

Walchand College of Engineering, Sangli

Department of Artificial Intelligence and Machine Learning

Curriculum Contents

FY B.Tech. (AIML)

(AY 2026 - 27)

SEM-I

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

Programme	B.Tech.
Class, Semester	First Year (CSE/IT/AIML) | Semester I
Course Code	8BS117
Course Name	Linear Algebra and Calculus
Desired Requisites:	Mathematics Subjects at Higher Secondary Level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hrs/week	30	20	50	100

Credits: 03

Course Objectives

1	To introduce the foundational principles of vector spaces, linear transformations and the consistency of linear systems.
2	To familiarize students with structural matrix decomposition techniques crucial for data processing and machine learning.
3	To present multi-variable differential optimization techniques using Jacobian and Hessian frameworks.
4	To introduce the principles of correlation, linear regression and least-squares curve fitting to model relationships within data frameworks.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	**Understand** the mathematical foundations for data analysis.	II	Understanding
CO2	**Apply** the concepts of Linear Algebra to solve linear systems and reduce data dimensionality.	III	Applying
CO3	**Solve** problems involving partial differentiation.	III	Applying
CO4	**Apply** regression, correlation and multi-type curve fitting to to engineering datasets.	III	Applying

Module	**Module Contents**	**Hours**
I	**Fundamentals of Linear Algebra** Vectors and norms, vector spaces, Subspaces, Span, Linear dependence and independence, Basis and Dimension. Linear Transformation: Definition and properties, Matrix representation, null space and column space, Rank-nullity theorem.	**05**

II	**Computational Linear Algebra** Rank of matrix: Echelon forms, Consistency of systems, Systems of linear equations, Gauss elimination and LU Decomposition, Orthogonal, Symmetric, and Positive Definite matrices.	**05**
III	**Eigenvalues and Matrix Decomposition** Characteristic equation and Cayley-Hamilton Theorem, Eigenvalues and eigenvectors: Geometric and Algebraic multiplicity, Diagonalization of matrices, Singular Value Decomposition (SVD), Principal Component Analysis (PCA).	**05**
IV	**Partial Differentiation** Functions of several variables, Partial Differentiation, Chain rule, gradient, directional derivatives, Jacobian Matrix, Hessian matrix, maxima and minima of function of two variables, Lagrange Multipliers: Constrained optimization.	**05**
V	**Correlation and Linear Regression** Correlation and Covariance, Karl Pearson correlation coefficient. Linear Regression; regression coefficients, Regression lines.	**04**
VI	**Curve Fitting** Introduction, principle of least squares, Fitting of Straight line (Linear), Second degree curve, Exponential curve.	**04**

Textbooks	
1	G. Strang, Linear Algebra and Its Applications, 4th Edition, Thomson, Brooks/Cole, 2006.
2	G. B. Thomas, J. R. Hass, C. Heil and M. D. Weir, Thomas' Calculus, 15th Edition, Pearson, 2023.
3	D. C. Montgomery, E. A. Peck and G. G. Vining, Introduction to Linear Regression Analysis, 6th Edition, John Wiley & Sons, 2021.

References	
1	K. Hoffman and R. Kunze, Linear Algebra, 2nd Edition, Prentice- Hall of India, 2005.
2	M. Artin, Algebra, Prentice-Hall of India, 2005.
3	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.
4	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.

Useful Links	
1	**Linear Algebra** https://nptel.ac.in/courses/111106051 https://nptel.ac.in/courses/111105035 https://nptel.ac.in/courses/111101115
2	**Partial Differentiation and its Applications** https://nptel.ac.in/courses/111104125
3	**Correlation, Regression and Curve Fitting** https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma110

CO-PO Mapping													
CO	**Programme Outcomes (PO)**											**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**
CO1	3	2									1		1
CO2	3	3	2	1	2						1	2	2
CO3	3	2	1								1	2	2
CO4	3	3	2	1	2						1	2	2

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

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Course Information

Programme	First Year B. Tech. CSE, IT, and AIML
Class, Semester	First Year B. Tech., Sem. I/II
Course Code	8BS120
Course Name	**Molecular Foundation for Computing**
Desired Requisites:	Students are expected to know the basic concept in Chemistry.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**Lab**	**Total**
Practical	2 Hrs/week	20	50	30	100
		Credits: 3			

Desired Knowledge

Basic knowledge of chemistry concepts studied at higher secondary level (10+2), Fundamental understanding of chemistry and mathematics concepts, elementary laboratory skills and scientific understanding.

Course Objectives

1	Introduce students to engineering materials and their practical applications in modern engineering systems.
2	Develop understanding of chemical analysis and material characterization techniques used in material evaluation.
3	Enable students to interpret analytical and characterization data for assessing material properties and performance.
4	Provide knowledge of the structure–property relationships of electronic materials and nanomaterial's for informed material selection in engineering applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain the principles of chemical analysis, material characterization techniques, and structure–property relationships of engineering materials.	II	Understand
CO2	Apply concepts of corrosion science, corrosion prevention methods, Gibbs phase rule, and phase diagrams.	II	Understand
CO3	Explain the working principles and applications of batteries, fuel cells, and supercapacitors.	III	Apply
CO4	Demonstrate chemical analysis and material testing experiments, interpret data, and prepare technical laboratory reports. (Lab)	III	Apply

Module	**Module Contents**	**Hours**
I	**Chemical analysis and Characterization of Materials:** Introduction to chemical analysis, Qualitative vs Quantitative methods, Gravimetric analysis-principles & examples, Volumetric (titrimetric) analysis, Spectroscopic techniques (UV-Vis, IR, HRMS/Mass)-basic concepts, Introduction to SEM & TEM for material characterization, Application examples: alloy composition, quality evaluation.	8

II	**Electrochemical Energy System:** Terms in battery and fuel cell: Anode, Cathode, Cell, Battery, Electrode Electrolyte, Types of batteries: Construction, working, uses and advantages of primary cells: Dry Cell: (Leclanche Cell) , Lithium cells: Lithium cells with solid cathode Lithium cells with liquid cathode, Secondary cell: Lead – Acid cell, Nickel – Cadmium Cell, Hydrogen oxygen fuel cell.	3
III	**Memory Storage and Data Storage Materials** Transition Metal Oxides and their applications in memory storage devices such as memresisters. Advanced Materials used in storage devices such as magnetic nanoparticles, graphene, carbon nanotubes, their types and synthetic routes their applications in computer science and engineering such as in transistors, memory devices and interconnects. Modern data storage devices, Cloud storage etc.	3
IV	**Corrosion Science:** Fundamentals of corrosion, Electrochemical corrosion mechanisms, Factors affecting corrosion, Types of corrosion (uniform, pitting, crevice, galvanic), Corrosion monitoring & control, Corrosion prevention methods (coatings, cathodic protection).	5
V	**Electronic Materials:** Introduction to Electronic Materials, Classification of Electronic Materials, Conducting Materials, Semiconductor Materials, Doping Concept, Applications, Dielectric and Insulating Materials, Dielectric Materials, Types of Dielectric Materials, Insulating Materials and their properties.	3
VI	**Nano-science and Technology:** Introduction to science at nanoscale, nanoscale dimension, historical developments, importance in modern computing and electronics. Classification of Nanomaterials 0D, 1D, 2D, 3D nanomaterials, properties of nanomaterials. Why properties of materials differs at nanoscale from its bulk counterparts. Synthetic routes of nanomaterial. Smart materials, shape memory alloys, Piezoelectric materials, Electrochromic materials, Self-healing materials, Actuator materials. Applications of smart materials in sensors, stent, wearable electronics etc.	4

List of Experiments/ Lab Activities (Any 10)	
1	Estimation of hardness of water by EDTA method (Complexometric titration).
2	Estimation of alkalinity of water (Neutralization titration).
3	Estimation of dissolved oxygen in water (Iodometric titration).
4	Estimation of chloride content in water (Argentometry).
5	Demonstration of pH meter and pH metric titration.
6	Determination of strength of acid/base conductometrically.
7	Colorimetric estimation of copper.
8	Estimation of copper from bronze (Iodometric titration).
9	Estimation of Zn from brass (Displacement titration).
10	Determination of purity of iron (Redox titration).
11	Interpretation of UV–Vis and IR Spectral Data using Software.
12	Determination of corrosion rate by weight loss method.
13	Gravimetric estimation of Ba from $BaSO_4$ as BaO.
14	Synthesis of metal nanoparticles (silver nanoparticles using chemical reduction method).
15	Introduction to chemical structure drawing using chemdraw software .

Textbooks	
1	P. C. Jain and M. Jain, *Engineering Chemistry*. New Delhi, India: Dhanpat Rai Publishing Company (P) Ltd., 2015.

2	S. K. Kulkarni, *Nanotechnology: Principles and Practices*, 3rd ed. Cham, Switzerland: Springer, 2015.
3	G. R. Chatwal and S. K. Anand, *Instrumental Methods of Chemical Analysis*, 5th ed. Mumbai, India: Himalaya Publishing House, 2007.
4	S. Chawla, *A Textbook of Engineering Chemistry*, 4th ed. New Delhi, India: Dhanpat Rai & Co. (P) Ltd., 2016.
5	S. K. Bhasin and S. Rani, *Laboratory Manual on Engineering Chemistry*, 3rd ed. New Delhi, India: Dhanpat Rai Publishing Company (P) Ltd., 2008.
References	
1	A. I. Vogel, *A Textbook of Quantitative Chemical Analysis*, 5th ed. London, U.K.: Longman Scientific & Technical, 1989.
2	B. K. Sharma, *Engineering Chemistry*. Meerut, India: Krishna Prakashan Media Pvt. Ltd., 2014.
3	H. H. Willard, L. L. Merritt Jr., J. A. Dean, and F. A. Settle Jr., *Instrumental Methods of Analysis*, 7th ed. New Delhi, India: CBS Publishers & Distributors, 1986.
4	Graphene Nanoelectronics, H. Raza, Ed. Berlin, Germany: Springer, 2012.
5	S. Sahay, *Quantitative Chemical Analysis*. New Delhi, India: Oxford Book Company, 2012.
Useful Links	
1	https://nptel.ac.in/courses?utm_source
2	https://research.ibm.com/?utm_source
3	https://www.energy.gov/eere/fuelcells/fuel-cell-technologies-office?utm_source

CO-PO Mapping (Theory)

	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	2	1	-	-	-	-	-	-	-	-		
CO2	3	3	3	-	-	-	-	-	-	-	-		
CO3	3	3	3	-	-	-	-	-	-	-	-		
CO4	3	3	-	3	3	-	-	2	3	-	1		

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment (Theory)

The assessment is based on MSE and ESE.

MSE shall be typically on modules 1 to 3.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Assessment (Lab)

The lab assessment will be conducted as mentioned below.
IMP: Lab ESE is a separate head of passing (min 40 %).

Assessment	Based on	Conducted by	Typical Schedule	Marks

Lab ESE	Lab Activities/ Journal/ Performance/ Presentations/ Oral/ Mini Project	Lab Course Faculty and External Examiner as applicable	During Week 1 to Week 13. Marks Submission at the end of Week 13.	30
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Syllabus Prepared By	
Syllabus Checked By	

Walchand College of Engineering, Sangli

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AY 2026-2027

Course Information	
Programme	First Year B. Tech.
Class, Semester	Sem I and Sem II
Course Code	8AE151
Course Name	Professional Communication
Desired Requisites:	10+2 level English

Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	---	**LA1**	**LA2**	**ISE**	**ESE**	**Total**
Tutorial	1Hr/week	30	30	--	40	100
Practical	---					
Interaction	1Hr/week	**Credits: 2**				

Course Objectives	
1	Enable clear, confident, and context-aware communication (verbal, non-verbal, written, digital)..
2	Prepare students to understand and apply effective listening, feedback and professional writing skills required for academic and career contexts.
3	Develop oral communication skills including public speaking, group discussion, debate and persuasion skills
4	Inculcate understanding of teamwork, collaboration, and digital communication, and equip students with personal branding and career communication skills.

Course Outcomes (CO) with Bloom's Taxonomy Level		
CO1	Communicate clearly, confidently, and competently in diverse real-world scenarios	Apply
CO2	Demonstrate adequate proficiency in language.	Apply
CO3	Demonstrate communication skills (LSRW) in personal and professional settings.	Apply
CO4	Work effectively in teams and apply communication and interpersonal skills for career readiness.	Apply

Module	**Module Contents**	**Hours**
	Foundations of Communication	
1	Communication -Nature, Types, and Principles. Barriers to Effective Communication and overcoming them. Developing Effective Listening Skills: Types, listening and note-making.	**2**
	Language Skills & Communicative Grammar	

2	Vocabulary precision, clarity. Modal verbs, passives, phrasal verbs. Common errors & editing Communicative Grammar: modal verbs, question tags, misplaced modifiers, passives Reading comprehension	**2**
	Non-Verbal Communication & Vocalics	
3	Understanding Non-Verbal Communication — Scope and Significance, Codes of non-verbal communication. Vocalics —Understanding Pronunciation, Intonation, and Voice modulation, eliminating fillers Developing Non-verbal skills for professional settings	**3**
	Formal Oral Communication Skills	
4	Presentation Skills — Structure, Delivery and Confidence. Techniques for public speaking. Group Discussion: Types, Dynamics, and Techniques Introduction to Debate: Structured Arguments and Rebuttal Techniques	**2**
	Professional Writing & Business Communication	
5	Introduction to academic writing. Principles of Professional Writing: Brevity, Clarity and Pragmatic writing, Cover letter writing. Résumé Writing: Formats, ATS Compatibility	**2**
	Interpersonal, Teamwork & Career Communication Skills	
6	Interpersonal skills- Significance, Emotional Intelligence (EQ) —Cores of Emotional Intelligence Team Building: Definition, Hierarchy and Team Dynamics Personal Branding in the Digital Age — LinkedIn and Social Media Strategy Interview Skills: Types, STAR Method, Mock Interview Preparation	**3**

Textbooks

1	Adler, R.B. & Rodman, G. — Understanding Human Communication, Oxford University Press
2	Sanjay Kumar & Pushpalata — Communication Skills, Oxford University Press, First Edition, 2012
3	Cialdini, R. — Influence: The Psychology of Persuasion, Harper Business

References

1	Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hills publishing Company 2006
2	William Sanborn Pfeiffer, T.V.S. Padmaja, Technical Communication: A Practical Approach, Pearson, Sixth Edition 2012
3	Reynolds, G. — Presentation Zen: Simple Ideas on Presentation Design and Delivery, New Riders
4	Exercises in Spoken English, Parts I and II, CIEFL, Hyderabad, Oxford University Press

Useful Links	
1	www.ted.com/talks — TED Talks on Communication

Course Assessment Plan — Notional Learning Hours

Professional Communication | First Year B Tech | Sem I & II | Credits: 2 | Total NLH: 60

Sl. No.	Assessment Type	Brief Description	Marks	Notional Learning Hours (NLH)	A T*	CO Mapped	Bloom's Taxonomy Level
1	Tutorial Exercise	Structured exercises based on Module I & II topics	20	8	LA1	CO2	Apply (L3)
2	Listening + Note-Making Task	Audio-visual listening exercise with note-making and summary writing from Module I	10	8	LA1	CO1, CO2	Apply (L3)
3	Oral Presentation	Individual 10-minute structured presentation evaluated via rubric (Module IV)	10	10	LA2	CO1, CO3	Apply (L3)
4	Group Discussion / Debate	Mock GD / Debate on current affairs or case-based topics (Module IV)	10	10	LA2	CO3, CO4	Apply (L3)
5	Professional Writing Task	Email makeover + Résumé peer review using ATS simulation (Module V)	10	8	LA2	CO1, CO4	Apply (L3)
6	End-Semester Examination	Oral exam covering all 6 modules (30–40% weightage on Modules 1–3; 60–70% on Modules 4–6)	40	16	ESE	CO1–CO4	Apply (L3)
		Total	**100**	**60**	—		

Notes: | **AT**= Assessment Type. NLH **= Notional Learning Hours** includes lecture contact hours, tutorial hours, self-study, and assessment preparation. | Total NLH = 60 (as per 2-credit course norm: 1 credit = 30 NLH).

Notional Learning Hours breakup as per component.

Component	Hours	Basis
Lecture contact hours (1 hr/week × 14 teaching weeks)	14	Teaching scheme
Tutorial / Lab contact hours (1 hr/week × 14 teaching weeks)	14	Teaching scheme
Self-study, reading & comprehension practice	12	Home preparation
Assessment preparation (LA1 + LA2 + ESE)	12	Assessment plan
Co-curricular / Activity-based learning tasks	8	Activity sessions
Total Notional Learning Hours	**60**	1 Credit = 30 NLH × 2 Credits

CO-PO Mapping														
	Programme Outcomes (PO)											**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1									3		2			
CO2									3		2			
CO3							2		2		2			
CO4								3	2		2			

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: ı
Hig Each CO of the course must map to at least one PO.

Syllabus Prepared By	Mr. M H Kalawate
Syllabus Checked By	

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AY 2026-27

Course Information

Programme	B. Tech.
Class | Semester	First Year (AIML/CSE/IT) | Semester I
Course Code	8ES114
Course Name	Problem Solving and Programming
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Interaction	02 Hrs/week	LA 1	LA 2	ESE	Total
Practical	02 Hrs/week	30	30	40	100
		Credits: 3			

Course Objectives

1	To introduce foundational concepts of computational logic and systematic algorithmic problem-solving techniques.
2	To familiarize students with basic syntax, data types, and control structures of the C programming language.
3	To build a strong understanding of modular programming constructs, arrays, and string handling methods.
4	To impart knowledge on advanced concepts including pointers, structured data types, and persistent file operations.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Define basic problem-solving terminology, syntax building blocks, tokens, and standard library functions of the C language.	I	Remember
CO2	Explain the execution flow of conditional logic, iterative loops, and memory addressing mechanics in structured programming.	II	Understand
CO3	Construct algorithmic flowcharts and develop working C programs to manipulate multi-dimensional arrays and string data.	III	Apply
CO4	Analyze computational problems to decompose them into modular user-defined functions and appropriate custom data structures.	IV	Analyze

Module	Module Contents	Hours
I	**General Problem Solving Concepts** Problem Solving in Everyday Life, Types of Problems, Problem Solving with Computers, Difficulties with Problem Solving, Problem Solving Aspects, Top Down Design. Problem Solving Strategies, Program Design Tools, Algorithms, Flowcharts and Pseudo, Codes	05
II	**Computer Programming** Types of Programming Languages, Features of C, Structure of a C Program, Declarations, Constants, Variables, Data Types, Operators and Expressions, Input and Output functions, Decision Control Statements**,** Conditional Statements: If, If-else, Nested If, If-elseif Statements.	04

III	**Iterative Statements** While Loop, For Loop, Do While Loop, Break, Continue, Pass, else Statement used with Loops, Functions, Need for functions, Definition, Function Call, Block Structure, Variable Scope, Return Type, Passing Arguments to a Function: Call by Reference, Call by Value, Recursive Functions.	05
IV	**Array** Declaration, Initialization, Two-Dimensional Arrays, Multi-Dimensional Array, String, Declaration and Initialization of Strings, Array of Strings, String functions.	04
V	**Pointers** Introduction, Definition and Declaration of Pointers, Address Operator, Pointer Variables, Structures, Declaration, Initialization, Accessing members of a Structure, Unions, Initializing a Union, Accessing the Members of a Union.	04
VI	**File Handling** Concept of a File, Types of File, File Operation, File functions, File opening modes in C, Reading, Write and Closing a File.	04

List of Assignments (Minimum 10 Assignments)

1. Program to simulate simple calculator that performs basic tasks such as addition, subtraction, multiplication and division.
2. Program to demonstrate different operators and their order precedence.
3. Program to accept the number and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number e) prime factors.
4. Program to accept a number from user and print digits of number in a reverse order.
5. Program to accept two numbers from user and compute smallest divisor and Greatest Common Divisor of these two numbers.
6. Program to find whether the number is positive / negative / zero using conditional statement.
7. Programs to show different types of iteration / loop.
8. Program to accept N numbers from user and compute and display maximum in list, minimum in list, sum and average of numbers.
9. Program to print the Fibonacci Series (with & without recursion).
10. Program to swap two number using function (Call by value & reference).
11. Program to demonstrate structure to array.
12. Program to demonstrate structure and union.
13. Program to demonstrate file handling.

Textbooks

1	E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
2	Yashavant Kanetkar, "Lets Us C", BPB Publication, 5th Edition, 20216.

Reference Books

1	Maureen Spankle, “Problem Solving and Programming Concepts”, Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978-0132492645.
2	Herbert Schidt, C: The complete reference, 4th edition, McGraw Hill publication.
3	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Useful Links

1	https://www.programiz.com/c-programming
2	https://www.w3schools.com/c/c_intro.php
3	https://www.javatpoint.com/c-programming-language-tutorial
4	https://nptel.ac.in/courses/106105171
5	https://nptel.ac.in/courses/106104128
6	https://nptel.ac.in/courses/106104074

CO-PO Mapping

Artificial Intelligence and Machine Learning

	Programme Outcomes (PO)										PSO's	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2
CO1	2	1									1	1	
CO2	2	1									1	1	
CO3	3	2	2		2					1	2	2	1
CO4	3	3	2		1					1	2	3	2

Information Technology

	Programme Outcomes (PO)										PSO's	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2
CO1	2	1									2	1	
CO2	2	1									2	1	1
CO3	3	2	2		2					1	3	2	1
CO4	3	3	2		1					1	3	3	2

Computer Science and Engineering

	Programme Outcomes (PO)										PSO's	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2
CO1	2	1									2	1	-
CO2	2	1									2	1	1
CO3	3	2	2		2					1	3	2	1
CO4	3	3	2		1					1	3	2	2

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. (min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates the starting week of a semester. Lab activities/Lab performance shall include

performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

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AY 2026-27

Course Information

Programme	B.Tech. (Artificial Intelligence and Machine Learning)
Class, Semester	First Year | Semester I
Course Code	2AI101
Course Name	Computer System and Architecture
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	ISE	MSE	ESE	Total
Tutorial		20	30	50	100
		Credits: 3			

Course Objectives

1	To introduce the concepts of computer system and its components.
2	To familiarize students with computer storage and hardware.
3	To discuss the basic concepts of computer networks.
4	To introduce CPU components and accelerators for AI.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	Describe the various components of the computer system.	II	Understand
CO2	Classify various hardware and storage devices.	III	Apply
CO3	Study the concepts of Computer Networks.	IV	Analyze
CO4	Recognize CPU components and various accelerators for AI.	IV	Analyze

Module	**Module Contents**	**Hours**
I	**Introduction to Computer and its Basics** Basic Components of a Computer System, Hardware and Software, I/O Operations, Role of Hardware and Software in the Execution of Programs, Fundamentals of Operating System.	07
II	**Computer Hardware** Types of Computers, RAM, CPU, CPU cores, GPU, Hard Disk Drive, Motherboard, Internal and External Components, Computer Comparison with Humans.	06
III	**Computer Storage** Storage Calculation, RAM, SWAP, Virtual Memory, Cache, HDD, SSD, SATA, SAS, RAID, NAS.	07
IV	**Computer Networking** Computer Communication, IP Addressing, MAC Addressing, LAN, MAN, WAN, Protocols, Ports, Networking Devices, Internet and Intranet.	06

V	**System Architecture Fundamentals** CPU Architecture: Structure and Components, Limitations for Large Workloads, Modern Computer Architectures: RISC vs. CISC Architectures.	06
VI	**Accelerators and I/O Devices** Types and Interfacing with the CPU, Bus Systems: Data, Address, and Control Buses, Specialized Hardware Accelerators: TPUs, NPUs, FPGAs for AI.	07

Textbooks	
1	James, K.L., The Computer Hardware Installation, Interfacing, Troubleshooting and Maintenance, PHI Learning.
2	Gupta, Vikas, Comdex: Hardware and Networking Course Kit, Dreamtech Press.

References	
1	Craig Zacker and John Rourke, PC Hardware Complete Reference.
2	Tom M. Mitchell, Machine Learning, McGraw Hill Education.
3	Prashant Joshi, Introduction to IT Systems, Khanna Book Publishing.

Useful Links	
1	http://www.tutorialspoint.com
2	https://www.javatpoint.com/hardware
3	https://edu.gcfglobal.org/en/computerbasics

CO-PO Mapping

	Programme Outcomes (PO)											**PSO**	
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**
CO1	3						1			2		2	
CO2	2	1	2			1		2		2		2	
CO3	3	2			3	2	1		1		2		3
CO4		3	1	2	2			1			1		1

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli
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AY 2024-25

Course Information

Programme	B.Tech. (Artificial intelligence and Machine Learning)
Class, Semester	First Year B | Semester I
Course Code	2VS153
Course Name	Hardware Assembly Skill
Desired Requisites:	Computer System and Architecture

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
	-	30	30	40	100
		Credits: 1			

Course Objectives

1	To introduce computer hardware and its different peripherals.
2	To develop computer programming skills in the students for advanced computer science courses.
3	To familiarize with AIML concepts.
4	To introduce computer networks.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Demonstrate the parts of a computer Motherboard	III	Applying
CO2	Implement various connections of peripheral devices.	III	Applying
CO3	Using Windows and Networking for various applications.	III	Applying
CO4	Development of data collection and analysis techniques.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Assignments

1. Hardware Components & Maintenance
2. BIOS, CMOS and BOOT Process
3. I/O Devices, Cables and Connections
4. Network Types, Devices, Tools
5. Operating System, Installation and Upgrades

6. Windows Administrative Tools and Network Configuration, User and Group Management
7. Physical and Digital Security Basics and Troubleshooting (Anti-Virus and Firewall)
8. Network Architecture, Network Operation and Security (Case Study of WCE Campus N/W)
9. Data Analysis using Excel
10. Study of Data Collection Tools and Techniques

Textbooks	
1	Steven Bright, Computer Fundamentals and Information Technology, Dreamtech Press, 1st Edition, 2018.
2	Edward K. Blum, Alfred V. Aho, Computer Science: The Hardware, Software and Heart of It, Springer, 1st Edition, 2011.

References	
1	Yashavant Kanetkar, Understanding Pointers in C, 3rd Edition, BPB Publication
2	The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, 2nd Edition, Prentice Hall of India

Useful Links	
1	https://nptel.ac.in/courses/106105214
2	https://nptel.ac.in/courses/106105171
3	https://nptel.ac.in/courses/106106231

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
CO	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	3						1			2		2	
CO2	2	1	2			1		2		2		2	3
CO3	3	2			3	2	1		1		2		3
CO4		3	1	2	2			1			1		2

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30

LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

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AY 2026-27 onwards

Course Information

Programme	B. Tech. All
Class, Semester	First Year
Course Code	8ES151
Course Name	Engineering Exploration
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**LA1**	**LA2**	**ESE**	**Total**
Interaction	-				
Tutorial	-	30	30	40	100
Practical	4 Hr /week	**Credits: 4**			

Course Objectives

1. To instil an understanding of the engineering profession
2. To impart a structured engineering design methodology
3. To build foundational skills in system modelling and analysis
4. To introduce physical computing and platform-based development
5. To foster professional ethics and sustainable engineering practices

Course Outcomes (CO)

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	Discuss the scope of Engineering and its study.	Understand	II
CO2	Solve real world challenges using multidisciplinary engineering skills	Apply	III
CO3	Demonstrate effective teamwork and communication skill during engineering project execution.	Apply	III
CO4	Analyse alternative design concepts using engineering criteria such as functionality, sustainability.	Analyse	IV
CO5	Develop engineering solutions using the engineering design process while considering sustainability and ethical constraints.	Create	VI

CO – PO mapping

	Programme Outcomes (PO)										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	1	-	-	-	-	1	-	-	-	-	-
CO2	2	2	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	3	2	-
CO4	-	2	2	-	-	-	3	-	-	-	-
CO5	-	-	3	-	-	-	1	3	-	-	-

Module	Module Contents	Hours
I	**Module 1: Introduction to Engineering and Engineering Study** Requirements and expectations of Engineering, disciplines of engineering, Expectation of modern engineer and Graduate Attributes Significance of teamwork, Significance of Agile practices, Significance of documentation	03 + 04
II	**Module 2: Sustainability and Ethics in Engineering** Introduction to sustainability, Sustainability leadership matrix, Life cycle assessment, carbon footprint, embodied energy calculation, alternative material selection and justification Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of Ethical Dilemmas.	03 + 04
III	**Module 3: Engineering Design** Engineering Design Process, Problem definition formulation process, Concept generation- Function tree, Morphological chart, and Concept selection- Pugh Chart, Material selection based on density, carbon foot-print and embodied energy, Product Architecture.	06 + 12
IV	**Module 4: Virtual Implementation** Virtual Implementation, Introduction to Engineering Drawing, Introduction to 3D modelling software, Part modelling & assembly. Circuit Diagram, Flowchart	06 + 14
V	**Module 5: Mechanisms, Motor Sizing and Battery Sizing (MSBS)** Types of mechanisms, degree of freedom, linkages, four bar linkage mechanism, actuators & its types, torque, governing equations, FOS, motor sizing, motor selection, mass identification using software, power adapters, types of adapters, power calculations & adapter selection	06 + 12
VI	**Module 6: Platform Based Development** Introduction to various platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino	06 + 14
		Total Hrs: 30+60

Course Project

Physical Implementation: Prototyping planning/Prototyping Sprint Reviews 18 Hrs

Each faculty will provide a need statement to students and mentor the group of students. Each group will come up with their own solution to the need statement. Number of need statements should be equal to number faculty teaching this course.

Sample need statements

1. To automate floor cleaning and reduce human effort.
2. To automate a selected industrial processing operation.
3. To automate Waste Segregation and Recycling.
4. To digitally capture the shape and dimensions of physical objects.
5. To reduce time and effort required for fruit peeling.
6. To automate corn shelling and improve agricultural productivity.
7. To detect driver fatigue and help prevent road accidents.
8. To automate the stacking of objects for improved productivity and safety.

Expected Deliverables

1) Problem Statement
2) Objectives
3) Literature Review
4) Methodology
5) Sustainability Analysis
6) Ethical Considerations
7) Prototype/Model/Survey/Simulation
8) Results and Discussion
9) Conclusion and Future Scope
10) Presentation and Final Report

Course Assessment Plan (*for total 90 learning hours*)

Assessment No.		Formative Assessment type	Brief Description	Marks	Notional Learning hours	Week
LA1	**1**	Engineering Exploration Quiz & Reflection (individual)	Quiz or Individual reflection report on engineering disciplines, graduate attributes, ethics, sustainability and teamwork, Agile practices.	**10**	5 (1)	1–3
	2	Sustainability & Ethics Studio Activity (individual or team)	Life Cycle Assessment and carbon footprint & embodied energy calculation exercise or ethical dilemma case study analysis	**10**	5 (1)	4–7
	3	Concept Generation & Design Review (team submission)	Problem definition & formulation, concept generation (function tree, morphological chart), concept selection (Pugh chart), material selection justification	**10**	6 (1)	8-15
LA2	**4**	Virtual Implementation (individual or team)	CAD part modelling & assembly, engineering drawing.	**10**	12 (2)	1–3
	5	Motor and Battery Sizing (individual or team)	circuit diagram/flowchart, mechanism selection, motor & battery sizing calculations	**10**	10 (2)	4–7
	6	Platform-Based Development (individual or team)	Arduino programming fundamentals, sensor/transducer/actuator interfacing	**10**	10 (2)	8-15
ESE	**7**	Prototyping Sprint Review 1	Problem Statement, Objectives, Literature Review, Methodology (Project deliverables 1–4)	**15**	4 (7)	1–3
	8	Prototyping Sprint Review 2	Sustainability Analysis, Ethical Considerations, working Prototype/Model/Survey/Simulation (Project deliverables 5–7)	**15**	4 (7)	4–7
	9	Final Presentation & Report	Results and Discussion, Conclusion and Future Scope, final report + presentation (Project deliverables 8–10)	**10**	4 (7)	8-15
Total				**100**	**60** (Contact hrs) **+ 30** (Self Learning) **=90 hrs**	

Note: The Course Faculty will finalize the assessment plan (including the distribution of internal evaluations, practical rubrics, and continuous assessments) at the start of the semester in accordance with institute regulations. Any modifications will be communicated to the students in advance.

Text Books	
1	Introduction to Engineering, Paul H. Wright, Carl T. F. Ross, Wiley India, 2008
2	Engineering Design: A Project-Based Introduction. 4th ed., by Clive L. Dym and Patrick Little, John Wiley & Sons, 2013.
References	
1	Systems Engineering Principles and Practice, Alexander Kossiakoff, William N. Sweet, Samuel J. Seymour, Steven M. Biemer, Wiley, 2020
2	Engineering Ethics: Concepts and Cases, Charles E. Harris Jr., Michael S. Pritchard, Michael J. Rabins, Cengage Learning, 2018
3	Norman, D. A., The Design of Everyday Things, Revised and Expanded Edition, Basic Books, 2013.
4	Ulrich, K. T., & Eppinger, S. D., Product Design and Development, 7th Edition, McGraw-Hill, 2024.
5	Ashby, M. F., Materials Selection in Mechanical Design, 5th Edition, Elsevier, 2016.
6	Budynas, R. G., & Nisbett, J. K., Shigley's Mechanical Engineering Design, 11th Edition, McGraw-Hill, 2019.
7	White, E., Making Embedded Systems, 2nd Edition, O'Reilly Media, 2024.
Useful Links	
1	https://youtube.com/playlist?list=PL2935W76vRNEE_NNWlpUar20iUdkFQ1z2&si=-MaDgeRnw2uTllTw
2	https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_mg54
3	https://onlinecourses.nptel.ac.in/e-learning/preview/noc25_mg63
4	https://www.youtube.com/playlist?list=PLGxa5y5etMwAY238yKu1orXTnzD9h5nL_
5	https://docs.arduino.cc/

SEM-II

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

Programme	B.Tech.
Class, Semester	First Year (CSE/IT/AIML) | Semester II
Course Code	8BS119
Course Name	Numerical Methods for Computation
Desired Requisites:	Mathematics Subjects at Higher Secondary Level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hrs/week	30	20	50	100

Credits: 03

Course Objectives

1	To learn numerical methods for finding roots of equations and interpolating discrete datasets.
2	To introduce analytical and numerical techniques for solving first-order ordinary differential equations.
3	To explain numerical integration techniques using Trapezoidal, Simpson's and Monte Carlo methods.
4	To familiarize students with higher-order linear differential equations and their engineering applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to

CO	**Course Outcome Statements**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	**Understand** the mathematical foundations of numerical methods used in engineering systems.	II	Understanding
CO2	**Apply** numerical algorithms to approximate continuous mathematical functions.	III	Applying
CO3	**Apply** numerical integration techniques to solve engineering problems.	III	Applying
CO4	**Apply** analytical and numerical methods to solve ordinary differential equations arising in engineering applications.	III	Applying

Module	**Module Contents**	**Hours**
I	**First Order Ordinary Differential Equations** Exact, Linear, Bernoulli's equation, Applications: Modeling growth and decay.	**05**
II	**Numerical Solution of ODE** Numerical Solution by (i) Euler's method (ii) Modified Euler's method (iii) Runge- Kutta fourth order method.	**05**

III	**Linear Differential Equations of Higher order** Linear Differential equation with constant coefficient, Complementary function, Particular Integral, Cauchy-Euler Linear Differential equation.	**05**
IV	**Basic Numerical Methods** Numerical solution of equations: Bisection and Regula-Falsi, Newton–Raphson method.	**04**
V	**Numerical Differentiation** Newton's Forward and backward difference interpolation formula, Lagrange's interpolation formula Newton's divided difference interpolation formula, Numerical differentiation: methods based on interpolation.	**05**
VI	**Numerical Integration** Newton cotes methods: Trapezoidal and Simpson's rules Error estimates for trapezoidal and Simpson's rule, Monte Carlo Integration.	**04**

Textbooks	
1	S. S. Sastry, Introductory Methods of Numerical Analysis, 5th Edition, Prentice-Hall of India, 2012.
2	D. G. Zill, A First Course in Differential Equations with Modeling Applications, 12th Edition, Cengage Learning, 2024.
3	M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, 2nd Edition, Wiley Eastern Limited (New Delhi), 1987.

References	
1	Richard L. Burden and J. Douglas Faires, Numerical Analysis, Brooks/Cole Cengage Learning, 11th Edition, 2020.
2	E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice-Hall, 1989.
3	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.
4	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.

Useful Links	
1	**Module II, IV, V, VI** https://nptel.ac.in/courses/111107105 https://nptel.ac.in/courses/127106019
2	**Module I, III** https://nptel.ac.in/courses/111106100

CO-PO Mapping

CO	**Programme Outcomes (PO)**											**PSO**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**
CO1	3	2									1		
CO2	3	3			2						1	1	
CO3	3	2	1		1						1	1	
CO4	3	3	2	2	2						1	2	

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

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AY 2026-27

Course Information

Programme	First Year B. Tech. CSE/ IT/ AIML
Class, Semester	First Year B. Tech., Sem. I/II
Course Code	8BS118
Course Name	Quantum Foundations for Computing
Desired Requisites:	Basic concepts of 10+2 level Physics.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ESE**	**Lab**	**Total**
Practical	2 Hrs/week	20	50	30	100
		Credits: 3			

Course Objectives

1	To provide fundamental scientific concepts for solving engineering and technical problems.
2	To develop analytical and critical thinking skills required for engineering studies.
3	To enhance the understanding of modern engineering and technological developments.
4	To develop experimental skills and the ability to analyze and interpret engineering data.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Exhibit memory of previously learned information by recalling facts, terms, and basic concepts in Physics.	I	Remember
CO2	Demonstrate understanding of facts and ideas by recalling, comparing, interpreting the terms in Physics.	II	Understand
CO3	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules for various concepts in Physics.	III	Apply
CO4	Analyze engineering systems for solving problems.	IV	Analyze

Module	**Module Contents**	**Hours**
I	**Modern Physics:** Introduction, black body radiation, Planck's quantum theory, phase velocity, group velocity and particle velocity, de-Broglie's hypothesis, Photo electric effect, Compton effect.	5
II	**Quantum Mechanics:** Heisenberg's uncertainty principle, wave function and physical significance, Schrödinger's wave equation, Particle in 1D Box, Eigen value and Eigen function.	5
III	**Fibre Optics and LASER:** Introduction, Interference and Diffraction of Light, Principle of Optical Fibre, Acceptance Angle, Numerical Aperture, Types of Optical Fibres, LASER Fundamentals, Applications of LASER.	4

IV	**Semiconductor Physics:** Introduction, Classification of Solids, Energy Bands in Solids, Density of States, Fermi-Dirac Statistics, Fermi Level, Effect of Temperature on Fermi Level, Electrical Conductivity of Metals and Semiconductors, Hall Effect.	5

V	**Fundamentals of Microchip Technology:** Introduction, Classification of Integrated Circuits (ICs), Silicon Crystal Growth, Oxidation, Photolithography, Diffusion, Ion Implantation, Etching, Metallization, Packaging of Integrated Circuits, and Applications of Microchips.	4
VI	**Nanoscience and Nanotechnology:** Introduction to Nanoscience and Nanotechnology, Nanoscale and Nanomaterials, Classification and Properties of Nanomaterials, Synthesis of Nanomaterials: Top-Down and Bottom-Up Approaches, Graphene and Carbon Nanotubes, Applications of Nanotechnology.	3

List of Experiments/ Lab Activities (Any 8-10)	
1	Find the diameter of the wire by diffraction of light.
2	Determination of wavelength of light by plane diffraction grating.
3	Determine the specific rotation of sugar solution.
4	Find the wavelength of He-Ne LASER using plane diffraction grating.
5	Verify the expression for the resolving power of a telescope.
6	Measure the wavelength of ultrasonic waves by Kundt's tube method.
7	Design and simulate Colpitt's Oscillator.
8	Determine the Planck's constant.
9	Study the I-V characteristic of P-N junction diode in forward and reverse bias conditions.
10	Determine the wavelength of Sodium Light by Newton's Ring.
11	Study of Rectifier circuits.
12	To study the Hall effect and determine the Hall coefficient and carrier concentration of a semiconductor material.
13	Design and analyze a transistor circuit to obtain the desired current gain through I–V characterization.
14	To study and verify the truth tables of logic gates.
15	To study and analyze electronic circuits and systems using MATLAB & SPICE simulation tools.

Textbooks	
1	M. N. Avadhanulu and P. G. Kshirsagar, "A Text book of Engineering Physics", S.Chand Pub.
2	Bhattacharya & Nag, Engineering Physics
3	Harnam Singh, *Advanced Practical Physics for Students*, S. Chand & Company Ltd., Revised Edition, 2011, Volumes I & II.
References	
1	Beiser, Arthur, Concepts of Modern Physics, McGraw-Hill Education, 7th Edition, 2015**.**

2	Ghatak, Ajoy, Optics, McGraw-Hill Education, 6th Edition, 2017**.**
3	Kulkarni, S. K.**,** *Nanotechnology: Principles and Practices*, 3rd Edition, Springer, 2015.
4	Streetman, Ben G. and Banerjee, Sanjay Kumar, Solid State Electronic Devices, Pearson Education, 7th Edition, 2015**.**
5	Thyagarajan, K. and Ghatak, A. K., Lasers: Fundamentals and Applications, Springer, 2nd Edition, 2010**.**
Useful Links	
1	https://onlinecourses.nptel.ac.in/e-learning
2	https://swayam.gov.in/nc_details/NPTEL
3	https://ocw.mit.edu/search/

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	1									1		
CO2	3	2		1							1		
CO3	3	3	2	2							1		
CO4	3	3	2	2							1		

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment (Theory)

The assessment is based on MSE and ESE.
MSE shall be typically on modules 1 to 3.
ESE shall be on all modules with around 30% weightage on modules 1 to 3 and 70% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Assessment (Lab)

The lab assessment will be conducted as mentioned below.
IMP: Lab ESE is a separate head of passing (min 40 %).

Assessment	Based on	Conducted by	Typical Schedule	Marks
Lab ESE	Lab Activities/ Journal/ Performance/ Presentations/ Oral/ Mini Project	Lab Course Faculty and External Examiner as applicable	During Week 1 to Week 13. Marks Submission at the end of Week 13.	30

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Syllabus Prepared By	Dr. A. A. Mohite, Dr. B. N. Jamadar and Dr. K. V. Madhale
Syllabus Checked By	Head of Department CSE/IT/AIML

Course Contents for B. Tech. Programme, Department of CSE/ IT/ AIML Engineering, AY 2026-27

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B.Tech. (Artificial Intelligence and Machine Learning)
Class, Semester	First Year | Semester II
Course Code	2ES106
Course Name	Digital Logic Design
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	LA	MSE	ESE	Total
Practical	2 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives

1	To understand the fundamentals of digital systems and Boolean algebra.
2	To analyze and design combinational and sequential logic circuits.
3	To study memory devices, programmable logic devices, and digital subsystems.
4	To introduce hardware implementation concepts useful in AI and embedded applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Descriptor
CO1	Explain number systems, Boolean algebra, and logic gate operations.	II	Understand
CO2	Design and simplify combinational logic circuits using Karnaugh maps and logic minimization techniques.	III	Apply
CO3	Analyze and design sequential circuits such as counters, registers, and finite state machines.	IV	Analyze
CO4	Implement digital subsystems using memory devices, PLDs, and HDL concepts for AI-based embedded applications.	V	Evaluate

Module	Module Contents	Hours
I	**Digital Fundamentals and Number Systems** Digital Systems, Binary, Octal, Hexadecimal Number Systems, Signed and Unsigned Numbers, Complements, Binary Arithmetic, codes (BCD, Gray, ASCII), Logic Gates and Truth Tables.	06
II	**Boolean Algebra and Combinational Logic Design** Boolean Laws and Theorems, Canonical Forms, SOP and POS Forms, Karnaugh Maps (K-map), Minimization Techniques, Implementation using NAND/NOR Gates, Multiplexers, Demultiplexers, Encoders, Decoders, Comparators, Adders and Subtractors.	07

III	**Sequential Logic Circuits** Latches and Flip-Flops (SR, JK, D, T), Excitation Tables, Race Around Condition, Registers, Shift Registers, Ripple and Synchronous Counters, Sequence Generators.	07
IV	**Finite State Machines and Timing Circuits** Mealy and Moore Machines, State Reduction and Assignment, Synchronous Sequential Circuit Design, Timing Diagrams, Clocking Methods, Asynchronous Counters.	06
V	**Memory and Programmable Logic Devices** RAM, ROM, SRAM, DRAM, EEPROM, Flash Memory, PLA, PAL, FPGA Basics, Memory Interfacing Concepts, Introduction to Hardware Description Languages (HDL).	06
VI	**Digital Logic Applications in AI and Embedded Systems** Arithmetic Logic Unit (ALU), Data Path Concepts, Digital Circuits in AI Hardware Accelerators, Interfacing Sensors with Digital Systems, Introduction to Edge AI Hardware Platforms.	06

List of Experiments / Lab Activities/Topics

List of Lab Assignments:

1. Study of Number Systems, Logic Gates, and Truth Table Verification using ICs.
2. Implementation of Boolean Functions using Universal Gates (NAND/NOR).
3. Design and Verification of Half Adder and Full Adder Circuits.
4. Implementation of Multiplexer, Demultiplexer, Encoder, and Decoder Circuits.
5. Simplification of Boolean Expressions using K-Map and Hardware Realization.
6. Design and Testing of Flip-Flops (SR, JK, D, T).
7. Implementation of Counters and Shift Registers.
8. Design of Synchronous and Asynchronous Sequential Circuits.
9. Simulation of Digital Circuits using HDL/Logisim/Multisim/Proteus.
10. Case study -AI/Embedded System Oriented Digital Logic Application.

Textbooks

1	Digital Design, M. Morris R. Mano, Michael D. Ciletti, 6th Edition, Pearson Education 2018/2024 Global Edition
2	Fundamentals of Digital Circuits, A. Anand Kumar, 4th Edition, PHI Learning Pvt. Ltd. 2016
3	Digital Principles and Applications, Donald P. Leach, Albert Paul Malvino, Goutam Saha, 8th Edition, McGraw Hill Education, 2015

References

1	Digital Logic and Computer Design – Pearson.
2	Modern Digital Electronics – McGraw Hill.
3	Digital Systems – Pearson.
4	NPTEL Course on Digital Circuits and Systems.

5	IIT Bombay Virtual Labs – Digital Electronics Lab.

Useful Links

1	https://nptel.ac.in/courses/117106086

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	1							1		2	1
CO2	3	3	2	1	2		1			1		3	2
CO3	3	3	3	2	2	2			1	1		3	2
CO4	2	3	3	2	3			1	1	1	1	3	3

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Lab Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli
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Course Information

Programme	B.Tech.
Class, Semester	First Year AIML SEM II
Course Code	8ES107
Course Name	Engineering Graphics and CAD
Desired Requisites:	Basic Knowledge of Different Types of Curves, Line and Planes.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**LA**	**ESE**	**Total**
Tutorial	-	20	30	50	100
Lab	2 Hrs/week	**Credits: 3**			

Course Objectives

1	To develop visualization and graphical communication skills through engineering drawing principles.
2	To impart knowledge of projection techniques for representation of lines, planes, and solids.
3	To introduce orthographic, isometric, perspective projections, and geometrical transformations used in computer graphics.
4	To familiarize students with applications of engineering drawing concepts in computer science, information technology, CAD, animation, and graphical modeling.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Draw and interpret projections of lines, planes, and solids using standard engineering drawing methods.	I	Demonstrating
CO2	Explain orthographic, isometric, and perspective projection techniques for visualization of engineering objects.	II	Understanding
CO3	Apply geometrical transformation techniques using matrix methods for graphical representation and computer graphics applications.	III	Applying
CO4	Analyze and create graphical models and engineering drawings applicable to CAD, animation, gaming, and computer graphics systems.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Basics of Engineering Drawing and Projection of Lines** Introduction to engineering drawing, drawing instruments, BIS conventions, scales, dimensioning, lettering, and types of lines. Projection of points and straight lines in different quadrants. True length and true inclination of lines with respect to HP and VP.	04
II	**Projection of Planes and Solids** Projection of plane surfaces such as square, rectangle, pentagon, hexagon, and circle inclined to HP and VP. Projection of simple solids such as prism, pyramid, cylinder, cone, and sphere in different orientations. Visualization techniques for engineering objects.	05
III	**Orthographic and Isometric Projections** Principles of orthographic projection and multi-view representation. Conversion of pictorial views into orthographic views and vice versa. Principles of isometric projection and isometric view of simple solids and engineering objects.	04
IV	**Perspective Projection and Visualization Techniques** Introduction to perspective projection. One-point and two-point perspective projection of simple geometrical objects. Principles of visual perception and graphical	05

	visualization techniques used in computer graphics and gaming applications.	
V	**Geometrical Transformations Using Matrix Methods** Introduction to coordinate systems and matrix representation of geometrical entities. Translation, rotation, scaling, reflection, and shearing transformations in two-dimensional space using matrix operations. Homogeneous coordinates and composite transformations.	05
VI	**Applications of Engineering Drawing in CSE and IT** Applications of engineering graphics in computer graphics, CAD, animation, gaming, image processing, graphical user interfaces, virtual reality, and geometrical modeling. Introduction to CAD tools and graphical software for visualization and transformation of geometrical objects.	04

List of Experiments / Lab Activities (Minimum 10 Assignments)

Sr. No.	Title of Experiment	Contents
1	Introduction to Engineering Drawing and CAD Environment	Study of drawing instruments, BIS conventions, dimensioning, scales, lettering, and introduction to AutoCAD interface and basic settings.
2	Basic Drawing Commands in CAD	Practice of LINE, CIRCLE, ARC, POLYGON, RECTANGLE, ELLIPSE, and SPLINE commands for geometrical constructions.
3	Projection of Points and Straight Lines	Drawing projections of points and lines in different quadrants. Determination of true length and true inclination.
4	Projection of Plane Surfaces	Projection of square, rectangle, pentagon, hexagon, and circular plane surfaces inclined to HP and VP.
5	Projection of Solids	Orthographic projection of prism, pyramid, cylinder, cone, and sphere in different orientations.
6	Orthographic Projection of Engineering Objects	Conversion of pictorial views into orthographic views and vice versa using standard projection techniques.
7	Isometric Projection and Isometric View	Preparation of isometric projections and isometric views of simple solids and engineering objects.
8	Perspective Projection	One-point and two-point perspective projection of simple geometrical objects and blocks.
9	Editing and Modification Commands in CAD	Use of MOVE, COPY, ROTATE, SCALE, TRIM, EXTEND, OFFSET, MIRROR, FILLET, and CHAMFER commands.
10	Translation and Rotation Transformations	Application of translation and rotation transformations on 2D geometrical objects using CAD tools and coordinate methods.
11	Scaling, Reflection, and Shearing Transformations	Demonstration of scaling, reflection, and shearing transformations for graphical objects.
12	Composite Transformations and Geometrical Modeling	Combination of multiple geometrical transformations and preparation of graphical patterns and models.
13	Mini Project using CAD Tools	Preparation of a complete graphical model or engineering drawing incorporating projections, transformations, dimensions, layers, and annotations applicable to CSE/IT applications.

Module wise Measurable Students Learning Outcomes:

After the completion of the course the student should be able to:

[1] Draw and interpret projections of points, lines, planes, and solids using engineering drawing principles.

[2] Prepare orthographic, isometric, and perspective views of geometrical and engineering objects.

[3] Apply geometrical transformation techniques such as translation, rotation, scaling, reflection, and shearing using matrix methods.

[4] Analyze graphical representations and visualization techniques used in computer graphics and IT applications.

[5] Identify applications of engineering drawing concepts in CAD, animation, gaming, image processing, and virtual reality systems.

[6] Use graphical and CAD tools for creation and visualization of engineering and computer graphics models.

Text Books

1	Bhatt N.D., Panchal V.M. and Ingle P.R., *Engineering Drawing*, Charotar Publishing House, 2014.
2	Shah, M.B. and Rana B.C., *Engineering Drawing and Computer Graphics*, Pearson Education,

	2008.
3	Agrawal B. and Agrawal C. M., *Engineering Graphics*, TMH Publication, 2012.
References	
1	Narayana, K.L. and P. Kannaiah, *Text Book on Engineering Drawing*, Scitech Publishers, 2008.
2	Donald Hearn and M. Pauline Baker, *Computer Graphics with OpenGL*, Pearson Education.
3	Fredderock E. Giesecke, Alva Mitchell and Others, *Principles of Engineering Graphics*, Maxwell McMillan Publishing, 2010.
Useful Links	
1	https://nptel.ac.in/courses/112/103/112103019/
2	https://nptel.ac.in/courses/105/104/105104148/
3	https://www.youtube.com/watch?v=xXdpkQXDuMw&list=PL9RcWoqXmzaJT-fliqTSwUjWU4zCX_H2A

CO-PO Mapping For AIML Department

	Programme Outcomes (PO)										PSO	
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	3	2	2		1				2		1		
CO2	3	1	1						2		1		
CO3	3	3	2	1	2						2	3	2
CO4	3	2	3	1	3			1	2		3	2	3

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High

Assessment

The assessment is based on MSE, ISE/LA and ESE.
MSE shall be typically on modules 1 to 3.
ISE/LA shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be lab work, assignment, orals etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE/LA+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	B. Tech.
Class | Semester	First Year (AIML / CSE / IT) Semester II
Course Code	8ES155
Course Name	Python Programming
Desired Requisites:	C Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Interaction	01 Hrs/week	LA 1	LA 2	ESE	Total
Practical	02 Hrs/week	30	30	40	100
		Credits: 2			

Course Objectives

1	To understand problem-solving concepts and computational thinking using Python.
2	To learn Python programming fundamentals and utilize standard libraries effectively.
3	To develop creative solutions using Python libraries for numerical computing, data analysis, and visualization.
4	To impart knowledge on advanced concepts including pointers, structured data types, and persistent file operations.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	Apply Python programming concepts to solve computational problems.	III	Apply
CO2	Develop Python programs using functions, modules, and data structures.	III	Apply
CO3	Analyze and manipulate data using NumPy, Pandas, and SciPy libraries.	IV	Analyze
CO4	Create data visualizations and machine learning solutions using Python libraries.	V	Create

Module	**Module Contents**	**Hours**
I	**Introduction to Python Programming** Introduction to Python, Installation and Development Environment, Python Syntax and Program Structure, Python building blocks – Identifiers, Keywords, Variables, Data Types, Type Casting, Operators and Expressions, Input and Output Functions, Comments	02
II	**Control Flow** Conditional Statement (if, if…else, nested if) Nested Conditions, Match-Case Statement, While Loop, For Loop, Range Function, Nested Loops, Break, Continue, Pass, Else Clause with Loops	02
III	**Functions and Strings** Python Built – in functions, User defined functions: function definition, calling, argument and parameter passing, return statement, Recursive Functions, Lambda Functions Strings: String Operations, String Methods, String Formatting, Regular Expressions	02

IV	**Python Data Structures** Lists: Creation, Indexing, Slicing, Methods, Mutability, Aliasing, Cloning, Nested Lists, List Comprehensions, Tuples: Creation, Packing and Unpacking, Tuple Operations, Returning Multiple Values, Sets: Set Operations, Methods, Set Comprehension, Dictionaries: Dictionary Operations, Methods, Nested Dictionaries, Dictionary Comprehension	03
V	**File Handling and Exception Handling** File Operations, Reading and Writing Files, closing a file, Renaming and deleting files, Exception Handling: Built-in Exceptions, try-except-finally, Multiple Exceptions, raise Statement, Custom Exceptions	02
VI	**Introduction of Python Libraries** Python Numpy and Pandas, Scipy, Python Libraries, Scikit Learn, Python for Data Visualization- Matplotlib, Seaborn.	02

Assignments

List of Lab Assignments: (Minimum 10)

1. Problem solving using Python variables, operators, expressions, and input-output statements.
2. Problem solving using strings and string manipulation functions.
3. Problem solving using Python data structures: Lists, Tuples, Dictionaries, and Sets.
4. Problem solving using decision-making statements and looping constructs.
5. Problem solving using functions, recursion, lambda functions, and standard library modules.
6. Implementation of programs using Python packages and modules.
7. Problem statements on NumPy arrays and numerical operations.
8. Problem statements on Pandas for data manipulation and analysis.
9. Problem statements using SciPy for scientific and mathematical computing.
10. Data visualization using Matplotlib library.
11. Data visualization using Seaborn library.

Textbooks

1	Reema Thareja, Python Programming Using Problem Solving Approach, Oxford University Press, 1st Edition, 2017.
2	R. Nageswara Rao, Core Python Programming, Dreamtech Press, 3rd Edition, 2021.
3	Allen B. Downey, Think Python: How to Think Like a Computer Scientist, O'Reilly Media, 2nd Edition, 2015.

Reference Books

1	Maureen Sprankle, Problem Solving and Programming Concepts, Pearson Education, 9th Edition, 2011.
2	Fabrizio Romano, Learning Python, Packt Publishing, 2nd Edition, 2018.
3	Martin C. Brown, Python: The Complete Reference, McGraw-Hill Education, 4th Edition, 2018.
4	Jeeva Jose, P. Sojan Lal, Introduction to Computing & Problem Solving with Python, Khanna Publishers, 1st Edition, 2016.
5	Wes McKinney, Python for Data Analysis, O'Reilly Media, 3rd Edition, 2022.

Useful Links

1	https://www.python.org/
2	https://numpy.org/

3	https://pandas.pydata.org/
4	https://matplotlib.org/
5	https://seaborn.pydata.org/
6	https://scikit-learn.org/
7	https://www.w3schools.com/python/
8	https://www.geeksforgeeks.org/python-programming-language/

CO-PO Mapping

Artificial Intelligence and Machine Learning

	Programme Outcomes (PO)										PSO's	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2
CO1	3	2	1		1							3	
CO2	3	2	2		2	1						3	
CO3	2	3	2	2	3		2	2	1			2	2
CO4	2	2	3	2	3				2	1	1	3	3

Information Technology

	Programme Outcomes (PO)										PSO's	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2
CO1	3	2	1		1							3	
CO2	3	2	2		2	1						3	
CO3	2	3	2	2	3		2	2	1			2	2
CO4	2	2	3	2	3				2	1	1	3	3

Computer Science and Engineering

	Programme Outcomes (PO)										PSO's	
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO11	PSO 1	PSO 2
CO1	3	2	1		1							2	
CO2	3	2	2		2	1						2	1
CO3	2	3	2	2	3		2	2	1			3	2
CO4	2	2	3	2	3				2	1	1	3	3

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. (min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates the starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

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Course Information	
Programme	B. Tech. (Artificial Intelligence and Machine Learning)
Class, Semester	First Year | Semester II
Course Code	2AI102
Course Name	Fundamentals of AI
Desired Requisites:	Basic mathematical aptitude, logical reasoning ability, and fundamental computer literacy

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	ISE	MSE	ESE	Total
		20	30	50	100
		Credits: 3			

Course Objectives	
1	Understand the fundamental concepts, principles, and applications of Artificial Intelligence.
2	Explain intelligent agents, problem-solving methods, and search techniques used in AI.
3	Understand knowledge representation, reasoning, and basic machine learning concepts
4	Recognize emerging AI technologies and the ethical implications of AI systems.

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Descriptor**
CO1	Explain the fundamental concepts, evolution, applications, and intelligent agent models of Artificial Intelligence.	II	Understand
CO2	Apply basic search techniques to formulate and solve simple AI problems.	III	Apply
CO3	Illustrate knowledge representation, reasoning mechanisms, and fundamental machine learning concepts.	II	Understand
CO4	Discuss neural networks, emerging AI technologies, and ethical issues associated with AI applications.	II	Understand

Module	**Module Contents**	**Hours**
I	**Introduction to Artificial Intelligence** Definition and Scope of AI, History and Evolution of AI, Types of AI, AI vs Machine Learning vs Deep Learning, Intelligent Systems, Challenges and Future of AI	06

II	**Intelligent Agents** Concept of Intelligent Agents, Agent Architecture, Types of Agents, Problem Formulation, State Space Representation, Performance Measures	07
III	**Search Techniques** Introduction to Search, Uninformed Search Techniques, Informed Search Techniques, Hill Climbing, Local Search Methods, Constraint Satisfaction Problems	07
IV	**Knowledge Representation and Reasoning** Knowledge-Based Systems, Knowledge Representation Techniques, Propositional Logic, Predicate Logic, Inference Mechanisms, Forward Chaining, Backward Chaining	07
V	**Fundamentals of Machine Learning** Introduction to Machine Learning, Learning Paradigms, Classification and Regression, k-Nearest Neighbors (k-NN), Clustering Basics, Model Evaluation	06
VI	**Neural Networks, Deep Learning and AI Ethics** Biological Neuron and Artificial Neuron, Perceptron Model, Introduction to Artificial Neural Networks, Overview of Deep Learning, AI Ethics	06

Textbooks	
1	S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 4th ed. Hoboken, NJ, USA: Pearson, 2021.
2.	T. Taulli, Artificial Intelligence Basics: A Non-Technical Introduction, 2nd ed. Berkeley, CA, USA: Apress, 2020.
3.	T. M. Mitchell, Machine Learning. New York, NY, USA: McGraw-Hill, 1997.

References	
1	W. Ertel, Introduction to Artificial Intelligence, 3rd ed. Cham, Switzerland: Springer, 2020.
2	D. L. Poole and A. K. Mackworth, Artificial Intelligence: Foundations of Computational Agents, 3rd ed. Cambridge, U.K.: Cambridge University Press, 2023.
3.	I. Goodfellow, Y. Bengio, and A. Courville, *Deep Learning*. Cambridge, MA, USA: MIT Press, 2016.

Useful Links	
1	https://nptel.ac.in/courses/106105077
2	https://nptel.ac.in/courses/106105152

CO-PO Mapping

	Programme Outcomes (PO)											**PSO**	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO2**
CO1	3	2			1						2	2	3
CO2	3	3	2	1	2						3	3	3
CO3	3	2	1	1	2						3	3	3
CO4	2	1			1	2	1	3	1	2	3	3	3

The strength of mapping is to be written as 1,2,3; Where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO.
Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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Course Information

Programme	F.Y. B.Tech. (Artificial Intelligence & Machine Learning)
Class, Semester	First Year | Semester II
Course Code	2VS154
Course Name	Data Visualization Skills
Desired Requisites:	General Computer Proficiency

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
		30	30	40	100
		Credits: 1			

Course Objectives

1	To summarize concepts of data visualization techniques
2	To understand data sets and represent using various plotting methods
3	To understand equations and plotting it
4	To apply different interactive data visualization tools and design dashboard

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand the purpose and importance of data visualization	II	Understand
CO2	Explain the various basic visualization techniques	III	Apply
CO3	Perform processing of data and plotting equations	IV	Evaluate
CO4	Design simple dashboard	V	Create

List of Experiments / Lab Activities/Topics

List of Lab Activities:

Tools to be used: - MS Excel, Power BI / Tableau

1. Selection and handling data sets and its representation.
2. Computing statistical information of a data set.
3. Use of data analysis tool for data handling and collecting information.
4. Study and Implement different types of chart and plots.
5. Plot Linear and Nonlinear Equation.
6. Handle different conditional statement on dataset and plots.
7. Study and Implementation of Different plotting functions Study of different Tools for Data Visualization.
8. Introduction to AI tool and Installation.
9. Connecting and preparing the data for visualization using AI tool.
10. Data aggregation and statistical functions for visualization using AI tool Create the interactive Dashboard for the Dataset.

Textbooks	
1	1. Edward R. Tufte, “The Visual Display of Quantitative Information” Graphics Press, 2nd Edition, 2013
References	
1	Data Visualization in Excel: A Guide for Beginners, Intermediates, and Wonks (AK Peters Visualization Series)
Useful Links	
1	https://xula.libguides.com/c.php?g=943591&p=9408473
2	https://www.datavisualizationsociety.org/

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
CO’s	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO2**	**PO1**
CO1	2					1	2	2	1			3	2
CO2	1	2	3	2	3							1	3
CO3	2	3	2		3	1				1		2	
CO4		2	1	1	3					2	2		2

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates the starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.