 Hrs


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Unit 2: LASER • Concept of LASER, • Principle and working of LASER: Absorption, Spontaneous emission, Stimulated emission, Population inversion • Einstein's coefficients • Properties of LASER • Types of LASERS - Ruby LASER, He-Ne LASER • Applications of LASER: Industrial, Medical	07 Hrs
Unit 3: Quantum Mechanics • Introduction to quantum physics • de Broglie wavelength of matter waves and its different forms • Heisenberg's uncertainty principle • Wave function and probability interpretation • Schrödinger's time independent & dependent wave equation (1-D) • Energy of particle in 1-D potential well using Schrödinger equation • Numerical	07 Hrs
Unit 4: Semiconductor Physics • Fermi Dirac distribution • Formation of bands in solids • Fermi energy level in intrinsic and extrinsic semiconductors • Dependence of Fermi energy level on temperature • Hall effect: equation for Hall voltage and Hall coefficient and relation between them • Numerical	07 Hrs
Unit 5: Semiconductor Devices and Digital Electronics • Properties of a P-N junction • Diode equation and I-V characteristic • Construction, working and I-V characteristics of BJT and JFET • Introductory digital concepts: Logic levels, Digital waveform and characteristics. • Logic functions and logic gates: AND, OR, NOT, NAND, and NOR • Numerical	07 Hrs
Unit 6: Supercapacitor and Battery • Introduction: Electrolytic and galvanic cells, • Electrochemical energy storage: Supercapacitors, Batteries, and their types • Cell reactions in rechargeable batteries	07 Hrs


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• Reaction mechanism in Li-ion battery • Thermodynamic and Kinetic parameters of cell reactions • Battery parameters • Numerical	
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Self-learning topics:	Optical Fiber Communication, Holography, Quantum Tunneling, Wide-Bandgap (WBG) Semiconductors, Optoelectronic Devices, Realization of Logic Gates using Universal Gates, Hydrogen Fuel Cells
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Course Outcomes (COs): After completion of the course, students will be able to:

CO	Statement
#01.1	Express the principles of interference and diffraction and apply these concepts to solve engineering problems.
#01.2	Summarize the operating principles of LASERs, and their various engineering and medical applications.
#01.3	Interpret the principles of wave-particle dualism and uncertainty and examine the energy states of a particle in a 1-D potential well using Schrödinger's equations.
#01.4	Interpret the temperature dependence of Fermi energy levels in semiconductors and apply the principles of the Hall effect to determine charge transport properties.
#01.5	Compare the operational and output characteristics of P-N junction-based devices and summarize the principles of digital electronics.
#01.6	Compare supercapacitors and batteries and determine the equilibrium cell voltage of rechargeable systems using thermodynamic parameters.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
#01.1	3	3	2									1
#01.2	2	3	2									1
#01.3	3	3	3									1
#01.4	3	3	2									1
#01.5	2	3	2									1
#01.6	3	3	2				1					1


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Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Engineering Physics: Fundamentals and Applications	1 st	A. Singh, S. Singh, S. K. Sharma	Cambridge University Press	2025
2	Engineering Physics	2 nd	H. K. Malik Ajay Kumar Singh	Tata McGraw Hill Education	2017
3	Engineering Physics	1 st	A. B. Bhattacharya A. Nag	Khanna Publishing House	2025
4	A Text Book of Engineering Physics	11 th	M. N. Avadhanulu, P. G. Kshirasagar TVS A. Murthy	S. Chand Publications	2020
5	A Textbook of Engineering Physics	2 nd	D.K. Bhattacharya Poonam Tandon	Oxford University Press	2024

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Fundamentals of Physics	12 th	J. Walker, D. Halliday, R. Resnick	Wiley Publications	2021
2	Engineering Physics	2 nd	B.K. Pandey and Chaturvedi	Cengage Learning Publications	2021
3	Battery Technology: Fundamentals of Battery Electrochemistry, Systems and Applications	1 st	A. Börger	Wiley	2025
4	Solid State Physics	11 th	S. O. Pillai	New Edge Internationals	2025
5	Digital Fundamentals	11 th	T. L. Floyd	Pearson	2017
6	Solid State Electronic Devices	7 th	B. G. Streetman S. K. Banerjee	Pearson	2016


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Useful Link /Web Resources:

1. <http://hyperphysics.phy-astr.gsu.edu/hbase/index.html>
2. https://en.wikipedia.org/wiki/Wave_interference
3. https://en.wikipedia.org/wiki/Introduction_to_quantum_mechanics

Course Coordinator

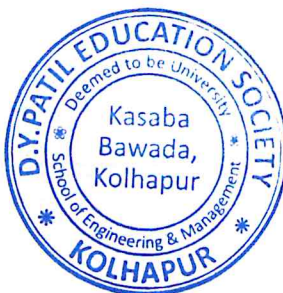
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Course Title: Applied Physics Laboratory	
Course Code: 26FYEUB#02	Semester: I & II
Teaching Scheme: L-T-P: 0-0-2	Credits: 01
Evaluation Scheme: ISE-25	ESE Marks:

Prior Knowledge of:	Optics, semiconductor basics, graph plotting, slope calculation, circuit connections, working principle of electromagnet
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Course Objectives:

1	To develop hands-on proficiency in utilizing advanced optical instruments and laser systems to experimentally measure properties of wave, evaluate the resolution limits of optical devices, and apply interference and diffraction principles to determine micro-dimensions and beam propagation properties.
2	To experimentally verify quantum-mechanical phenomena and semiconductor device operations by measuring fundamental physical constants and energy bandgap, and plotting I-V characteristics.
3	To analyse the physical, electrical, and charge transport properties of semiconductor materials and electrochemical energy storage systems by evaluating carrier concentrations, identifying conduction mechanisms, and determining the performance metrics of supercapacitors.

List of Experiments-

Exp. No	Title of Experiments	Duration
01	Wavelength of LASER source	02 Hrs
02	Resolving power of plane diffraction grating	02 Hrs
03	Resolving power of telescope	02 Hrs
04	Newton's ring	02 Hrs
05	Diameter of cylindrical obstacle	02 Hrs
06	Divergence of LASER beam	02 Hrs
07	Planck's constant	02 Hrs
08	Physical significance of the wave function	02 Hrs
09	Band gap energy of a given P-N junction diode	02 Hrs


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10	Hall effect	02 Hrs
11	de-Morgan's theorem	02 Hrs
12	I-V characteristics of a Field Effect Transistor (FET)	02 Hrs
13	Areal capacitance of supercapacitor device	02 Hrs

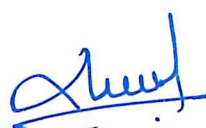
Minimum 10 Experiments should be conducted from the above list.

Course Outcomes (COs): After successful completion of the course, students will be able to

CO	Statement
#02.1	Apply the principles of interference, diffraction, and wave propagation to determine wave properties and performance limits of optical instruments.
#02.2	Examine fundamental quantum phenomena and active electronic components by measuring physical constants and material properties and evaluating the current-voltage characteristics.
#02.3	Determine charge carrier transport properties in semiconductors using the Hall effect.
#02.4	Examine the performance parameters of electrochemical energy storage systems using supercapacitor characterization techniques.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
#02.1	3	3	2						1			1
#02.2	3	3	2						1			1
#02.3	3	3	3						1			1
#02.4	3	3	2			1	1		1			1


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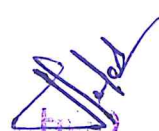
Suggested Learning Resources: --Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Engineering Physics: Fundamentals and Applications	1 st	A. Singh, S. Singh, S. K. Sharma	Cambridge University Press	2025
2	Engineering Physics	2 nd	H. K. Malik, A. K. Singh	Tata McGraw Hill Education	2017
3	Engineering Physics	1 st	A. B. Bhattacharya, A. Nag	Khanna Publishing House	2025
4	A Text Book of Engineering Physics	11 th	M. N. Avadhanulu, P. G. Kshirasagar, TVS A. Murthy	S. Chand Publications	2020
5	Physics Practical for B.Sc./B.Tech	1 st	R. C. Tiwari, A. Shukla	ASTRAL	2022

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Fundamentals of Physics	12 th	J. Walker, D. Halliday, R. Resnick	Wiley Publications	2021
2	Engineering Physics	2 nd	B.K. Pandey and Chaturvedi	Cengage Learning Publications	2021
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6	Solid State Electronic Devices	7 th	B. G. Streetman S. K. Banerjee	Pearson	2016


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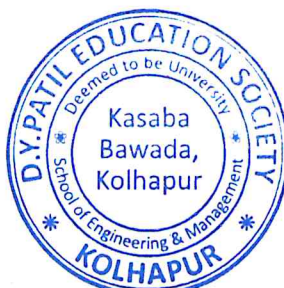
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Useful Link /Web Resources:

1. <https://vlab.amrita.edu/?sub=1>
2. <http://vlabs.iitb.ac.in/vlab/labsps.html>

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(As Per National Education Policy 2020)

Course Title: Introduction to Programming	
Course Code: 26FYEUS103	Semester: I
Teaching Scheme: L-T-P:3-0-0	Credits: 03
Evaluation Scheme: ISE-I/MSE/ISE-II: 10/30/10	ESE Marks: 50

Prior Knowledge of:	Basic knowledge about the working of computers. No prior programming experience is assumed.
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Course Outcomes (COs): After completion of the course, students will be able to:

CO	Statements
CO1	Analyze problems and formulate algorithmic solutions using flowcharts, pseudocode, and visual programming (Scratch).
CO2	Understand and apply fundamental programming constructs — data types, variables, expressions, and control structures (conditional and iterative).
CO3	Design modular, reusable code using Python functions (including recursion), and effectively manipulate structured data types such as lists, tuples, dictionaries, and strings.
CO4	Implement exception handling mechanisms to develop robust Python programs, and apply the skill set to build small, self-contained applications.

Curriculum Details

Course Contents	Duration
Unit 1: Algorithmic Thinking & The Building Blocks [CO-1] - Core steps in problem-solving; introduction to algorithms and their characteristics. - Pseudocode conventions and standard flowchart symbols. - The transition from visual blocks (Scratch) to text-based code (Python). - Understanding variables, constants, and memory concepts (the 'labelled box' analogy). - Input, processing, and output paradigm Dual-Tool Demonstration: - Scratch: Using Ask/Say blocks and simple motion scripts to illustrate the input-process-output cycle. - Python: Sketching the equivalent flow with input() and print(), without syntax detail yet — reinforcing that the logic, not the language, comes first.	06 Hrs
Unit 2: Sequential Execution & Expressions [CO-2] - Data types: Numbers (Integers, Floats) and Text/Strings. - Variables in Python — dynamic typing, naming rules, and best practices.	06 Hrs



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• Operators: Arithmetic, relational, logical, and assignment. • Operator precedence and expression evaluation. • Type casting: int(), float(), str(). Dual-Tool Demonstration: • Scratch: Using the green Operators blocks to calculate math formulas and join text strings. • Python: Translating those block expressions into standard Python statements and handling type casting.	
Unit 3: Conditional Branching (Making Decisions) [CO-2] • Boolean logic and truth values; comparison operators recap. • Unidirectional branching: if statement. • Bidirectional branching: if-else statement. • Multi-way branching: if-elif-else ladder. • Nested conditions and common decision-making pitfalls. Dual-Tool Demonstration: • Scratch: Implementing if-then and if-then-else blocks to control sprite behaviour based on sensing inputs. • Python: Mapping those exact blocks to if, if-else, and if-elif-else syntax, highlighting the importance of indentation.	07 Hrs
Unit 4: Iteration & Looping (Repetitive Logic) [CO-2] • Why loops are needed; definite vs. indefinite repetition. • The for loop with range(). • The while loop and condition-controlled repetition. • Infinite loops and loop-termination strategies. • Jump statements: break and continue. • Nested loops and pattern generation. Dual-Tool Demonstration: • Scratch: Using repeat (n), repeat until, and forever blocks. • Python: Translating those behaviours into for loops (with range()), while loops, and break/continue statements.	08 Hrs
Unit 5: Modular Programming (Functions & Abstraction) [CO-3] • The philosophy of 'Divide and Conquer'; benefits of modular code. • Defining functions using def; the function-call mechanism. • Parameters — positional and keyword arguments; default values. • Return values, including functions returning multiple values. • Scope: local vs. global variables. • Introduction to recursion — base case and recursive case (factorial, sum of digits). Dual-Tool Demonstration: • Scratch: Creating custom blocks using the 'My Blocks' feature to modularize an animation or game script. • Python: Defining standard functions with def, passing positional/keyword arguments, and returning values.	08 Hrs



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Unit 6: Structured Data Types, Exception Handling [CO-3, CO-4] • Lists — creation, indexing, slicing, and common built-in methods (append, remove, sort). • Tuples — immutability and typical use cases. • Dictionaries — key-value pairs, and common methods (keys(), values(), items()). • String manipulation — indexing, slicing, and built-in string methods. • Iterating over lists, tuples, and dictionaries. • Keeping programs from crashing: try-except blocks and common exception types. Dual-Tool Demonstration: • Scratch: Using Scratch Data Lists to store, search, and manipulate multiple items dynamically, and discussing their in-memory, non-persistent nature. • Python: Moving beyond single variables to Lists, Tuples, and Dictionaries, then reading/writing that data to text files and wrapping risky operations in try-except blocks for robust code.	10 Hrs
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Textbooks

1. Learn to Program with Scratch by Majed Marji (No Starch Press) — for the visual-programming component.
2. Python Programming: A Modern Approach by Vamsi Kurama (Pearson) — for the Python component.

Reference Books

1. Python Crash Course by Eric Matthes (No Starch Press).
2. Think Python: How to Think Like a Computer Scientist by Allen B. Downey (O'Reilly, freely available online).



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Course Title: Introduction to Programming Laboratory	
Course Code: 26FYEUS104	Semester: I
Teaching Scheme: L-T-P:0-0-2	Credits: 01
Evaluation Scheme: ISE: 25	ESE Marks:

Prior Knowledge of:	Basic knowledge about the working of computers. No prior programming experience is assumed.
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Course Outcomes (COs): After completion of the course, students will be able to:

CO	Statements
CO1	Analyze problems and formulate algorithmic solutions using flowcharts, pseudocode, and visual programming (Scratch).
CO2	Understand and apply fundamental programming constructs — data types, variables, expressions, and control structures (conditional and iterative).
CO3	Design modular, reusable code using Python functions (including recursion), and effectively manipulate structured data types such as lists, tuples, dictionaries, and strings.
CO4	Implement exception handling mechanisms to develop robust Python programs, and apply the skill set to build small, self-contained applications.

Practical

Lab Session	Experiment / Assignment	Duration
Lab 1	Orientation to the Scratch editor and the Python IDLE/VS Code environment. Draft flowcharts and pseudocode for everyday logic problems (e.g., making tea, ATM withdrawal).	02 Hrs
Lab 2	Explore the Scratch stage/sprites and Python I/O; compare Ask/Say blocks with input()/print().	02 Hrs
Lab 3	Build a temperature or currency converter in Scratch using variables and operator blocks.	02 Hrs
Lab 4	Recreate the same converter as a Python program; compare the two implementations.	02 Hrs
Lab 5	Design a grade calculator or number-guessing game visually using nested Scratch blocks.	02 Hrs
Lab 6	Code the grade calculator / number-guessing game in Python using if-elif-else and loops.	02 Hrs



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Lab 7	Generate geometric patterns (stars, polygons) using Scratch's Pen extension and repeat blocks.	02 Hrs
Lab 8	Generate numerical patterns in Python — Fibonacci series, prime-number checks, pattern printing.	02 Hrs
Lab 9	Build a modular calculator in Scratch, with each operation as a custom 'My Block'.	02 Hrs
Lab 10	Rewrite the modular calculator as a collection of Python functions.	02 Hrs
Lab 11	Store and display a list of student names / high scores using Scratch Data Lists.	02 Hrs
Lab 12	Implement the same using Python lists, and persist the data to a text file.	02 Hrs
Lab 13	Mini-project: a student record manager combining lists/dictionaries, functions, and file handling.	02 Hrs
Lab 14	Mini-project: add exception handling for invalid input/missing files; demonstration and evaluation.	

Laboratory Instruction Note: Software & Environment

This course uses the official Scratch 3.0 editor (online at scratch.mit.edu, or the offline Scratch Desktop app) and Python 3.10 or later with the IDLE or VS Code editor.

- Use Python 3.x throughout — do not use Python 2.x syntax (e.g., `print` as a statement), which is obsolete and unsupported since January 2020.
- Save Scratch projects as .sb3 files and Python scripts as .py files with descriptive names for evaluation.
- Encourage students to keep the Scratch and Python versions of each lab exercise side by side, reinforcing the 'block-to-text' translation that is the pedagogical spine of this course.

Textbooks

1. Learn to Program with Scratch by Majed Marji (No Starch Press) — for the visual-programming component.
2. Python Programming: A Modern Approach by Vamsi Kurama (Pearson) — for the Python component.

Reference Books

1. Python Crash Course by Eric Matthes (No Starch Press).
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Course Title: Digital Electronics	
Course Code: 26FYEUS105	Semester: I
Teaching Scheme: L-T-P:3-0-0	Credits: 03
Evaluation Scheme: ISE-I/MSE/ISE-II: 10/30/10	ESE Marks: 50

Prior Knowledge of:	None (First Year Core Course)
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Course Objectives:

1.	To introduce number systems, codes, and Boolean algebra as the mathematical basis of digital circuits.
2.	To familiarize students with logic gates and minimization techniques for efficient circuit design.
3.	To develop the ability to design and analyse combinational and sequential logic circuits.
4.	To introduce memory devices and programmable logic as a foundation for advanced digital/VLSI courses.

Course Outcomes (COs): After completion of the course, students will be able to:

CO	Statements
CO1	Convert numbers between different number systems and perform binary arithmetic and code conversions.
CO2	Simplify Boolean expressions using Boolean algebra and Karnaugh map techniques, and realize logic gates using universal gates.
CO3	Design and analyze combinational logic circuits such as adders, subtractors, multiplexers, encoders, and decoders.
CO4	Design and analyze sequential logic circuits including flip-flops, counters, and registers, and describe basics of memory and programmable logic devices.

Unit-wise Syllabus

Course Contents	Duration
Unit 1: Number Systems, Codes & Boolean Algebra Number systems: binary, octal, decimal, hexadecimal and inter-conversions; binary arithmetic (1's and 2's complement addition/subtraction); codes: BCD, Excess-3, Gray code, ASCII and code conversions; Boolean algebra postulates and theorems, De Morgan's laws; Boolean function simplification — SOP and POS forms.	06 Hrs
Unit 2: Logic Gates & Minimization Techniques Basic logic gates — AND, OR, NOT, NAND, NOR, XOR, XNOR: truth tables and symbols; universal gates (NAND/NOR) and realization of other gates using them; Karnaugh Map (K-Map) simplification for 2, 3, and 4 variables; don't-care conditions in K-Maps.	06 Hrs



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Unit 3: Combinational Logic Circuits Design procedure for combinational circuits; adders and subtractors — half adder, full adder, half subtractor, full subtractor; multiplexers and demultiplexers — design and applications; encoders and decoders — design and applications; code converters and magnitude comparators.	08 Hrs
Unit 4: Sequential Logic Circuits — Flip-Flops Latches vs flip-flops; SR latch and SR flip-flop; JK, D, and T flip-flops — truth tables and excitation tables; master-slave flip-flop and edge-triggering concept; flip-flop conversions (e.g., JK to D, D to T); timing diagrams and the race-around condition.	08 Hrs
Unit 5: Counters & Registers Asynchronous (ripple) counters — design and timing; synchronous counters — design using flip-flops; up/down counters, modulo-N counters, decade counter; shift registers — SISO, SIPO, PISO, PIPO; ring counter.	08 Hrs
Unit 6: Memory Devices & Programmable Logic Memory basics — RAM (static/dynamic), ROM and their classification; PLA, PAL, and PROM — concept and comparison; introduction to programmable logic devices (CPLD/FPGA overview); introduction to Hardware Description Language (HDL) ; applications and current trends — digital logic in modern SoCs and edge devices.	06 Hrs

Text Books:

Sr. No	Title
1	R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 4th Edition.
2	M. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson Education, 6th Edition.

Reference Books:

Sr. No	Title
1	Thomas L. Floyd, "Digital Fundamentals", Pearson Education, 11th Edition.
2	A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning, 4th Edition.



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Course Title: Digital Electronics Laboratory	
Course Code: 26FYEUS106	Semester: I
Teaching Scheme: L-T-P: 0-0-2	Credits: 01
Evaluation Scheme: ISE: 25	ESE Marks:

Prior Knowledge of:	Concurrent registration with Course 26FYEUS106— Digital Electronics
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Course Outcomes (CO):

CO No.	Statement
CO1	Verify the truth tables of basic and universal logic gates using digital IC trainer kits.
CO2	Design and implement combinational circuits such as adders, subtractors, multiplexers, encoders, and decoders.
CO3	Design and verify the operation of various flip-flops (SR, JK, D, T) using digital ICs.
CO4	Design and demonstrate sequential circuits such as counters and shift registers using digital ICs.

List of Experiments-

Exp. No	Title	Duration
01	Verification of Truth Tables of Basic Logic Gates	02 Hrs
02	Realization of Basic Gates Using Universal Gates	02 Hrs
03	Simplification and Verification of Boolean Expressions Using K-Map	02 Hrs
04	Design and Implementation of Half Adder and Full Adder	02 Hrs
05	Design and Implementation of Half Subtractor and Full Subtractor	02 Hrs
06	Design and Verification of Multiplexer and Demultiplexer	02 Hrs
07	Design and Verification of Encoder and Decoder	02 Hrs
08	Study and Verification of Flip-Flops (SR, JK, D, T)	02 Hrs
09	Design and Implementation of a 4-Bit Counter	02 Hrs
10	Design and Implementation of Shift Registers	02 Hrs



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Course Title: Design Thinking Through Innovation	
Course Code: 26FYEUN#03	Semester: I/II
Teaching Scheme: L-T-P: 1-0-0	Credits: 01
Evaluation Scheme: ISE: 25	ESE Marks:

Prerequisites:	Understanding, User-Centric Mindset, Collaboration and Teamwork, Curiosity and Open-Mindedness, Effective Communication Skills, Learning Orientation, and Risk Tolerance.
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Course Description:	The Design Thinking & Innovations subject aims to provide students with the tools and exposure to address problems using the design thinking process. The curriculum for "Design Thinking through Innovations" structured in such a way students learn to acquire both knowledge of design and practice of skills required to develop an attitude towards design. Being of the exemplary kinds, it focuses more on hands-on knowledge, learned by doing and acting upon challenges discovered within the community and surroundings.
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Course Objectives:

1.	To Familiarize with Engineering Design Process and The basics of Design Thinking
2.	To Bring Awareness on Idea Generation to Solve the Problems
3.	To Familiarize with the various types of prototype and the techniques used for prototyping.

Course Outcomes (COs): At the end of the course, the students should be able to:

CO	Statements	BTL
CO1	Learn the Structured Approach of Engineering Design and the Relevance of Design and Design Thinking in Engineering & Understand Idea Generation Techniques to find solutions to Problems.	1
CO2	Understand the various types of prototypes and Inculcate the techniques used for prototyping.	2

Course Content:

Content	Duration
Unit I: Engineering Design, Design Thinking and Idea Generation - Introduction, Key Concepts of Design, A Simplified Process of Engineering Design - What is Design Thinking? - Its Importance, Socio-Economical Relevance, Principles,	07 Hrs



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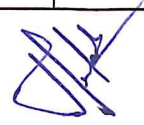
Origin, Process of Design Thinking, Relevance of Design and Design Thinking in Engineering • Introduction to Idea Generation, Idea Generation Techniques, Processes, Define the Problem, Needs v/s Wants, Identify Philosophy, Problem Solving Tools, Case Studies • Critical thinking: Fundamentals, Characteristics, Critical v/s Ordinary Thinking. • Critical thinking skills- linking ideas, structuring arguments, five pillars of critical thinking.	
Unit II: Prototyping and Tools for Design - Innovation • Prototyping: Introduction, Need, Process, Types, Fidelity for prototypes, Minimum Usable Prototype [MUP] – Concept, challenges, etc. • Prototyping for Digital & Physical products: Concept, What is unique in Digital and Physical Prototypes? • Digital & Physical prototypes: Preparation; testing prototypes with users. • Introduction to Different tools used for design and Innovation, such as Hand Saw (Wood, PVC, CPVC and Steel), Component cutter, Spanners, Allen key & Wrench (Flat, Ring, Adjustable), Solder Gun, Component cutter, Tweezer, Multi meter, Glue Gun, Hex saw, Cutter, Wire Stripper.	07 Hrs

Text Books:

Sr. No	Title	Author(s)	Publisher	Year
1.	Introduction to Design Thinking	S.Salivahanan, S.Suresh Kumar, D.Praveen Sam	Tata Mc Graw Hill, First Edition	2019
2.	The Design Thinking Playbook	Michael Lewrick	Wiley	2019
3.	Prototyping for Designers: Developing the best Digital and Physical Products	Kathryn McElroy	O'Reilly	2017

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1.	Design Thinking – New Product Essentials from PDMA	1 st	Michael G. Luchs, Scott Swan , Abbie Griffin	Wiley	2015
2.	101 Design Methods: A Structured Approach for Driving Innovation in Your Organization	1 st	Vijay Kumar	Wiley	2012


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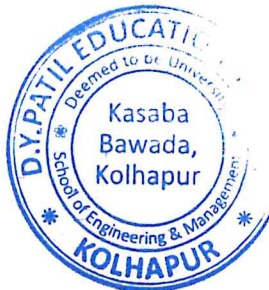
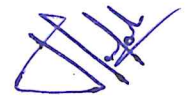
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Online Resources:

Sr. No.	Online Resource Link	Source
1	Introduction to Design Thinking - Course (swayam2.ac.in) Design Thinking Full Course Design Thinking Process Design Thinking For Beginners Simplilearn - YouTube	Swayam (NPTEL) & YouTube
2	Thinking at IDEO - Insight, innovation, & a healthy dose of play	IDEO
3	INTRO (youtube.com)	YouTube
4	The Power of an Entrepreneurial Mindset Bill Roche TEDxLangleyED (youtube.com)	YouTube
5	https://www.ideo.com/pages/design-thinking	IDEO U
6	https://dschool.stanford.edu/	Stanford D school
7	https://www.designthinkersacademy.com/usa/	Design Thinking Institute
8	https://www.ibm.com/design/thinking/page/toolkit	Design thinking ToolKit
9	https://hbr.org/2018/09/design-thinking-is-fundamentally-conservative-and-preserves-the-status-quo	



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Course Title: Design Thinking Through Innovation Laboratory	
Course Code: 26FYEUN#04	Semester: I / II
Teaching Scheme: L-T-P: 0-0-1	Credit: 01
Evaluation Scheme: ISE: 25	ESE Marks:

Prerequisites:	Understanding, User-Centric Mindset, Collaboration and Teamwork, Curiosity and Open-Mindedness, Effective Communication Skills, Learning Orientation, and Risk Tolerance.
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Course Description:	The Design Thinking & Innovations subject aim at providing students with the tools and exposure to be able to address problems using the design thinking process. Design Thinking & Innovations is designed in such a way students learn to acquire both knowledge of design and practice of skills required to develop an attitude towards design. Being of the exemplary kinds, it focuses more on hands-on knowledge, learned by doing and acting upon challenges discovered within the community and surroundings.
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Course Objectives:

1.	To Discuss Various Techniques of Idea Generation.
2.	To Explain the Various Tools Used for Innovation.
3.	To Discuss the Methods of Implementing Design Thinking in The Real World.
4.	To Discuss the Implementation of Creativity and Innovation.

Course Outcomes (COs):

At the end of the course, the student should be able to:

CO	Statements	BTL
CO1	Learn the Structured Approach of Engineering Design and the Relevance of Design and Design Thinking in Engineering & Understand Idea Generation Techniques to find out solutions to Problems.	1
CO2	Understand the various types of prototypes and Incorporate the techniques used for prototyping.	2



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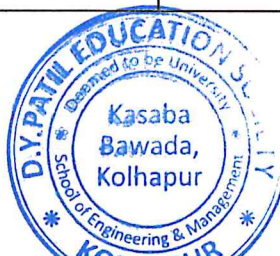
Course Content

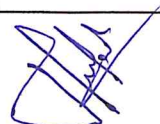
Sr. No.	Title of Experiments/Assignment List	Duration
01	Overview of Design Thinking: Ethical Design and Critiques, Generation of "IDEA", Problem Identification and Exercises.	02 Hrs
02	Brainstorming Sessions to Find out Solution for Identified Problems	02 Hrs
03	Prototyping and Modelling Challenge, Various Tools and Methodology Used for the Prototyping.	02 Hrs
04	Hands-On Demonstration of Different Tools used for Design & Innovation.	02 Hrs
05	Hands-On Demonstration of Soldering Machine, Function and Purpose of Soldering Machine.	02 Hrs
06	Explanation and Usage of Joining & Insulation Tools and Technics.	04 Hrs
07	Assembly and Disassembly of Two Wheel Drive Robot Based Vehicle.	02 Hrs
08	Micro Project: Group Formation and Idea Generation.	02 Hrs
09	Creation of Prototype and Innovative Solution.	02 Hrs
10	Test and Evaluation of Prototype.	02 Hrs
11	Report Drafting - Instructions & Practices.	02 Hrs
12	Presentation & Exhibition.	02 Hrs

Suggested Learning Resources: --

Reference Books:

Sr. no.	Name of Book	Author	Year
1.	Design Thinking: Understand-Improve-Apply	S. G. Blank	2007
2.	Design Thinking for Innovation Research and Practice	Walter Brenner, Falk Uebernickel, Springer	2016
3.	Business Design Thinking and Doing: Frameworks, Strategies and Techniques for Sustainable Innovation	Angele M. Beausoleil	2022




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Course Title: Indian Knowledge System	
Course Code: 26FYEUUK#05	Semester: I & II
Teaching Scheme L-T-P: 02-00-00	Credits: 02
Evaluation Scheme ISE/MSE: 20/30	ESE Marks: 00

Course Objectives:

1	Understand the foundations, principles, and significance of Indian Knowledge Systems.
2	Explore India's scientific and technological contributions in architecture, agriculture, physics, chemistry, and mathematics.
3	Examine the principles of Ayurveda and Yoga for holistic health and well-being.
4	Analyze indigenous knowledge for sustainability, environmental conservation, and cultural preservation.

Curriculum Details:

Contents	Duration
Unit I: Foundations of Indian Knowledge Systems • Definition and scope of Indian Knowledge Systems • Knowledge traditions in India • Indian approaches to knowledge generation • Characteristics of IKS (holistic, experiential, sustainable, interdisciplinary) • Concept of culture in IKS • Diversity and unity in Indian culture • Indian languages as repositories of knowledge	07 Hrs
Unit II: Ancient Indian Science (Architecture & Agriculture) Architecture in India • Introduction to Indian Architecture • Principles of Traditional Indian Architecture (Vastu and Climate-responsive Design) • Dravida Architecture (South Indian Style) • Maratha Architecture • Rock-cut Architecture • Scientific and Sustainable Features of Traditional Indian Architecture Traditional Agricultural Practices for Sustainable Development • Introduction to Traditional Indian Agriculture	07 Hrs

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Contents	Duration
• Traditional Water Harvesting and Irrigation Systems • Traditional Houses and Village Planning • Traditional Weather Forecasting Methods • Indigenous Knowledge for Soil, Seed and Biodiversity Conservation • Relevance of Traditional Agriculture in Sustainable Development	
Unit III: Ayurveda, Yoga and Holistic Well-being Ayurveda • Introduction to Ayurveda • Basic Principles of Ayurveda: Panchamahabhutas and Tridosha Theory • Mind–Body Relationship and Preventive Healthcare • Diet (Ahara), Lifestyle (Vihara) and Daily Regimen (Dinacharya) for Healthy Living • Medicinal Plants and Herbal Formulations • Contemporary Relevance of Ayurveda and Evidence-based Research Yoga • Introduction to Yoga • Objectives and Benefits of Yoga: Physical Fitness, Mental Well-being, Emotional Balance, Self-discipline and Healthy Lifestyle • Scientific Basis of Yoga • Yoga for Stress Management and Wellness • Role of Yoga in Holistic Health • Demonstration of Simple Yogic Practices	07 Hrs
Unit IV: Scientific Contributions of India: Physics, Chemistry and Mathematics Physics in Indian Knowledge Systems • Introduction to Physical Sciences in Indian Knowledge Systems • Vaisheshika Philosophy and Atomic Theory • Concept of Panchamahabhuta as a Framework for Understanding Nature Chemistry in Indian Knowledge Systems • Introduction to Rasashastra • Contributions of Nagarjuna and Vagbhatta • Traditional Metallurgy	07 Hrs

Sprakash


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Contents	Duration
Mathematics in Indian Knowledge Systems • Sulbasutras and Principles of Geometry • Decimal Number System and the Concept of Zero • Contributions of Aryabhata and Brahmagupta	

Course Outcomes (CO): After successful completion of the course, students will be able to

CO	Statements
#05.1	Explain the concepts, principles, and cultural foundations of Indian Knowledge Systems.
#05.2	Describe the scientific principles and sustainable practices of traditional Indian architecture and agriculture.
#05.3	Explain the principles of Ayurveda and Yoga for holistic health and well-being.
#05.4	Analyze India's scientific contributions in physics, chemistry, and mathematics and their contemporary relevance.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
#05.1	2	2					2		2			1
#05.2	2	2	2				2					1
#05.3	2	1					2	1	3			1
#05.4	2	3	2									1

Text Books:

Sr. No.	Title	Edition	Author(s)	Publisher	Year
1	Textbook on Indian Knowledge Systems	1st	B. Mahadevan, Vinayak Rajat Bhat & Nagendra Pavana R.	PHI Learning Pvt. Ltd. New Delhi,	2022
2	Bhartiya Knowledge System	1st	M. C. Bora	Khanna Book Publishing Co. Pvt. Ltd., New Delhi	2024

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	History of Hindu Mathematics (Vol. I & II)	Reprint Edition	Bibhutibhushan Datta & Avadhesh Narayan Singh	Bharatiya Kala Prakashan	1993
2	History of Science, Philosophy and Culture in Indian Civilization	1st	D. P. Chattopadhyaya (Editor)	Centre for Studies in Civilizations, New Delhi	Various Volumes (1999 onwards)
3	Light on Yoga	Revised Edition	B. K. S. Iyengar	HarperCollins Publishers	2006
4	Vāstu Śāstra: The Indian Science of Architecture	Reprint Edition	Dr. D. N. Shukla	Munshiram Manoharlal Publishers	2007
5	Indian Knowledge System	1st	A. K. Pathak	Pearson India Education Services Pvt. Ltd.	2023
6	Indian Knowledge Systems	1st	Shantha Nair	McGraw Hill Education (India) Pvt. Ltd.	2023



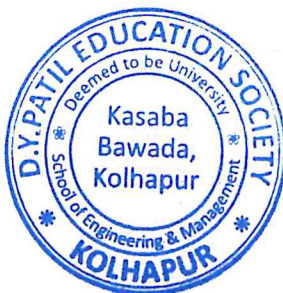
Mrs. Shilpa S Desai
Course co-ordinator



Mr. A. R. Matkar
HoD

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Course Title: Liberal Learning Course - I	
Course Code: 26FYEUC107	Semester: I
Teaching Scheme L-T-P: 1 – 0 – 0	Credits: 01
Evaluation Scheme: - ISE-25	ESE Marks- 00

Prerequisites:	Interest in the chosen club activity, along with basic enthusiasm, creativity, teamwork, and willingness to learn. Basic familiarity with relevant tools (where applicable) is sufficient.
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Course Objectives:

1.	To extend creativity, self-expression, physical and mental well-being, and an appreciation for arts, culture, languages, and healthy lifestyles through experiential learning activities.
2.	To find fundamental knowledge and practical skills related to their chosen club, enabling them to apply appropriate techniques, tools, and creative practices effectively.
3.	To enhance communication, teamwork, leadership, critical thinking, and problem-solving skills through collaborative projects, performances, workshops, and club activities.
4.	To summarize ethical values, cultural awareness, self-confidence, lifelong learning, and social responsibility by actively participating in extracurricular and experiential learning experiences.

Curriculum Details:

Course Contents(All Clubs)	Duration
1. Dance Club:	
Unit 1: Introduction to Semi-Classical Dance - Meaning and origin of Semi-Classical Dance - Difference between Classical and Semi-Classical Dance - Importance of expressions, rhythm, and grace	05 Hrs
Unit 2: Basic Body Conditioning - Warm-up exercise - Stretching and flexibility training - Posture correction - Balance and coordination exercises	05Hrs
Unit 3: Fundamental Dance Techniques - Basic hand gestures (Mudras) - Eye movements (Drishti Bheda) - Neck movements (Griva Bheda)	05 Hrs

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• Head movements (Shiro Bheda) • Basic footwork patterns	
Unit 4: Rhythm and Music • Introduction to Taal and Laya • Understanding beats and counting • Clapping exercises • Dancing to different tempos	05 Hrs
Unit 5: Expressions (Abhinaya) • Navarasas (Nine Emotions) • Facial expression practice • Storytelling through expressions	05 Hrs
Unit 6: Bollywood Dance Syllabus • Bollywood basic steps • Hand movements • Footwork • Walking styles • Hip movements • Shoulder movements • Expressions • Easy choreography	05 Hrs
2. Yoga & Meditation Club:	
Unit I: Warming up for Yoga • Introduction about yoga and meditation • Instructions for doing yoga • Exercise to warm up for yoga • History of Yoga • Benefits of yoga and meditation • Practical: Perform warming. up exercises to prepare the body from head to toe for yoga	05 Hrs
Unit II: Surya Namaskar • Introduction to Surya Namaskar • Benefits of Surya Namaskar • Instructions for doing Surya Namaskars • Types of Surya Namaskars • Practical • The 12 poses of Surya Namaskar and their benefits • Practical: Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up.	05 Hrs

Principles

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Unit III: Surya Namaskar • Introduction of Nadi shudhi Pranayama • Nadi shudhi Kriya (Tratak or Jalnati) • Mudra types and uses • Introduction of Kumbhak • Breathing exercises and types • Practical	05 Hrs
Unit IV: Practice Basic Asanas • Introduction to Asanas and basic information • Practical: Vajrasana, Padmasana, Swastikasana Practical: Perform Sarvangasana, Halasana, Kandharasana (setubandhasana) • Practical: Perform Bhujangasana, Naukasana, Mandukasana Practical: Perform Paschimottasana, Baddhakonasana, Bharadwajasana. • Practical: Perform Veera Bhadrapada, Vrukshasana, Trikonasana Follow up experiment with shavasana for self-relaxation Practical: Perform Sarvangasana, Halasana, Kandharasana (setubandhasana) Practical: Perform Bhujangasana, Naukasana, Mandukasana Practical: Perform Paschimottasana, Baddhakonasana, Bharadwajasana. Practical: Perform Veera Bhadrasana, Vrukshasana, Trikonasana • Follow up experiment with shavasana for self-relaxation and Makrasana. • Pawanmuktasana, Malasana, Cat Cow Pose, Adhao Mukhasana, Ugrasana, Plank Pose, Malasana, Ashtang Namaskar, Happy Baby Pose, Ustrasana, Gou Mukh Asana.	05 Hrs
Unit V: Practice Basic Pranayama • Practical: Perform Bhastrika, Anulom Vilom Pranayam Kriya • Practical: Practice Kapalbhati Pranayam Kriya • Practical: Practice Bhramary Pranayam	05 Hrs
Unit VI: Practice Meditation • Practical: Perform sitting in Dhyan Mudra and meditating • Start with five minute and slowly increasing to higher durations • Trainer will explain the benefits of Meditation before practice	05 Hrs

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Self Learning: • Everyday practice • Read books on different methods to maintain health, wellness and to enhance mood • Watch videos on Yoga practices	
3. Music Club:	
Unit I: • Introduction of Music • Introduction of saregamapa	05 Hrs
Unit II: • Introduction of Guitar • Practically holding and Grip of it	05 Hrs
Unit III: • Playing Individual song on Guitar	05 Hrs
Unit IV: • Developing singing scales	05 Hrs
Unit V: • Group albums on friendship mashup	05 Hrs
Unit VI: • Practice of group album on trending song and shooted in garden	05 Hrs
4. Adventure Club:	
Unit I: Introduction to Adventure Activities • Introduction • Benefits of adventure activities • How to plan an adventure activity and prepare for safety	05 Hrs
Unit II: Safety Protocols, Risk Management and Basic First Aid for Adventure Activities • Equipment safety check • Emergency response procedure • Risk assessment and mitigation strategies. • Common injuries and ailments in adventure settings • Wound care and basic treatments	05 Hrs
Unit III: Adventure Cycling and Trekking Equipment Safety Check • Basic cycle/bike maintenance and repair • Cycling activity • Long-distance trekking and camping (One Day in Nature)	05 Hrs

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Unit IV: Adventure Sports: Self-defence and Personal Development, Leadership. • Benefits of Self-Defence Sports • Physical fitness and conditioning • Improved self-confidence and self-esteem • Enhanced coordination, agility, and reflexes • Stress relief and mental discipline • Teamwork and collaboration in challenging environments	05 Hrs
Unit V: Study of Historical Monuments • Historical background and evolution of Indian Culture. • History of Maratha Empire. • Visit Forts, temples, Palace, etc.	05 Hrs
Unit VI: Visit to Vertical Adventure Park (Masai Pathar-Jeur) • Rappelling • Parasailing • Sports Climbing • Rock climbing	05 Hrs
5. Foreign Language Club (German Language):	
Unit I: • Introduction to German Language • Alphabet, pronunciation, greetings, farewell expressions, numbers, polite expressions	05 Hrs
Unit II: • Self-Introduction • Personal information, family, occupations, countries and nationalities	05 Hrs
Unit III: • Basic Grammar • Personal pronouns, articles, verbs (sein and haben), present tense, question formation, simple sentence structure	05 Hrs
Unit IV: • Everyday Communication • Time, dates, daily routine, food and beverages, shopping, asking for directions	05 Hrs
Unit V: • Listening & Speaking Practice • Short conversations, role plays, reading simple texts, writing basic sentences, revision	05 Hrs

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Unit VI: • Interactive lectures • Audio-visual presentations • Pronunciation practice • Vocabulary-building exercises • Pair and group conversations • Worksheets and quizzes Learning Resources: • Instructor-prepared notes • Basic German vocabulary handouts • Audio recordings for pronunciation practice • Worksheets and classroom exercises Recommended Books: • Netzwerk Neu A1 – Ernst Klett Verlag (Selected introductory lessons) • Schritte International Neu 1 – Hueber Verlag (Introductory chapters) • Arnold Leitner – German Made Easy	05 Hrs
6. Photography Club:	
Unit I: Introduction to Photography & Camera Basics • Introduction • Camera Fundamentals • Exposure Triangle • Metering and Focusing	05 Hrs
Unit II: Composition and Visual Storytelling • Principles of Composition • Visual Storytelling • Perspective and Angles	05 Hrs
Unit III: Specific Photography Genres (Choose based on workshop focus) • Portrait Photography • Landscape Photography • Street Photography • Macro Photography	05 Hrs
Unit IV: Practical Application & Photo Walk • Photo Walk • Practical exercises	05 Hrs

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Unit V: Post-Processing & Editing • Introduction to Editing Software • Image Adjustments • Exporting and Sharing • Photo critiquing	05 Hrs
Unit VI: • Commercial product & still life photography	05 Hrs
7. Art & Craft Club:	
Unit I: Introduction to Origami • History of Origami • Basic Symbols • Valley Fold • Mountain Fold • Paper Handling • Engineering Concept: Folding Sequence, Precision, Symmetry, Communication Design	05 Hrs
Unit II: Basic Bases • Square Base • Bird Base • Water bomb Base • Engineering Concept: Packaging Design, Manufacturing, Accuracy, Tolerance	05 Hrs
Unit III: Intermediate Origami • Intermediate • Folding Techniques • Engineering Concept: Structural Strength, Locking Mechanism, Product Design	05 Hrs
Unit IV: Modular Origami • Modular Origami • Assembly Techniques • Engineering Concept: Modular Design, Assembly, Teamwork, Aerodynamics	05Hrs
Unit V: Engineering Applications of Origami • Engineering Applications • Deployable Structures • Engineering Concept: Deployable Structures, Aerospace Engineering, Compact Storage, Rapid Deployment, Symmetry in Design	05 Hrs
Unit VI: Design Thinking & Final Project • Design Thinking	05Hrs

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• Prototype Development • Presentation • Engineering Concept: Innovation, Prototype Development, Problem Solving, Presentation Skills	
8. Video – Editing/Movie Club:	
Unit I: Introduction to Movie & Editing Club • Introduction • Scope of video editing and filmmaking • Career opportunities in content creation and media • Overview of the course structure and activities • Interactive discussion on different types of video content and filmmaking	08 Hrs
Unit II: Basic Video Editing • Adding and arranging clips • Cutting, trimming, and splitting clips • Basic editing techniques • Exporting videos • Practical: Create a simple edited video using sample footage	08 Hrs
Unit III: Location Visit for Practical Cinematography • Understanding practical filmmaking • Camera shots, angles, and movements • Framing, composition, and lighting techniques • Practical shooting at an outdoor location • Practical: Students will capture different cinematic shots for further editing	07 Hrs
Unit IV: Understanding Timeline & Creating a Simple Video • Timeline management • Sequence arrangement • Clip synchronization • Creating a complete short video • Practical: Students will edit the footage captured during the location visit and create a simple video	07 Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO's	Statements
107.1	Recall the basic concepts, techniques, and practices related to the chosen club activity.
107.2	Explain the fundamental principles, tools, and methods used in the chosen club activity.
107.3	Describe the importance of communication, teamwork, leadership, and ethical values in club activities.
107.4	Summarize the role of creativity, cultural awareness, physical and mental well-being, and lifelong learning in personal and professional development.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
107.1	1	1				1			1	1		1
107.2	2	2				2						1
107.3	2	1							1	1		1
107.4	2	1				1		1		1		1

Useful Links/Web Resources:

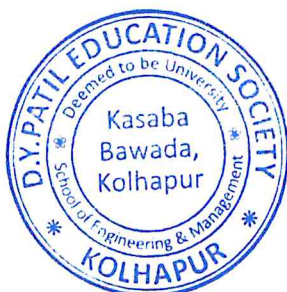
- **SWAYAM:** <https://swayam.gov.in>
- **NPTEL:** <https://nptel.ac.in>
- **AICTE IDEA Lab:** <https://idealab.aicte-india.org>
- **YouTube Education:** <https://www.youtube.com>
- **Canva (Design & Creativity):** <https://www.canva.com>
- **Google Arts & Culture:** <https://artsandculture.google.com>

Course Coordinator

Ms.P.G. Melsagare

HoD

Mr. A.R. Matkar



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Department of First-Year Engineering

Course Title: Engineering Mathematics-II	
Course Code: 26FYEUB201	Semester: II
Teaching Scheme L-T-P: 3-0-0	Credits: 3
Evaluation Scheme: ISE-I/MSE/ISE-II: 10/30/10	ESE Marks: 50

Prerequisites:	Basic knowledge of differential calculus, algebra, vectors, functions, elementary statistics, and probability.
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Course Objectives:

1.	To develop the concepts of Partial Differentiation for solving engineering problems.
2.	To apply interpolation and numerical differentiation techniques for computational analysis.
3.	To introduce statistical and probabilistic methods for engineering data analysis.
4.	To develop an understanding of vector calculus and its applications in solving engineering problems.

Curriculum Details:

Course Contents	Duration
Unit 1: Partial Differentiation • Introduction • Partial derivatives • Total derivatives • Euler's theorem on homogeneous functions • Jacobian and its properties	07 Hrs
Unit 2: Interpolation and Numerical Differentiation • Introduction to Interpolation • Newton's Forward Interpolation Formula • Newton's Backward Interpolation Formula • Stirling's Central Difference Interpolation Formula • Lagrange's Interpolation Formula • Numerical Differentiation using Finite Differences	07 Hrs
Unit 3: Frequency distribution and measure of central Tendency • Frequency distribution, Continuous frequency distribution • Graphical representation of a Frequency distribution- Histogram, frequency polygon • Measure of central tendency- Arithmetic mean, median and mode • Range, Quartile deviation • Mean deviation, Standard deviation	07 Hrs

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Unit 4: Correlation and Regression • Introduction, Types of correlation, Karl Pearson's coefficient of correlation • Interpretation of the coefficients of corrections • Computation of coefficient of correlation for ungroup data • Lines of regression • Calculations of equations of the lines of regression	07 Hrs
Unit 5: Probability Distribution • Introduction, Elementary theory of probability, Random variable • Discrete probability distribution, Continuous probability distribution • Binomial distribution • Poisson distribution • Normal distribution	07 Hrs
Unit 6: Vector Calculus • Introduction. • Gradient of scalar point function • Divergence of vector point function • Curl of a vector point function • Irrotational, Solenoidal vector field	07 Hrs
Self-Learning Topic: Mathematics in Modern Engineering and Emerging Technologies • Role of mathematics in engineering and scientific innovations • Applications of mathematics in Artificial Intelligence and Machine Learning • Mathematics in Data Science and Big Data Analytics • Applications of mathematics in Computer Graphics, Robotics, and Automation • Mathematical modelling and simulation of real-life engineering problems	

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO's	Statements
201.1	Solve engineering problems involving partial differentiation, Jacobians, and multivariable functions.
201.2	Estimate unknown values and numerical derivatives using interpolation and numerical differentiation techniques.
201.3	Interpret engineering data using statistical measures, correlation, regression, and probability distributions.
201.4	Apply vector calculus concepts to analyze scalar and vector fields in engineering applications.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
201.1	3	3	2									1
201.2	2,3	3	2									1
201.3	2,3	3	2									1
201.4	3	3	2									1

Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	10 th	Erwin Kreyszig	Wiley India Pvt. Ltd.	2015
2	Higher Engineering Mathematics	44 th	B. S. Grewal	Khanna Publishers	2021
3	Engineering Mathematics	5 th	B. V. Ramana	McGraw Hill Education	2019
4	Fundamentals of Mathematical Statistics	12 th	S. C. Gupta, V. K. Kapoor	Sultan Chand & Sons	2020
5	Introduction to Probability and Statistics for Engineers and Scientists	6 th	Sheldon M. Ross	Academic Press	2021

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	8 th	Peter V. O'Neil	Cengage Learning	2017
2	A Textbook of Engineering Mathematics	10 th	N. P. Bali, Manish Goyal	Laxmi Publications	2019
3	Mathematical Statistics	8 th	J. N. Kapur, H. C. Saxena	S. Chand Publishing	2005
4	Probability and Statistics for Engineers	9 th	Richard A. Johnson	Pearson Education	2019
5	Engineering Mathematics	2 nd	H. K. Dass	S. Chand Publishing	2018

Useful Links/Web Resources:

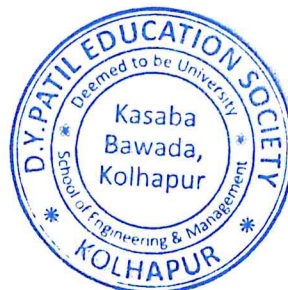
1. DELNET- <http://www.delnet.in>
2. NDL-<http://ndl.iitkgp.ac.in>
3. N-LIST- <http://www.nlist.inflib.ac.in>
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

Course Coordinator

Dr. A. R. Mali

HoD

Mr. A. R. Matkar



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Department of First-Year Engineering

Course Title: Engineering Mathematics-II Tutorial	
Course Code: 26FYEUB202	Semester: II
Teaching Scheme L-T-P: 0-0-2	Credit: 01
Evaluation Scheme: ISE Lab	Total: 25 Marks

Prerequisites:	Basic knowledge of differential calculus, algebra, vectors, functions, elementary statistics, and probability.
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Course Objectives:

1.	To develop the concepts of Partial Differentiation for solving engineering problems.
2.	To apply interpolation and numerical differentiation techniques for computational analysis.
3.	To introduce statistical and probabilistic methods for engineering data analysis.
4.	To develop an understanding of vector calculus and its applications in solving engineering problems.

List of Tutorials:

Session No	Title of Activities	Duration
01	Partial Differentiation: Partial Derivatives, Total Derivatives, and Euler's Theorem on Homogeneous Functions.	02 Hrs
02	Partial Differentiation: Jacobian and its Properties with Engineering Applications.	02 Hrs
03	Interpolation: Newton's Forward, Newton's Backward, Stirling's Central Difference, and Lagrange's Interpolation Formulae.	02 Hrs
04	Numerical Differentiation: Numerical Differentiation using Finite Difference Formulae.	02 Hrs
05	Numerical Differentiation: Numerical Differentiation using Finite Differences and Applications using MATLAB.	02 Hrs
06	Frequency distribution and measure of central Tendency: Histogram, Frequency polygon, Arithmetic mean, median and mode.	02 Hrs
07	Frequency distribution and measure of central Tendency: Range, Quartile deviation, Mean deviation, Standard deviation.	02 Hrs
08	Frequency distribution and measure of central Tendency: Arithmetic mean, median and mode, Range, Quartile deviation, Mean deviation, Standard deviation using MATLAB.	02 Hrs
09	Correlation and Regression: Computation of Correlation, Lines of regression.	02 Hrs
10	Correlation and Regression: Computation of Correlation, Lines of regression by using MATLAB.	02 Hrs
11	Probability Distribution: Discrete and Continuous Probability Distributions, Binomial, Poisson, and Normal Distributions.	02 Hrs
12	Vector Calculus: Gradient, Divergence, Curl of a vector point function, Irrotational, Solenoidal vector field.	02 Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO's	Statements
202.1	Solve engineering problems involving partial differentiation, Jacobians, and multivariable functions.
202.2	Estimate unknown values and numerical derivatives using interpolation and numerical differentiation techniques.
202.3	Interpret engineering data using statistical measures, correlation, regression, and probability distributions.
202.4	Apply vector calculus concepts to analyze scalar and vector fields in engineering applications.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
202.1	3	3	2									1
202.2	2,3	3	2			1						1
202.3	2,3	3	2			1						1
202.4	3	3	2									1

Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	10 th	Erwin Kreyszig	Wiley India Pvt. Ltd.	2015
2	Higher Engineering Mathematics	44 th	B. S. Grewal	Khanna Publishers	2021
3	Engineering Mathematics	5 th	B. V. Ramana	McGraw Hill Education	2019
4	Fundamentals of Mathematical Statistics	12 th	S. C. Gupta, V. K. Kapoor	Sultan Chand & Sons	2020
5	Introduction to Probability and Statistics for Engineers and Scientists	6 th	Sheldon M. Ross	Academic Press	2021

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	8 th	Peter V. O'Neil	Cengage Learning	2017
2	A Textbook of Engineering Mathematics	10 th	N. P. Bali, Manish Goyal	Laxmi Publications	2019
3	Mathematical Statistics	8 th	J. N. Kapur, H. C. Saxena	S. Chand Publishing	2005
4	Probability and Statistics for Engineers	9 th	Richard A. Johnson	Pearson Education	2019
5	Engineering Mathematics	2 nd	H. K. Dass	S. Chand Publishing	2018

Useful Links/Web Resources:

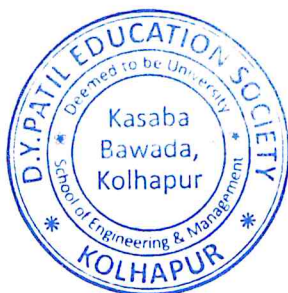
1. DELNET- <http://www.delnet.in>
2. NDL-<http://ndl.iitkgp.ac.in>
3. N-LIST- <http://www.nlist.inflib.ac.in>
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

Course Coordinator

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Department of First-Year Engineering

Course Title: Applied Chemistry	
Course Code: 26FYEUB#06	Semesters: I & II
Teaching Scheme: L-T-P: 3 – 0 – 0	Credits: 3
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	ESE Marks: 50

Prior Knowledge of:	Students should have knowledge about basic chemistry related to periodic table, properties of elements, properties of water, polymer, nanomaterial, energy storage and energy conversion devices, basics of memory and memory device etc.,
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Course Objectives:

1	To understand the fundamentals of water chemistry, water quality and water treatment technologies.
2	To explain the principles and applications of sensors.
3	To introduce the chemistry of semiconductor memory devices and display technologies.
4	To impart the basic concepts of energy conversion and energy storage devices.
5	To provide knowledge of green chemistry, nanomaterials and advanced polymeric materials.
6	To familiarize students with the principles of E-waste management and resource recovery.

Curriculum Details:

Course Contents	Duration
Unit I: Water Chemistry Introduction, water quality parameters-Total solids, Acidity, Alkalinity, Dissolved oxygen (DO), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Electrical conductivity (EC), Hardness (definition, types, units and numerical based on hardness), Engineering problems associated with hard water, Modern water treatment technologies, Introduction to industrial waste water treatment.	07 Hrs
Unit II: Fundamentals of Sensors and Engineering Applications Definition and classification of sensors, Characteristics of sensors: sensitivity, selectivity, response time, accuracy, stability, Chemical Principles and Functional Materials for Sensors: Surface phenomena (adsorption, desorption, catalysis); electrochemical principles (redox reactions, ion exchange); semiconductor chemistry (band gap, doping, conductivity modulation); optical sensing principles (absorption,	07 Hrs

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fluorescence); functional sensor materials (conducting polymers, graphene, CNTs and metal oxide nanomaterials). Case studies and Engineering applications: Gas sensors for air quality monitoring, glucose biosensors for healthcare and IoT-based industrial automation.	
Unit III: Chemistry of Memory Devices and Display Systems Memory Devices: Introduction, basic chemical concepts of electronic memory, Materials for electronic memory devices (organic, inorganic, polymeric and hybrid), Chemical processes involved in semiconductor chip fabrication-purification of silicon, doping (n-type and p-type), oxidation and chemical vapor deposition (CVD). Display Systems: Liquid Crystals (LC's) – Introduction, chemical classification (nematic, smectic, discotic and cholesteric), molecular structure, properties, and application in Liquid Crystal Displays (LCD's), Properties and application of Organic Light Emitting Diodes (OLED's) and light-emitting electrochemical cells.	07 Hrs
Unit IV: Energy Conversion and Storage Devices Fuel cells: Introduction, types of fuel cells, construction, working and applications of Phosphoric acid fuel cell and Hydrogen-oxygen fuel cell (H_2-O_2). Solar cells: Introduction to solar cells, principle, properties and applications of p-n junction solar cell and Quantum Dot Sensitized solar cell. Battery: Introduction, classification of batteries as primary and secondary, construction, working and applications of Carbon-Zinc cell and Nickel Cadmium (Ni-Cd) Battery. Numerical	07 Hrs
Unit V: Engineering Advanced Materials and Green Chemistry Polymer: Introduction, classification of polymers, synthesis, properties and applications of some industrially important polymers as Phenol formaldehyde polymer, urea formaldehyde polymer, Polyaniline (Conducting polymer), Poly lactic acid (Biodegradable polymer).	07 Hrs

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Nanomaterials: Introduction, unique properties and applications of nanomaterials, classification of nanomaterials (0D, 1D, 2D and 3D) with suitable examples, synthesis of nanomaterials by Top-down and Bottom-up approaches. Green Chemistry: Introduction to Twelve principles of Green Chemistry, Green synthesis of nanomaterials. Numerical	
Unit VI: E-Waste Management Introduction, sources of e-waste, composition, characteristics and need of e-waste management, toxic materials used in manufacturing electronic and electrical products, health hazards impact due to exposure to e-waste, recycling and recovery-different approaches of recycling (separation, thermal treatments, hydrometallurgical extraction), recovery of valuable metals. Role of stakeholders in sustainable E-waste management (producers, consumers, recyclers, and statutory bodies).	07 Hrs

Course Outcomes (COs): After successful completion of the course, students will be able to:

COs	Statements
#06.1	Understand the concepts of water chemistry to interpret water quality and treatment processes.
#06.2	Explain the fundamentals and applications sensors.
#06.3	Discuss the basic concepts of electronic memory devices and display systems.
#06.4	Describe the principles of energy conversion and storage devices.
#06.5	Explain the synthesis and applications of advanced polymeric materials and nanomaterials.
#06.6	Explain the principles and practices of sustainable E-waste management.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
#06.1	2	3	2									1
#06.2	2	3	2									1
#06.3	2	3	2									1
#06.4	2	3	2									1
#06.5	2	3	2									1
#06.6	2	3	2									1

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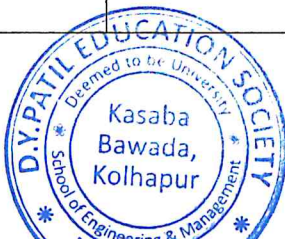
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Text Books:

Sr. No.	Title	Edition	Author(s)	Publisher	Year
1	A Textbook of Engineering Chemistry	12 th	S. S. Dara, S. S. Umare	Chand & Company Ltd., New Delhi	2011
2	A Textbook of Engineering Chemistry	-	Shashi Chawla	Dhanpat Rai & Co.	2017
3	A Textbook of Engineering Chemistry	2 nd	Shikha Agarwal	Cambridge University Press	2022
4	A Textbook of Engineering Chemistry	18 th	Jain and Jain	Dhanpat Rai Publications	2023

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Functional Materials: Preparation, Processing and Applications	1 st	Sabu Thomas, Yiu-Wing Mai and co-editors	CRC Press	2012
2	Nanoscience and Nanotechnology: Fundamentals to Frontiers	1 st	M. S. Ramachandra Rao and Shubra Singh	Wiley India	2013
3	Water and Wastewater Engineering	3 rd	Mackenzie L. Davis	McGraw-Hill Education	2019
4	Electronic Waste Management and Treatment Technology	1 st	Sunil Kumar, Rakesh Kumar and co-editors	Butterworth-Heinemann (Elsevier)	2019
5	Energy storage and conversion devices: Supercapacitors, batteries, and hydroelectric cells	1 st	Anurag Gaur, A. L. Sharma, Anil Arya.	CRC Press, SBN: 978-1-003-14176-1	2021
6	Electrochemical Energy Storage for Renewable Sources and Grid Balancing	1 st	Patrick T. Moseley and Jürgen Garche	Elsevier	2025



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(Mrs. S. S. Desai)



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School of Engineering & Management

Department of First-Year Engineering

Course Title: Applied Chemistry Laboratory	
Course Code: 26FYEUB#07	Semesters: I & II
Teaching Scheme: L-T-P: 0-0-2	Credit: 1
Evaluation Scheme: ISE: 25	ESE Marks: 00

Prior Knowledge of:	Handling of Glassware & Chemicals, preparation of solutions and experiments based on titration.
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Course Objectives:

1	Analyse water quality and engineering materials using standard experimental methods.
2	Understand the principles and operation of common analytical instruments used in chemical laboratories.
3	Prepare industrially important polymers and understand their synthesis and applications.
4	Develop laboratory skills, scientific attitude and safe laboratory practices for solving engineering problems.

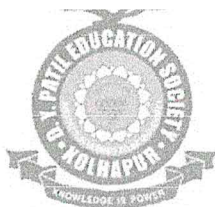
List of Experiments-

Exp. No.	Title of Experiments	Duration
01	Determination of total hardness of water sample by EDTA method (Complex metric Titration).	02 Hrs
02	Determination of normality of given strong acid by titrating against strong alkali solution by conductometer.	02 Hrs
03	Study the working of a metal oxide (MQ-135/MQ-2) gas sensor for detection of gas.	02 Hrs
04	Determination pH of given solutions by pH meter.	02 Hrs
05	Estimation of Iron from a solution by calorimeter (Optical Sensor).	02 Hrs
06	Estimation of Copper from a solution by calorimeter (Optical Sensor).	02 Hrs
07	Green synthesis of Metal-Oxide nanoparticles using plant extract.	02 Hrs
08	Synthesis of CdS thin film by Successive Ion Layer Adsorption and Reaction (SILAR) technique.	02 Hrs
09	Preparation of urea-formaldehyde resin.	02 Hrs
10	Preparation of phenol formaldehyde resin.	02 Hrs
11	Study the construction and working of Ni-Cd battery (Demonstration).	02 Hrs

RBhakar

[Signature]
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Exp. No.	Title of Experiments	Duration
12	Estimation of amount of calcium from waste chalk.	02 Hrs

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
#07.1	Apply volumetric analytical techniques for the quantitative analysis of water and metal ions.
#07.2	Operate analytical instruments for the analysis of chemical systems.
#07.3	Prepare functional inorganic and polymeric materials using standard laboratory synthesis techniques.
#07.4	Investigate electrochemical systems through the construction and working of Ni-Cd battery.

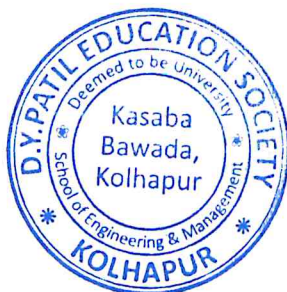
Course Articulation Matrix: Mapping of Course Outcomes (Cos) with Program Outcomes (PO's)

PO's Cos	BTL	1	2	3	4	5	6	7	8	9	10	11
#07.1	3	3							1			1
#07.2	3	3							1			1
#07.3	3	3				1			1			1
#07.4	3	3							1			1

Reference Books:

Sr. No.	Title	Edition	Author(s)	Publisher	Year
1	Vogel's Textbook of Quantitative Chemical Analysis	6 th	Jeffery G. H., Bassett J., Mendham J. and Denney R. C	Pearson Education	2000
2	Practical Engineering Chemistry	1 st	Sunita Rattan	S. K. Kataria & Sons	2012
3	Instrumental Methods of Chemical Analysis	7 th	Gurdeep Raj	Goel Publishing House	2021


Mrs. Shilpa S. Desai
Course coordinator




Mr. A. R. Matkar
HOD
School of Engineering & Management,
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COURSE CURRICULUM & LABORATORY MANUAL

Microprocessors

First Year — CSE / DSE / Allied Engineering Branches

Theory: 3 Lectures / Week | Practical: 2 Hours / Week

6 Units (Theory) · 10 Experiments (Practical)

Course Code (Theory): 25U** Course Code (Lab): 25U******

PART A — Theory Course

Course Information

Course Code	25U*****
Course Title	Microprocessors
Category	Program Core
L – T – P	3 – 0 – 0
Credits	3
Contact Hours	3 Lectures/ week
Prerequisite	None (First Year Core Course)

Course Objectives

- To introduce the architecture, timing, and operation of the 8085 microprocessor.
- To develop the ability to write and execute assembly language programs on the 8085.
- To familiarize students with interrupts and basic peripheral interfacing using the 8085.
- To introduce the architecture and programming of the 8086 microprocessor as a step toward advanced processors.

Course Outcomes (CO)

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

CO No.	Course Outcome
CO1	Explain the architecture, pin functions, and timing diagram (instruction cycle, machine cycle, T-states) of the 8085 microprocessor.
CO2	Develop 8085 assembly language programs using various addressing modes and instruction types.
CO3	Describe the interrupt structure of the 8085 microprocessor and explain basic memory/I/O interfacing along with the 8255 PPI.
CO4	Explain the architecture, register organization, and memory segmentation of the 8086 microprocessor, write simple 8086 programs, and describe its interrupt structure along with a basic overview of advanced processors.

Unit-wise Syllabus

Unit	Title	Contents
1 (6 Hrs)	Introduction to 8085 Microprocessor	Microprocessor vs microcontroller vs microcomputer — basic concept; 8085 internal architecture: registers, accumulator, ALU, flag register; pin diagram of 8085 (overview); address bus, data bus, and control bus — basic concept; timing diagram — instruction cycle, machine cycle, and T-states with a simple example (e.g., opcode fetch, memory read/write cycle).
2 (6 Hrs)	8085: Instructions and Addressing Modes	Addressing modes of 8085 — immediate, direct, register, indirect; instruction types — data transfer, arithmetic, logical, and branching instructions; structure of an assembly language program — mnemonics, opcodes, operands, labels; simple programs using loops — addition, subtraction; basic concept of time delay generation using loops.
3 (8 Hrs)	8085 Interrupts & Interfacing	Interrupt structure of 8085 — TRAP, RST 7.5, RST 6.5, RST 5.5, INTR and their priority; basic concept of interrupt service routine (ISR); memory interfacing — basic idea of connecting RAM/ROM; I/O interfacing — memory-mapped I/O vs I/O-mapped I/O (basic concept); 8255 Programmable Peripheral Interface — block diagram and one simple interfacing example (LED/switch).
4 (8 Hrs)	Introduction to 8086 Microprocessor	Need for 16-bit processors — comparison of 8085 (8-bit) and 8086 (16-bit); 8086 internal architecture — Bus Interface Unit (BIU) and Execution Unit (EU), basic idea of instruction queue; register organization of 8086 — general-purpose, segment, pointer, and index registers, flag register; concept of memory segmentation and physical address calculation with a simple example.
5 (8 Hrs)	8086: Instructions and Addressing Modes	Addressing modes of 8086 — register, immediate, and direct addressing (basic types); instruction types — data transfer, arithmetic, and logical instructions; simple assembly language programs using an emulator/assembler — addition, subtraction, moving data between registers/memory.
6 (6 Hrs)	8086 Interrupts & Overview of Advanced Processors	Interrupt structure of 8086 — hardware and software interrupts, basic idea of the interrupt vector table; basic concept of I/O interfacing with 8086; real-world relevance of microprocessors in embedded systems and IoT devices.

Text Books

1	Ramesh S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", Penram International Publishing, 5th Edition.
2	A. K. Ray and K. M. Bhurchandi, "Advanced Microprocessors and Peripherals", McGraw Hill Education, 3rd Edition.

Reference Books

1	Douglas V. Hall, "Microprocessors and Interfacing", McGraw Hill Education, 2nd Edition.
2	B. Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publications.

COURSE CURRICULUM & LABORATORY MANUAL

Microprocessors

First Year — CSE / DSE / Allied Engineering Branches

Theory: 3 Lectures / Week | Practical: 2 Hours / Week

6 Units (Theory) · 10 Experiments (Practical)

Course Code (Theory): 25U** Course Code (Lab): 25U******

PART B — Laboratory Course

Course Information

Course Code	25U202
Course Title	Microprocessors Laboratory
Category	Program Core (Lab)
L – T – P	0 – 0 – 2
Credits	1
Contact Hours	2 Hours / week
Prerequisite	Course 25U**** — Microprocessors

Course Outcomes (CO)

On successful completion of this laboratory course, students will be able to:

CO No.	Course Outcome
CO1	Write and Execute basic 8085 data transfer and arithmetic programs (8-bit/16-bit addition-subtraction) using a microprocessor kit/simulator.
CO2	Demonstrate 8085 programs for multiplication, division, sorting, and searching operations.
CO3	Develop 8085 programs for code conversion and perform basic peripheral interfacing using the 8255 PPI.
CO4	Develop and execute basic 8086 assembly language programs using an emulator/assembler. EMU8086/MASM/TASM

List of Experiments

Exp. No.	Title	Maps to Unit
1	Study of 8085 Microprocessor Kit / Simulator & Basic Data Transfer Instructions	Units 1–2
2	8-Bit Addition and Subtraction Using 8085	Unit 2
3	16-Bit Addition and Subtraction Using 8085	Unit 2
4	Multiplication of Two 8-Bit Numbers (Repeated Addition Method)	Unit 2
5	Division of Two 8-Bit Numbers (Repeated Subtraction Method)	Unit 2
6	Sorting an Array of Numbers Using 8085	Unit 2
7	Finding the Largest and Smallest Number in an Array Using 8085	Unit 2
8	Code Conversion Program — BCD to Binary Using 8085	Unit 2
9	Interfacing 8255 PPI with 8085 — LED/Switch Interfacing	Unit 3
10	Basic 8086 Assembly Language Programs — Addition and Subtraction	Units 4–5

PART C — Practical Manual

Experiment No. 1

Study of 8085 Microprocessor Kit / Simulator & Basic Data Transfer Instructions

1. Introduction

Before writing programs, it is necessary to understand the layout of the 8085 microprocessor trainer kit (or simulator software) — its keypad, display, registers, and memory. This experiment introduces the kit/simulator and the basic data transfer instructions (MOV, MVI, LXI) used to move data between registers and memory.

2. Algorithm

1. Switch on the kit/simulator and reset it to the initial state.
2. Load the given 8-bit/16-bit data into the accumulator/register pair using MVI/LXI instructions.
3. Transfer the data between registers using the MOV instruction.
4. Store the result in the specified memory location.
5. Halt the program (HLT) and display the result.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

4. Result

The 8085 microprocessor kit/simulator was studied, and the basic data transfer instructions (MOV, MVI, LXI) were executed with the **observed output matching the expected values**.

Experiment No. 2**8-Bit Addition and Subtraction Using 8085**

1. Introduction

This experiment covers writing and executing 8085 assembly programs to add and subtract two 8-bit numbers stored in memory, using basic arithmetic instructions (ADD, SUB) and storing the result back in memory.

2. Algorithm

1. Load the first 8-bit number into the accumulator.
2. Load the second 8-bit number into a general-purpose register.
3. Add (or subtract) the register content with the accumulator using ADD/SUB instruction.
4. Store the result in the specified memory location.
5. Halt the program.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

--

4. Result

The 8-bit addition and subtraction programs were executed, and the results **obtained matched the expected manual calculations.**

Experiment No. 3**16-Bit Addition and Subtraction Using 8085**

1. Introduction

This experiment extends 8-bit arithmetic to 16-bit operands, which require handling of register pairs (such as H-L, D-E) and carry propagation between the lower and higher bytes.

2. Algorithm

1. Load the first 16-bit number into a register pair (e.g., H-L).
2. Load the second 16-bit number into another register pair (e.g., D-E).
3. Add (or subtract) the lower bytes first, then the higher bytes including carry/borrow.
4. Store the 16-bit result in specified memory locations.
5. Halt the program.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

--

4. Result

The 16-bit addition and subtraction programs were executed, and the results **matched the expected manual calculations.**

Experiment No. 4**Multiplication of Two 8-Bit Numbers (Repeated Addition Method)**

1. Introduction

Since the 8085 does not have a direct multiplication instruction, multiplication is performed using the repeated addition method — adding the multiplicand to itself as many times as the value of the multiplier.

2. Algorithm

1. Load the multiplicand and multiplier into separate registers.
2. Initialize the result location to zero.
3. Add the multiplicand to the result, and decrement the multiplier, repeating until the multiplier becomes zero.
4. Store the final result (handling carry into the higher byte if needed).
5. Halt the program.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

--

4. Result

The multiplication program using the repeated addition method was executed, and the product obtained **matched the expected value.**

Experiment No. 5**Division of Two 8-Bit Numbers (Repeated Subtraction Method)**

1. Introduction

Similar to multiplication, division in 8085 is performed using the repeated subtraction method — subtracting the divisor from the dividend repeatedly until the remainder is less than the divisor, with the subtraction count giving the quotient.

2. Algorithm

1. Load the dividend and divisor into separate registers.
2. Initialize the quotient counter to zero.
3. Subtract the divisor from the dividend repeatedly, incrementing the quotient counter each time, until the result is less than the divisor.
4. Store the quotient and the remainder in specified memory locations.
5. Halt the program.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

--

4. Result

The division program using the repeated subtraction method was executed, and the quotient and remainder **obtained matched the expected values.**

Experiment No. 6**Sorting an Array of Numbers Using 8085**

1. Introduction

Sorting is a fundamental data-handling operation. This experiment implements a simple sorting technique (bubble sort) in 8085 assembly language to arrange a given array of 8-bit numbers stored in memory in ascending order.

2. Algorithm

1. Load the starting address of the array and the count of elements.
2. Compare each pair of adjacent elements in the array.
3. If the first element is greater than the second, swap them.
4. Repeat the comparison pass for all elements until no swaps are needed.
5. Store the sorted array back in memory and halt.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

--

4. Result

The sorting program was executed, and the array was arranged in ascending order **as expected**.

1. Introduction

2. Algorithm

- ### 3. Program

4. Result

The program correctly identified the largest and smallest numbers in the given array, **matching the expected values.**

Experiment No. 8**Code Conversion Program — BCD to Binary Using 8085**

1. Introduction

Code conversion is a common requirement in digital systems interfacing with humans (BCD, used in displays) and processors (binary). This experiment implements an 8085 program to convert a given 2-digit BCD number into its equivalent binary value.

2. Algorithm

1. Load the given 2-digit packed BCD number into the accumulator.
2. Separate the tens digit and unit's digit using masking and shift operations.
3. Multiply the tens digit by 10 (using repeated addition) and add the unit's digit.
4. Store the resulting binary value in the specified memory location.
5. Halt the program.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

--

4. Result

The BCD-to-binary conversion program was executed, and the binary value **obtained matched the expected result.**

Experiment No. 9**Interfacing 8255 PPI with 8085 — LED/Switch Interfacing**

1. Introduction

The 8255 Programmable Peripheral Interface (PPI) is used to interface I/O devices such as LEDs and switches with the microprocessor. This experiment demonstrates configuring one port of the 8255 as output (to drive LEDs) and another as input (to read switch status).

2. Algorithm

1. Determine the control word for the 8255 to configure Port A as output and Port B as input (mode 0).
2. Send the control word to the control register of the 8255 to initialize the ports.
3. Read the switch status from Port B (input).
4. Send the read status (or a fixed pattern) to Port A (output) to drive the LEDs.
5. Repeat continuously or halt after one iteration, as required.

3. Program

write the assembly language program (Address / Label / Mnemonic / Operand / Comments):

--

4. Result

Port A was configured as output and Port B as input on the 8255; the LED output correctly reflected the switch input pattern in all cases tested.



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Course Title: Problem Solving Through Programming	
Course Code: 26FYEUS203	Semester: II
Teaching Scheme: L-T-P: 3 – 0 – 0	Credits: 03
Evaluation Scheme: ISE-I/MSE/ISE-II:10/30/10	ESE Marks: 50

Prior Knowledge of:	Basic Computer Fundamentals, Basic Knowledge of Programming
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Course Objectives:

1.	Acquire basic principles of problem-solving using computers.
2.	Learn and use the syntax of C programming language to solve basic science and engineering problems.
3.	Select appropriate programming constructs, functions to build solutions to a variety of problems.

Curriculum Details:

Course Contents	Duration
Unit 1: Introduction to C programming: Review of computational thinking and algorithmic problem solving, Overview of C language, Comparison of Python and C, Structure of a C program, Compilation and execution process, Tokens, Keywords, Identifiers, Variables, Constants, Data Types, Type Conversion, Operators and Expressions, Formatted Input and Output (printf(), scanf()).	06 Hours
Unit 2: Control Structures and Problem Solving Operator precedence and associativity, Decision-making statements (if, if-else, nested if, else-if, switch), Iterative statements (while, do-while, for), Nested loops, break, continue, Problem solving using control structures, Menu-driven programs.	09 Hours
Unit 3: Array, Pointer and String One-dimensional and Two-dimensional arrays, String handling, Standard string library functions, Introduction to pointers, Pointer arithmetic, Arrays and pointers, Passing arrays and pointers to functions, Dynamic memory allocation (malloc(), calloc(), realloc(), free()).	09 Hours
Unit 4: Functions and Modular Programming Function declaration, definition and invocation, Function arguments and return values, Call by value, Recursive functions, Scope and lifetime of variables, Storage classes, Header files, Preprocessor directives (#include, #define), Modular program development.	06 Hours
Unit 5: User-Defined Data Types and File Handling Structures, Arrays of structures, Nested structures, Unions, Enumerated data types, typedef, File handling concepts, File opening and closing, Text and binary files, File input/output operations, Error handling.	06 Hours
Unit 6: Programming Applications Command-line arguments, Bitwise operators, Debugging, Coding standards and best practices, Integrated programming problems and case studies.	06 Hours

Self-learning topics: Memory organization in C (Stack vs Heap).



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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
CO1	Explain the fundamental concepts of the C programming language, including program structure, data types, operators, expressions, and control statements.
CO2	Describe the principles of modular programming and identify the use of functions, arrays, strings, pointers, and user-defined data types in C programs.
CO3	Explain the concepts of dynamic memory allocation, file handling, and standard programming practices used in C programming.
CO4	Interpret programming problems and identify appropriate debugging techniques and basic code optimization practices for writing reliable and maintainable C programs.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	2	3										
CO2	2	1	2	2		1							
CO3	2	1	2	2		1							
CO4	2	2	1	2	1	2							

Text Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	C: The Complete Reference	4th	Herbert Schildt	McGraw-Hill Education.	2000
2	Programming with C	4th	Byron S. Gottfried	McGraw-Hill Education	2018
3	Programming in ANSI C	8th	E. Balagurusamy	McGraw-Hill Education.	2019
4	Understanding Pointers in C	4th	Yashavant Kanetkar	BPB Publications	2003

Reference Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	The C Programming Language	2nd	Brian W. Kernighan and Dennis M. Ritchie	Pearson Education	1988
2	Let Us C	17th	Yashavant Kanetkar	BPB Publications	2020
3	C: How to Program	8th	Paul Deitel and Harvey Deitel	Pearson	2015



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Online Books:

Sr.No	Reference	URL
1	GNU C Manual	https://www.gnu.org/software/c-intro-and-ref/manual/c-intro-and-ref.pdf 2nd
2	cppreference (C Language Reference)	https://cppreference.com/c
3	Programiz – C Programming Tutorial	https://www.programiz.com/c-programming



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Course Title: Problem Solving Through Programming Laboratory	
Course Code: 26FYEUS204	Semester: II
Teaching Scheme: L-T-P: 0 – 0 – 2	Credits: 01
Evaluation Scheme ISE: 25	ESE Marks:

Prior Knowledge of:	Basic Computer Fundamentals, Basic Knowledge of Programming
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Course Objectives:

1.	Acquire basic principles of problem-solving using computers.
2.	Learn and use the syntax of C programming language to solve basic science and engineering problems.
3.	Select appropriate programming constructs, data structures and functions to build solutions to a variety of problems.

Details:

Exp. No	Title of Experiments	Duration
01	Write, compile, debug, and execute simple C programs. Demonstrate the use of variables, data types, arithmetic expressions, and formatted input/output using printf() and scanf().	2 hrs
02	Develop C programs using if, if-else, nested if, and switch statements to solve real-world problems such as grading, electricity bill calculation, and menu-driven calculators.	2 hrs
03	Implement programs using while, do-while, and for loops to generate number patterns, multiplication tables, factorials, Fibonacci series, prime numbers, and Armstrong numbers.	2 hrs
04	Develop modular programs using user-defined functions. Implement recursive programs for factorial, Fibonacci series.	4 hrs
05	Write programs to perform operations on one-dimensional and two-dimensional arrays, matrix operations, string manipulation, and use standard string library functions.	4 hrs
06	Demonstrate pointer operations, pointer arithmetic, passing pointers to functions, and dynamic memory allocation using malloc(), calloc(), realloc(), and free().	4 hrs
07	Develop programs using structures, nested structures, arrays of structures, unions, enumerations, and typedef to manage student or employee records.	4 hrs
08	Implement programs to create, read, update, append, and search records in text and binary files using standard file handling functions.	2 hrs



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09	Write programs using command-line arguments and bitwise operators for applications such as number conversion, bit manipulation, and simple encoding techniques.	2 hrs
10	Design and implement a menu-driven application integrating functions, arrays, pointers, structures, and file handling. Examples include Student Record Management System, Library Management System, Employee Payroll System, or Inventory Management System.	2 hrs

Self-Learning Topics: Algorithm development using flowcharts and pseudocode.

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
CO1	Explain the fundamental concepts of procedural programming and the structure and execution of C programs
CO2	Describe the role of functions, arrays, pointers, and user-defined data types in developing modular C programs
CO3	Explain the concepts of dynamic memory allocation and file handling in C programming.
CO4	Interpret programming problems and identify appropriate debugging techniques, coding standards, and best programming practices used in C programming.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

COs \ POs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	3	1			1							
CO2	2	3	2	1		1							
CO3	2	3	2			2							
CO4	2	2	3			2			1		1		1



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Text Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	C: The Complete Reference	4th	Herbert Schildt	McGraw-Hill Education.	2000
2	Programming with C	4th	Byron S. Gottfried	McGraw-Hill Education	2018
3	Programming in ANSI C	8th	E. Balagurusamy	McGraw-Hill Education.	2019
4	Understanding Pointers in C	4th	Yashavant Kanetkar	BPB Publications	2003

Reference Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	The C Programming Language	2nd	Brian W. Kernighan and Dennis M. Ritchie	Pearson Education	1988
2	Let Us C	17th	Yashavant Kanetkar	BPB Publications	2020
3	C: How to Program	8th	Paul Deitel and Harvey Deitel	Pearson	2015

Online Books:

Sr.No	Reference	URL
1	GNU C Manual	https://www.gnu.org/software/c-intro-and-ref/manual/c-intro-and-ref.pdf 2nd
2	cppreference (C Language Reference)	https://cppreference.com/c
3	Programiz – C Programming Tutorial	https://www.programiz.com/c-programming



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School of Engineering & Management

Department of First-Year Engineering

Course Title: Professional Communication	
Course Code: 26FYEUA#08	Semester: I/II
Teaching Scheme L-T-P: 1-0-0	Credits: 01
Evaluation Scheme: - ISE	Total = 25 Marks

Prerequisites:	Basic English grammar, Ability to read and understand simple English texts. Basic listening, speaking, reading, and writing (LSRW) skills, Willingness to participate in discussions, presentations, and group activities.
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Course Objectives:

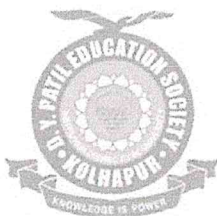
1.	To make students learn important communicative situations, the basics of communication, and its significance in the corporate sector
2.	To sharpen listening, speaking, reading, and writing skills
3.	To facilitate them to draft office documents effectively
4.	To enhance career skills to make students industry-ready

Curriculum Details:

Course Contents	Duration
Unit 1: Language and Communication • Need for effective communication • The process and levels of communication • Professional communication • Communication networks/ flows • Forms and methods (verbal and non-verbal) of communication • Barriers to communication and solutions	04 Hrs
Unit 2: Introduction to LSRW • Listening Skills: Hearing and listening, Listening as an active skill; Types of Listening; Barriers to effective listening skills • Speaking Skills: Importance, Various oral business contexts/situations, Group communication, Preparing effective public speeches (Impromptu and Prepared) • Reading Skills: Benefits of effective reading, Types of reading (Skimming; Scanning, Intensive reading, Extensive reading) Overcoming common obstacles, Reading comprehension • Writing Skills: Importance, Paragraph writing techniques	03Hrs

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Unit 3: Professional Correspondence • Official correspondence Principles, structure (elements) Layout (complete block, modified block, semi-block), Types (enquiry and reply, claim and adjustment) • Office drafting Writing notice, agenda, and minutes of the meeting • Email writing Advantages and limitations Style, structure, and content Email etiquette	04 Hrs
Unit 4: Career Skills and Ethics • Resume and cover letter writing Types of resume Important features of selling resume Cover letter writing • Job Interviews Interview preparation FAQs (Frequently Asked Questions) • Guidance for IELTS, TOFEL and GRE • Corporate etiquette and ethics	03 Hrs

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO's	Statements
CO#08.1	Explain the fundamentals of professional communication, including the communication process, verbal and non-verbal communication, communication networks, barriers, and strategies for effective communication in professional contexts.
CO#08.2	Demonstrate proficiency in Listening, Speaking, Reading, and Writing (LSRW) skills to communicate effectively in academic, professional, and interpersonal situations.
CO#08.3	Prepare professional business correspondence, including official letters, notices, agendas, minutes of meetings, and emails by applying appropriate formats, language, and communication etiquette.
CO#08.4	Develop career readiness by preparing effective resumes, cover letters, participating confidently in interviews, and demonstrating professional ethics and corporate etiquette in workplace environments.

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Department of First-Year Engineering

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
CO#08.1	2	2							2	2	3	
CO#08.2	2									2	2	2
CO#08.3	3					3				3	3	3
CO#08.4	2						2		2	2	2	2

Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Technical Communication: Principles and Practice	4 th	Meenakshi Raman & Sangita Sharma	Oxford University Press	2022
2	Personality Development and Soft- Skills	2 nd	Barun K. Mitra	Oxford University Press	2016
3	Communication Skills	2 nd	Sanjay Kumar & Pushp Lata	Oxford University Press	2015
4	Strategic Communication for Engineers and Managers	1 st	Dr. Maruti Devkar and Mrs. Sapana Devkar	Astitva Prakashan	2026

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Business Communication	2 nd	Urmila Rai and S.M. Rai	Himalaya Publishing House Pvt. Ltd.	2014
2	A University Grammar of English	1 st	Randolph Quirk and S Greenbaum	Pearson	2007

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3	Effective Technical Communication	2 nd	B. K. Mitra	Oxford University Press	2006
4	Effective Technical Communication	2 nd	M. Ashraf Rizvi	McGraw Hill Education	2005

Useful Links/Web Resources:

1. <https://www.skillsyouneed.com>
2. <https://www.psychologytoday.com>
3. <https://www.britishcouncil.in>
4. <https://www.udemy.com>
5. <https://www.englishclub.com>



Course Coordinator

Dr. Maruti Devkar

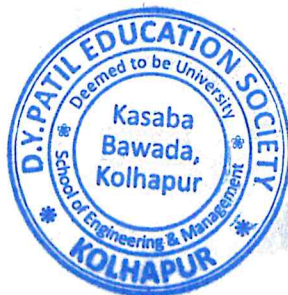


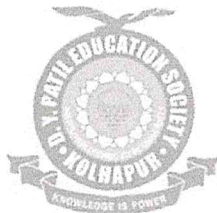
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Mr. A.R. Matkar

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School of Engineering & Management
Department of First-Year Engineering

Course Title: Professional Communication Laboratory	
Course Code: 26FYEUUA#09	Semester: I/II
Teaching Scheme L-T-P: 0-0-2	Credit:01
Evaluation Scheme: - ISE	Total = 25 Marks

Prerequisites:	Basic English grammar, Ability to read and understand simple English texts. Basic listening, speaking, reading, and writing (LSRW) skills, Willingness to participate in discussions, presentations, and group activities.
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Course Objectives:

1.	To familiarize students with English phonology and improve their pronunciation
2.	To improve language learning skills (LSRW) by providing ample practice
3.	To develop students' verbal and non-verbal communication
4.	To cultivate creative thinking and workplace skills

List of Lab Sessions:

Session No	Title of Activities	Duration
01	Icebreaking: Introducing self and others Different ways of introducing self and others: demonstration	02Hrs
02	Phonetics Introduction to phonetics - consonants, vowels and diphthongs, stress, intonation in English with video samples	02Hrs
03	Remedial English Vocabulary-building games and identifying errors revising rules of English grammar	02Hrs
04	Listening Practice Listening comprehension, strategies for effective listening with audio/video samples	02Hrs
05	Reading Practice Improving Comprehension Skills, Techniques for good comprehension	02Hrs
06	Technical Writing Practice Paragraph writing, writing notices, agenda minutes of the meeting, email writing	02Hrs
07	Public Speaking Practicing extempore and prepared speeches	02Hrs
08	Group discussion Group discussions on current topics	02Hrs
09	Mock Meetings Purposes, preparation, and procedure for conducting effective meetings	02Hrs
10	Mock Interviews Preparing for FAQs and facing mock interviews	02Hrs
11	Creative Writing Blog Writing	02Hrs
12	Film/Book Appreciation Showing short films and appreciation of them. Reading novels or short stories and critical analysis of them.	02Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO's	Statements
CO#09.1	Demonstrate effective interpersonal communication by introducing self and others, applying correct pronunciation, phonetics, vocabulary, grammar, and active listening skills in professional and social contexts.
CO#09.2	Demonstrate reading, writing, and technical communication skills to prepare professional documents such as paragraphs, notices, agendas, minutes of meetings, and emails using appropriate language conventions.
CO#09.3	Communicate confidently in individual and group situations through public speaking, group discussions, mock meetings, and mock interviews by demonstrating teamwork, leadership, and professional etiquette.
CO#09.4	Develop analytical, creative, and reflective communication skills by writing blogs and critically appreciating films, books, and literary texts to foster lifelong learning and effective expression.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

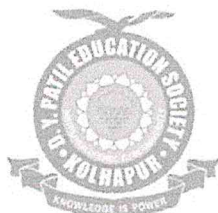
POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
CO#09.1	3	3								3	3	3
CO#09.2	3					3				3	3	3
CO#09.3	3						2		2	2	2	2
CO#09.4	3		3						3	3	3	3

Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	A Practical Course in Spoken English	1 st	J.K. Gangaj	PHI Learning Pvt. Ltd	2014
2	English Language Laboratories	2 nd	Nira Konar	PHI Learning Pvt. Ltd	2014
3	Strategic Communication for Engineers and Managers	1 st	Dr. Maruti Devkar and Mrs. Sapana Devkar	Astitva Prakashan	2026

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Communication Skills	2 nd	Sanjay Kumar & Pushp Lata	Oxford University Press	2015
2	Technical Communication: Principles and Practice	2 nd	Meenakshi Raman & Sangita Sharma	Oxford University Press	2011

Useful Links /Web Resources:

1. <https://www.indiabix.com>
2. <https://www.skillsyouneed.com>
3. <https://interviewbuddy.in>
4. <https://learnenglish.britishcouncil.org>
5. <https://www.fluentu.com>

Course Coordinator

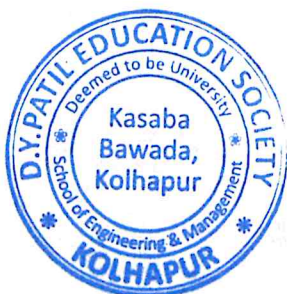
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(As Per National Education Policy 2020)

Course Title: Generative AI	
Course Code: 26FYEUN#10	Semester: II
Teaching Scheme: L-T-P: 2 – 0 – 0	Credits: 02
Evaluation Scheme:	ESE Marks: 50

Prior Knowledge of:	1. Basic computer literacy 2. Familiarity with using web browsers and office productivity software 3. No prior programming or Artificial Intelligence knowledge is required
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Course Description:	This course introduces first-year students to the fundamentals of Artificial Intelligence (AI) and Generative AI, emphasizing practical applications across various domains. Students will learn how to effectively interact with modern AI systems through prompt engineering, utilize AI-powered productivity tools, explore multimodal content generation, and understand the ethical, legal, and societal implications of AI technologies. The course combines conceptual understanding with hands-on activities to develop responsible and effective AI users for academic and professional environments.
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Curriculum Details:

Course Contents	Duration
Unit 1: Introduction to Artificial Intelligence and Generative AI Artificial Intelligence: definition, scope and historical evolution; AI vs Machine Learning vs Deep Learning vs Generative AI; Narrow AI, General AI and the emergence of Foundation Models; Evolution from traditional rule-based AI to the ChatGPT era; Real-world applications of Generative AI in education, healthcare, engineering, electronics and business; Overview of leading AI platforms: ChatGPT, Gemini, Claude, Copilot; Hands-on orientation: guided first interaction with a conversational AI tool	08 Hours
Unit 2: Prompt Engineering and AI-Assisted Productivity Fundamentals of prompt engineering: clarity, context and constraints; Zero-shot, one-shot and few-shot prompting; Chain-of-thought and step-by-step prompting; Structured prompting and reusable prompt templates; AI-assisted coding: using AI as a programming aid; AI-assisted learning and AI-assisted research/summarisation; Practical applications: resumes, emails, code, reports and research summaries.	08 Hours
Unit 3: Multimodal Generative AI and Content Creation Text-to-Image models: principles and applications; Text-to-Video models and AI video generation; Speech-to-Text and Text-to-Speech systems; Image understanding and visual question answering (conceptual); Multimodal AI: combining text, image, audio and video; Digital avatars and synthetic media; Guided tool demonstrations: Canva AI, Leonardo AI, Runway, ElevenLabs.	06 Hours
Unit 4: Responsible AI, Ethics, Governance and Future Trends AI ethics, bias and privacy in generative systems; Deepfakes: detection, risks and social impact; Copyright and intellectual property issues in AI-generated content; AI Safety and Responsible AI principles; Explainable AI and AI Governance frameworks; Environmental impact of AI and sustainable AI practices; Future of AGI: a balanced, non-speculative overview; Career opportunities in Generative AI: Prompt Engineer, AI Application	06 Hours



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Developer, AI Product Manager, AI Research Engineer, AI Consultant

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
CO1	Explain the fundamental concepts of Artificial Intelligence, Generative AI, and their applications across different domains.
CO2	Apply prompt engineering techniques and AI-assisted tools to enhance learning, communication, research, and productivity.
CO3	Demonstrate the use of multimodal Generative AI tools for creating and analyzing text, images, audio, and video content.
CO4	Evaluate ethical, legal, privacy, and governance issues related to Generative AI and adopt responsible AI practices in real-world scenarios.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

Cos \ POs	1	2	3	4	5	6	7	8	9	10	11	12	PS01	PS02
CO1	1			1						3	1	3	2	1
CO2	1				3		2		3	2				1
CO3	1	1		1							1		2	
CO4						1		1			1			

Text Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	Artificial Intelligence: A Modern Approach	4th	Russel, S., & Norvig, P	Pearson	2021
2	Co-Intelligence: Living and Working with AI.	-	Mollik, E	Penguin	2024

Reference Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	Generative AI with Large Language Models	-	Allamaraju, S	O'Reilly	2024
2	AI Engineering: Building Applications with Foundation Models.	-	Fowler, M.	O'Reilly	2024



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Course Title: Liberal Learning Course - II	
Course Code: 26FYEUC207	Semester: II
Teaching Scheme L-T-P: 1 – 0 – 0	Credits: 01
Evaluation Scheme: - ISE-25	ESE Marks: 00

Prerequisites:	Interest in the chosen club activity, along with basic enthusiasm, creativity, teamwork, and willingness to learn. Basic familiarity with relevant tools (where applicable) is sufficient.
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Course Objectives:

1.	To extend creativity, self-expression, physical and mental well-being, and an appreciation for arts, culture, languages, and healthy lifestyles through experiential learning activities.
2.	To find fundamental knowledge and practical skills related to their chosen club, enabling them to apply appropriate techniques, tools, and creative practices effectively.
3.	To enhance communication, teamwork, leadership, critical thinking, and problem-solving skills through collaborative projects, performances, workshops, and club activities.
4.	To summarize ethical values, cultural awareness, self-confidence, lifelong learning, and social responsibility by actively participating in extracurricular and experiential learning experiences.

Curriculum Details:

Course Contents(All Clubs)	Duration
1. Dance Club:	
Unit 1: Semi-Classical Choreography • Entry and exit techniques • Formation changes • Group coordination • Stage presence	05 Hrs

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Unit 2: Dance Compositions • Devotional songs • Folk-inspired Semi-Classical pieces • Semi-Classical fusion choreography • Theme-based performances	05 Hrs
Unit 3: Performance Skills • Costume and makeup basics • Stage etiquette • Confidence-building activities • Audience engagement	05 Hrs
Unit 4: Practical Training • Monthly choreography • Solo performance practice • Duet and group performances • Improvisation exercises	05 Hrs
Unit 5: Assessment & Showcase • Technique evaluation • Expression assessment • Rhythm accuracy • Annual performance/presentation	05 Hrs
Unit 6: Bollywood Dance Syllabus • Bollywood freestyle • Romantic style • Energetic dance • Folk fusion • Partner formations • Group formations • Transition techniques • Medium-level choreography	05 Hrs

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2.Yoga & Meditation Club:	
Unit I: Theory part • Obstacles in the way of yoga and how to overcome from them • Introduction of seven Chakras and how to balance with Asanas • Panch Mahabhuta or 5 elements of our body and how they related with ayurveda • Importance of Bandhas in Pranayama	05 Hrs
Unit II: Shudhikriyas • Tratak, • jalneti, • agnisar • udiyanbandh	05 Hrs
Unit III: • Breathing techniques • Pranayam with bandhas	05 Hrs
Unit IV: Practice Basic Asanas • Asanas and variations • vakrasana 1-2-3 • Ekpad Hastasana • Puppy pose 1-2	05 Hrs
Unit V: Practice Basic Asanas • Shalabhasana 1-2 • Bhujangasana 4 types • Natrajasana • Grudasana	05 Hrs
Unit VI: Practice Basic Asanas • Halasana 1-2 • Sarvangasan 1-2 • Hansasan • Ardhamatasyendrasana Self Learning: • Everyday practice • Read books on different methods to maintain health, wellness and to enhance mood • Watch videos on Yoga practices	05 Hrs
3.Music Club:	
Unit I: • Introduction of Music • Introduction of chords	05 Hrs
Unit II: • Introduction of leads • Practically holding and Grip of it	05 Hrs

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Unit III: • Playing Individual song on Guitar with chords	05 Hrs
Unit IV: • Learn to sing songs in various scales	05 Hrs
Unit V: • Group albums	05 Hrs
Unit VI: • Practice of group and individual	05 Hrs
4. Adventure Club:	
Unit I: Introduction to Adventure Activities • Adventure ethics and responsible tourism • Philosophy and importance of adventure sports • Types of adventure activities • Physical and psychological benefits • Adventure ethics and responsible tourism	05 Hrs
Unit II: Safety Protocols, Risk Management and Basic First Aid for Adventure Activities • Principles of outdoor safety • Risk identification • Hazard analysis • Safety protocols	05 Hrs
Unit III: Adventure Cycling and Trekking Equipment Safety Check • Route planning • Trekking techniques • Navigation using maps and compass	05 Hrs
Unit IV: Adventure Sports: Self-defence and Personal Development, Leadership. • Communication skills • Decision making • Problem solving • Self-defence techniques • Physical conditioning • Mental resilience • Adventure psychology	05 Hrs
Unit V: Study of Historical Monuments • Eco-tourism • Sustainable tourism • Wildlife awareness • Historical monument documentation	05 Hrs
Unit VI: Visit to Vertical Adventure Park • Helmet safety	05 Hrs

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- Parasailing - Parasailing (demonstration) - Ethical adventure practices	
5. Foreign Language Club (German Language):	
Unit I: Communication Skills - Self-introduction, family, occupations, countries & nationalities, hobbies - classroom communication, everyday vocabulary	05 Hrs
Unit II: Grammar Fundamentals - Personal pronouns, definite & indefinite articles - verb conjugation, sein, haben, regular verbs - sentence structure, W-questions, yes/no questions	05 Hrs
Unit III: Functional Grammar - Negation (nicht/kein), possessive pronouns, modal verbs (möchten, können, müssen), - accusative articles, common accusative verbs, separable verbs, conjunctions (und, aber, oder, denn).	05 Hrs
Unit IV: Everyday Communication - Time and appointments, daily routine, food & beverages - shopping, restaurant conversations, travel, transport, asking and giving directions, weather	05 Hrs
Unit V: Language Skills - Listening comprehension, reading short texts, guided writing - role plays, pronunciation - practice, revision and final assessment	05 Hrs
Unit VI: - Interactive lectures - Audio-visual presentations - Pair and group activities - Role plays and conversations - Worksheets and quizzes Recommended Books: - Netzwerk Neu A1 – Ernst Klett Verlag - Schritte International Neu 1 – Hueber Verlag - German Made Easy – Arnold Leitner	05 Hrs
6. Photography Club:	
Unit I: Advanced Gear, Calibration, & Exposure Science	04 Hrs
Unit II: Mastering Studio Lighting & Modifiers	04 Hrs
Unit III: Advanced Composition & Fine Art Visual Language	04 Hrs

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• Unit IV: Landscape, Heritage, & Nature Field Work	04 Hrs
• Unit V: Advanced Modelling & Portrait Photography	04 Hrs
• Unit VI: Commercial Product & Still Life Photography	04 Hrs
• Unit VII: Advanced Post-Processing Workflow	03 Hrs
• Unit VIII: Professional Business, Portfolio, & Niche Operations	03 Hrs
7. Art & Craft Club:	
Unit I: Advanced Folding Techniques • Engineering Concept • Shape Transformation • Mathematical Origami Motion Mechanism • Engineering Concept: Folding Sequence, Precision, Symmetry, Communication Design	05 Hrs
Unit II: Advanced Box Design Activities • Engineering Concept • Locking Mechanism Packaging • Engineering Product Design	05 Hrs
Unit III: Advanced Modular Origami Activities: Infinity Cube • 30-Unit Sonobe Icosahedron • Engineering Concept: Transforming Structures Modular • Design 3D Geometry	05 Hrs
Unit IV: Aerospace & Engineering Origami Activities • Advanced Miura Fold • Foldable Solar Panel Model • Engineering Concept: Deployable Structures Aerospace Engineering • Compact Storage • Rapid Deployment	05 Hrs
Unit V: Paper Engineering Activities • 3D Paper Art • 3dkirigami popup • Transforming Cube • Engineering Concept: Structural Design • Paper Engineering Product Development	05 Hrs
Unit VI: Creative Design & Innovation Activities • Origami Lamp Shade • Final Engineering Prototype / Presentation • Engineering Concept: Product Design • Innovation • Prototype Development Design Thinking	05 Hrs

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8. Video – Editing/Movie Club:

Unit I: Short Film Review • Theme and objective of the film • Storytelling approach • Cinematography and shot composition • Editing techniques used • Background music and sound effects. • Personal understanding and critical analysis	08 Hrs
Unit II: Movie Analysis Presentation (PPT) • The motive and message of the film. • Editing style and techniques used. • Camera angles and cinematography. • Use of transitions, color grading, and visual effects. • Role of background music and sound design.	08 Hrs
Unit III: Final Video Project • Storytelling and creativity • Video quality and shot selection • Use of transitions and visual effects • Color grading • Audio synchronization and background music • Overall editing quality and presentation	07 Hrs
Unit IV: Viva-Voce • Editing workflow • Software tools used • Effects and transitions applied • Challenges faced during editing • Export settings and project deliver	07 Hrs

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO's	Statements
207.1	Recall the basic concepts, techniques, and practices related to the chosen club activity.
207.2	Explain the fundamental principles, tools, and methods used in the chosen club activity.
207.3	Describe the importance of communication, teamwork, leadership, and ethical values in club activities.
207.4	Summarize the role of creativity, cultural awareness, physical and mental well-being, and lifelong learning in personal and professional development.

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POs COs	BTL	1	2	3	4	5	6	7	8	9	10	11
207.1	1	1				1			1	1		1
207.2	2	2				2						1
207.3	2	1							1	1		1
207.4	2	1				1		1		1		1

Useful Links/Web Resources:

- **SWAYAM:** <https://swayam.gov.in>
- **NPTEL:** <https://nptel.ac.in>
- **AICTE IDEA Lab:** <https://idealab.aicte-india.org>
- **YouTube Education:** <https://www.youtube.com>
- **Canva (Design & Creativity):** <https://www.canva.com>
- **Google Arts & Culture:** <https://artsandculture.google.com>

Course Coordinator

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