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 course 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.	5

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.	5
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).	5
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.	5
V	**Correlation and Linear Regression** Correlation and Covariance, Karl Pearson correlation coefficient. Linear Regression; regression coefficients, Regression lines.	4
VI	**Curve Fitting** Introduction, principle of least squares, Fitting of Straight line (Linear), Second degree curve, Exponential curve.	4

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).

Syllabus prepared by: Mrs. R.S. Janagond, Ms. S.A. Jamadar, Mr. N.N. Sutar.

Syllabus checked by: HOD Dr. A.R. Surve
HOD Dr. U.B. Chavan
HOD Dr. V.N. Waghmare

Walchand College of Engineering, Sangli
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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/ISE**	**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		
A student shall be declared to have passed if the student secures a minimum of 40% marks in aggregate (LA + MSE + ESE) and a minimum of 40% marks in the End-Semester Examination (ESE) separately.		
LA	Continuous Learning Assessment based upon performance in the Laboratory sessions, Lab reports and Viva	30 Marks
MSE	Written / Online Test based upon approximately 50% of the theory course content	20 Marks
ESE	Written Examination based upon 100% of the theory course content giving 70% weightage on post midsem portion	50 Marks

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

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Course Information

Programme	B. Tech. CSE
Class, Semester	First Year B. Tech., Sem. I
Course Code	8ES113
Course Name	Basic Electrical and Electronics Engineering
Desired Requisites:	12th Physics

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

Course Objectives

1. To introduce the fundamental concepts of electrical circuits, magnetic circuits, electrical machines and transformers.
2. To develop problem-solving skills in basic electrical circuits and provide an understanding of electrical safety, wiring, protection and energy conservation practices.
3. To familiarize students with the fundamentals of digital electronics and the working principles and applications of basic electronic devices, sensors and circuits.
4. To provide hands-on exposure to electrical and electronic measurements, instruments, sensors and basic electrical and electronic circuits through laboratory experiments.

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 construction, working principles and applications of electrical machines and transformers, and apply fundamental principles to basic magnetic circuits.	II	Understanding
CO2	apply fundamental electrical circuit laws to solve basic electrical circuit problems and verify circuit behavior through laboratory experiments.	III	Applying
CO3	apply electrical safety, wiring and protection practices, and demonstrate appropriate use of protective devices and energy conservation practices.	III	Applying

CO4	explain the operation and applications of basic electronic devices, sensors, diodes, transistors and operational-amplifier based circuits.	II	Understanding
CO5	explain the fundamentals of digital electronics and implement basic combinational digital circuits using logic gates.	III	Applying
CO6	select and use appropriate electrical and electronic measuring instruments and sensors to measure physical parameters and interpret measurement results.	III	Applying

Module	**Module Contents**	**Hours**
I	Electrical Circuit Fundamentals: Electrical quantities and circuit elements (R, L, C), Ohm's law, Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL), series and parallel circuits, AC fundamentals, RMS value, real, reactive and apparent power, power factor and its significance in industrial electrical systems.	5
II	Electrical Machines: Magnetic circuits – magnetic flux, MMF and Faraday's law of electromagnetic induction; DC Motor – construction, working principle, applications and torque-speed characteristics; Three Phase Induction Motor – construction, working principle, types, applications and torque-speed characteristics; Single Phase Transformer – construction, working principle, types and applications.	5
III	Electrical Safety, Wiring and Protection: Electrical hazards and safety precautions, earthing and grounding, protective devices (fuse, MCB and RCCB), electrical wiring, electrical energy conservation.	4
IV	Fundamentals of Digital Electronics: Number systems and binary arithmetic, logic gates and truth tables, Boolean algebra and K-map simplification, combinational circuits (half adder, full adder), subtractor, comparator, introduction to sequential circuits (flip-flops), applications in industrial automation and control.	5
V	Electronic Devices and Sensors: Semiconductor basics, diodes and rectifiers, LED, photodiode, solar cell, pressure sensor, proximity and position sensors, LDR and temperature sensors, sensors used in CNC machines, automobiles and industrial automation.	5
VI	Engineering Measurement and Instrumentation: Measurement systems and standards, static and dynamic characteristics of instruments, sensors and transducers, temperature measurement, pressure measurement, flow measurement, speed measurement, data acquisition basics, industrial applications.	4

List of Experiments/ Lab Activities / Mini project activities….	
1)	Verification of KCL and KVL.
2)	Implementation of RLC series circuit.
3)	Study of electrical machines.
4)	Study of transformers.
5)	Study of electrical wiring and fuses.

6)	Identification of electronic devices and components.
7)	Verification of basic logic gates using ICs.
8)	Implementation of half adder and full adder circuits.
Textbooks	
1	D. C. Kulshreshtha (2012), "*Basic Electrical Engineering*", 1st revised edition, McGraw Hill
2	D. P. Kothari and I. J. Nagrath (2010), "*Basic Electrical Engineering*", Tata McGraw Hill
3	B. L. Theraja (2013), "*A Textbook of Electrical Technology*", S Chand Publication
4	R. P. Jain (2009), "*Modern Digital Electronics*", 4th edition, Tata McGraw Hill
5	Robert Boylestad and Louis Nashelsky (2015), "*Electronic Devices and Circuits*", 11th edition, Pearson
6	Ramakant Gaikwad (2015), "*Op-amp and Linear Integrated Circuits*", 4th edition, Pearson
References	
1	V. D. Toro (1989), "*Electrical Engineering Fundamentals*", Prentice Hall India
2	E. Hughes (2010), "*Electrical and Electronics Technology*", Pearson
3	V. N. Mittal and Arvind Mittal, "*Basic Electrical Engineering*", 2nd edition, Tata McGraw Hill
4	Morris Mano (2011), "*Digital Design*", 4th edition, Pearson
5	Donald A. Neamen (2011), "*Electronic Circuit Analysis and Design*", 3rd edition, Tata McGraw Hill
6	Robert F. Coughlin and Frederick F. Driscoll (2009), "*Operational Amplifiers and Linear Integrated Circuits*", 6th edition, PHI
Useful Links	
1	Basic Electrical Technology, IISc Bangalore, Prof. L. Umanand: https://nptel.ac.in/courses/108108076
2	Basic Electrical Technology, IIT Kharagpur, Prof. N. K. De, Prof. G. D. Roy, Prof. T. K. Bhattacharya: https://nptel.ac.in/courses/108105053
3	Fundamentals of Electrical Engineering, IIT Kharagpur, Prof. Debapriya Das: https://nptel.ac.in/courses/108105112
4	https://nptel.ac.in/courses/108101091
5	https://nptel.ac.in/courses/108105113

CO-PO Mapping (Theory)

	Programme Outcomes (PO)											PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**
CO1	3	2	–	2	1	–	–	–	–	–	1	–	–
CO2	3	3	–	3	2	–	–	–	1	1	1	–	–
CO3	2	2	2	2	3	3	3	3	1	–	1	–	–
CO4	3	2	–	2	2	–	–	–	–	–	1	–	–
CO5	3	3	2	2	2	–	–	–	1	1	1	–	–
CO6	3	2	–	3	3	–	–	–	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

LA	Continuous Learning Assessment based upon performance in the Laboratory sessions, Lab reports and Viva	30 Marks
MSE	Written / Online Test based upon approximately 50% of the theory course content	20 Marks
ESE	Written Examination based upon 100% of the theory course content giving 70% weightage on post midsem portion	50 Marks

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Course Information

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

Programme	B. Tech. (Computer Science & Engineering)
Class, Semester	First Year B. Tech., Sem I
Course Code	8CS101
Course Name	Computer and Networking Essentials
Desired Requisites:	-

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

Course Objectives

1	To perceive knowledge of the I/O Devices, Hardware, Software and networking.
2	To use software, hardware and networking
3	To understand common hardware troubleshooting techniques.

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	Perceive knowledge of the I/O Devices, Hardware and Software, Networking, and common troubleshooting techniques .	II	Understand
CO2	Use the software, hardware and networking devises	III	Apply
CO3	Analyse different hardware and software required before acquiring	IV	Analyse

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to Computer Hardware, I/O Devices and Computer OS and Mobile OS** Overview of computer hardware and its importance in CSE, Basic components of a computer system, Interaction between hardware and software for I/O operations, Role of hardware in the execution of programs, Fundamentals of Computer and Mobile Operating Systems	6
II	**Module 2: CPU Architecture & Memory Hierarchy** CPU components and their functions, Instruction Set Architecture (ISA), CPU organization and operation, Types of memory: RAM, ROM, cache, virtual memory, Memory management and addressing, Memory hierarchy in modern computer systems	7

III	**Module 3: Motherboard and Expansion Slots & Storage Devices** Anatomy of a motherboard, understanding expansion slots and connectors, Installing and configuring hardware components, Hard disk drives (HDDs) and Solid-State Drives (SSDs), Optical drives and other storage media, RAID configurations and data redundancy	7
IV	**Module 4: Graphics Processing Unit (GPU) and Display Devices** Role of GPUs in modern computers, Graphics cards and their components, Display technologies: CRT, LCD, LED, etc.	6
V	**Module 5: Basics of Networking** Introduction to LAN, WAN, MAN, WiFi. Types of Ethernet cables, Servers, Clients, Ports and Protocols	6
VI	**Module 6: Troubleshooting and Diagnostics, Introduction to Computer Security and Antivirus** Common hardware issues and their solutions, Diagnostic tools and techniques, Hands-on troubleshooting exercises, Basics of Computer Security, Virus and Antivirus	7

Text Books	
1	Modern Computer Hardware Course by Manahar Lotia, BPB Publication
2	Computer Networking: A Top-Down Approach, by James F. Kurose, Keith W. Ross

References	
1	Computer Maintenance Hacks: 15 Simple Practical Hacks to Optimize, Speed Up and Make Computer Faster by Life 'n' Hack
2	Computer systems: a programmer's perspective I Randal E. Bryant, Carnegie Mellon University, David R. O'Hallaron,. Carnegie Mellon. University.-Third edition.

Useful Links	

CO-PO Mapping

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

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	B.Tech. (Computer Science Engineering)
Class, Semester	First Year B. Tech., Sem I
Course Code	8VS159
Course Name	Computer and Networking Essentials Lab
Desired Requisites:	Basic Computer Literacy

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

Course Objectives	
1	To identify and describe the basic components of a computer system.
2	To troubleshoot common hardware issues and perform repairs or replacements
3	To Analyze different hardware and software before acquiring

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	To identify and describe the basic components of a computer and Mobile system (CPU, motherboard, RAM, storage devices etc.).	II	Understand
CO2	Troubleshoot common hardware issues and perform repairs or replacements effectively.	III	Apply
CO3	Analyze different hardware and software before acquiring	IV	Analyse

List of Experiments / Lab Activities

List of Experiments:

1. **To familiarize with Computer and Mobile System Components and Operating Systems.**
   Procedure:
   - Identify and label the major hardware components of a computer system and mobile device.
   - Discuss the function of each component and its role in system operation.
   - Ask students to identify and label of each component correctly.
   - Discuss the function of each component and its role in the computer system.
   - Explore the basic features of desktop and mobile operating systems

2. **To understand the interaction between hardware and software for I/O operations.**
   Procedure:
   - Introduce students to a simple I/O operation, such as reading input from the keyboard.
   - Discuss the hardware components involved in the process, including the keyboard controller and CPU.
   - Demonstrate how the software interacts with hardware to perform the I/O operation.
3. **To introduce students to the fundamentals of Operating systems.**
   Procedure:
   - Set up multiple computers with different operating systems (Computer-Windows, macOS, Linux. & Mobile- Android, ios).
   - Ask students to perform basic tasks on each system, such as file management and software installation.
   - Compare and contrast the features and interfaces of different operating systems.
4. **To understand the components and functions of a CPU.**
   Procedure:
   - Disassemble a CPU to show its internal components, such as ALU, control unit, and registers.
   - Explain the function of each component and how they work together to execute instructions.
   - Demonstrate a simple instruction execution process using a simulator.
5. **To explore the performance of different levels of memory hierarchy.**
   Procedure:
   - Use a benchmarking tool to measure the access time of RAM, cache, and virtual memory.
   - Compare the performance results of each memory level and discuss the trade-offs.
   - Analyze the impact of cache hits and misses on program execution time
6. **To familiarize students with the anatomy of a motherboard.**
   Procedure:
   - Show a motherboard diagram highlighting various components and connectors.
   - Ask students to identify each component and explain its purpose.
   - Demonstrate the installation of hardware components like RAM and expansion cards.
7. **To explore the components of a graphics card and their functions.**
   Procedure:
   - Disassemble a graphics card to show its GPU, VRAM, and other components.
   - Explain the role of each component in processing and rendering graphics.
   - Demonstrate basic GPU-accelerated tasks using graphics software.
8. **To compare different display technologies.**
   Procedure:
   - Set up a computer system with displays using different technologies (CRT, LCD, LED, etc.).

- Observe and compare the image quality, resolution, and and power consumption of each display type.
- Discuss the advantages and disadvantages of each display technology.

9. To set up a simple LAN and understand basic networking components.

Procedure:

- Provide networking equipment like switches and Ethernet cables.
- Ask students to connect multiple computers to form a LAN.
- Verify network connectivity and communication between connected devices.

10. To understand the role of ports and protocols in networking.

Procedure:

- Introduce students to different network protocols (TCP, UDP) and port numbers**.**
- Use network monitoring tools to analyze network traffic and identify the protocols used.
- Demonstrate the establishment of a connection between a client and server using specific protocols.

11. To teach students common hardware troubleshooting techniques.

Procedure:

- Intentionally create hardware issues like loose connections or faulty components in a computer.
- Ask students to diagnose and resolve these issues using appropriate troubleshooting tools.
- Discuss the troubleshooting process and best practices.

12. To understand the importance of computer security and antivirus.

Procedure:

- Set up a computer with various types of malware (simulated or isolated) on it.
- Install an antivirus program and demonstrate malware scanning and removal.
- Discuss the importance of keeping antivirus software up to date and practicing safe computing habits

13. Case study of Data Center.

Procedure:

- Selecting any data center for study.
- Study the components of data center.
- If possible, visit to the data center.

Text Books	
1	James, K.L. " The computer hardware installation, interfacing, troubleshooting and maintenance" PHI Learning, New Delhi, 2014, ISBN: 978-81-203-4798-4.
2	Gupta, Vikas "Comdex: Hardware and Networking Course Kit " Dreamtech Press, New Delhi, ISBN: 978-93-5119-265-7.
3	Criage Zacker and John Rourke "PC Hardware Complete reference Tata McGraw-Hill.

References	
1	Minasi, Mark "The Complete PC Upgrade And maintenance Guide " BPB Publication, New Delhi ISBN:978-81-265-0627-9 4.
2	Kadam, Sachin "Computer Architecture and Maintenance"Shroff Publication, Mumbai Vol.1 ISBN: 978-9350230244
Useful Links	
1	https://www.javatpoint.com/hardware
2	https://edu.gcfglobal.org/en/computerbasics/keeping-your-computer-clean/1/#.

CO-PO Mapping

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

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.

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AY 2026-27 onwards

Course Information

Programme	B. Tech. Engineering
Class, Semester	F.Y. B.Tech. Sem: I/II
Course Code	8IK151
Course Name	Indian Knowledge System
Desired Requisites:	Basic knowledge of Indian Civilization

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

Course Objectives

To introduce undergraduate students to the ancient Indian technologies that exemplify the ingenuity and achievements of India's glorious civilization.

To emphasize the nature-centric aspects of ancient Indian technologies and explore their relevance and adoption in the modern era.

To expose students to the scientific principles and technological advancements of ancient India and explore their potential applications in modern technological development.

Course Outcomes

Upon successful completion of this course, the student will be able to:

CO	**Description**	**Blooms Taxonomy**	
		Level	**Descriptor**
CO1	Enumerate the main characteristics of education system in Vedic and post Vedic period to enrich the intellectual imagination	I	Remember
CO2	Review the ancient discovery and research in Indian number system and ancient Indian mathematics	II	Understand
CO3	Review the contribution from Ancient Indian system to astronomy and metallurgy	III	Understand
CO4	Trace the significant developments in Indian engineering and technology in Irrigation, painting, surgical techniques and shipbuilding	IV	Apply

CO5	Cultivate a deep sense of identity and pride in enriched scientific Indian heritage	V	Evaluate

CO – PO mapping

	Programme Outcomes (PO)										
COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11
CO 1	1					1					2
CO 2	2	3									1
CO 3	1			1	2	3					
CO 4			3	2		2	1				

Module	Module Contents	Hours
I	**Introduction to Ancient Indian Science and Technology** What is Indian Knowledge System (IKS)? Why do we need it? Salient aspects of IKS. The Vedic Corpus: Introduction to Vedas, Sub-classification of Vedas, Messages in Vedas, Vedic Life: A Distinctive Features, Art and Crafts in ancient India	5
II	**Ancient Indian Mathematics** Number systems in India, Measurements for time, distance, and weight, Bhūta-Saṃkhyā system, Kaṭapayādi system, Piṅgala and the Binary system. Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions, Algebra, Geometry and Trigonometry	8
III	**Ancient Indian Astronomy, and Sustainable Technologies** Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months, Indian Astronomical Instruments Wootz Steel, Mining and ore extraction, Metals and Metalworking Technology, Iron and steel in India, Lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components	8
IV	**Ancient Indian Water Conservation, Irrigation, Ayurveda and Animal Husbandry** Irrigation systems and practices in South India, Dyes and painting technology, Surgical techniques, Shipbuilding. Temple architecture in India, Perspective of Arthaśāstra on town planning.	5
	Total Hrs	**26**

Course Assessment Plan (*for total 26 learning hours)*					
Assessment	**Formative Assessment type**	**Brief Description**	**Marks**	**Notional Learning hours**	**week**
ISE/LA1	Suggested Creative Activity (any one)	1. Article Reflection 2. Book Design (preferably flip-book) on a given topic 3. Any other suggested by teacher	**10**	**8**	**3**
	Suggested creative activity - 2 (any one)	1. Exploration Visit Report 2. Short Film Making 3. Any other suggested by teacher	**20**	**5**	**5**
MSE/ LA2	Creative Activity-3:	Quiz: 30 Marks	**30**	**8**	**1-8**
ESE	Creative Activity-3	1. App Making/ Game Design/Website Design 2. Physical Prototype 3. Design of Experiment 4. Any other suggested by teacher	**40**	**5**	**1-8**
		Total	**100**		**26 hrs**

Text Books	
1	B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R. N., "*Introduction to Indian Knowledge System: Concepts and Applications*" PHI, 2022
2	Kapil Kapoor, Avadhesh K. Singh, "*Indian Knowledge Systems, Volume 1*", Indian Institute of Advanced Study, 2005
3	R. P. Kulkarni, "*Glimpses of India Engineering and Technology: Ancient and Medieval Period*," Munshiram Manoharlal Publishers Pvt. Ltd., 2018

Useful Links	
1	https://iksindia.org/
2	https://egyankosh.ac.in/
3	https://www.ugc.ac.in/
4	https://ncert.nic.in/textbook.php

A-A-Powar

S.S.Rathod

Walchand College of Engineering, Sangli

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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 course 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.	5
II	**Numerical Solution of ODE** Numerical Solution by (i) Euler's method (ii) Modified Euler's method (iii) Runge- Kutta fourth order method.	5

III	**Linear Differential Equations of Higher order** Linear Differential equation with constant coefficient, Complementary function, Particular Integral, Cauchy-Euler Linear Differential equation.	5
IV	**Basic Numerical Methods** Numerical solution of equations: Bisection and Regula-Falsi, Newton–Raphson method.	4
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.	5
VI	**Numerical Integration** Newton cotes methods: Trapezoidal and Simpson's rules Error estimates for trapezoidal and Simpson's rule, Monte Carlo Integration.	4

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).

syllabus prepared by : Ms. S.A. Jamadar, Mr. N.N. Sutar

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HoD Dr. V.N. Waghmare

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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/ISE**	**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/113108051
2	https://nptel.ac.in/courses/104106122
3	https://nptel.ac.in/courses/113106093

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

A student shall be declared to have passed if the student secures a minimum of 40% marks in aggregate (LA + MSE + ESE) and a minimum of 40% marks in the End-Semester Examination (ESE) separately.

LA (Laboratory Assessment)	Continuous Learning Assessment based on laboratory performance, laboratory reports and viva voce	30 Marks
MSE (Mid-Semester Examination)	Written / Online Test covering approximately 50% of the theory course content	20 Marks
ESE (End-Semester Examination)	Written Examination covering 100% of the theory course content, with 70% weightage assigned to the on post mid-semester portion	50 Marks

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Course Information

Programme	B.Tech. CSE/IT/AIML
Class, Semester	First Year B. Tech. SEM-I/II
Course Code	8ES115
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**	**ISE/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.	4
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.	5
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.	4
IV	**Perspective Projection and Visualization Techniques** Introduction to perspective projection. One-point and two-point perspective projection of	5

	simple geometrical objects. Principles of visual perception and graphical 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.	5
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.	4

List of Experiments / Lab Activities

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 CSE Department

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

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

CO-PO Mapping For IT Department

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

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

CO-PO Mapping For AIML Department

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

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

Assessment

LA	Continuous Learning Assessment based upon performance in the Laboratory sessions, Lab reports and Viva	30 Marks
MSE	Written / Online Test based upon approximately 50% of the theory course content	20 Marks
ESE	Written Examination based upon 100% of the theory course content giving 70% weightage on post midsem portion	50 Marks

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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/

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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

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: High

Each CO of the course must map to at least one PO.

Syllabus Prepared By	Mr. M H Kalawate
Syllabus Checked By	

HOD -CSE — A.R.Surve

HOD-IT —

HOD. AIML — Dhmane

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Course Information

Programme	B. Tech. (CSE/IT/AIML)
Class | Semester	First Year | 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	PO1 1	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	PO1 1	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	PO1 1	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. (Computer Science and Engineering)
Class, Semester	First Year B. Tech., Sem B
Course Code	8CS102
Course Name	Basics of Web Technology
Desired Requisites:	Basic Programming Knowledge

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

Course Objectives	
1	To introduce students to the evolution of the World Wide Web, web browsers, and server technologies.
2	To enable students to design and develop structured web pages using HTML5, CSS3, and responsive design techniques.
3	To enable students to implement dynamic and interactive web applications using JavaScript and DOM manipulation.
4	To enable students to develop a responsive web application using front-end and back-end technologies with database integration.
5	To make students understand security issues involved in web applications, implement user authentication and authorization, and use CMS platforms.

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	Distinguish between static and responsive layouts, HTML and HTML5, and explain web hosting, CMS, databases, web security, authentication and authorization.	II	Understand
CO2	Implement web forms and web pages using front-end and back-end technologies with suitable UI for a target device, integrating databases and user authentication.	III	Apply
CO3	Analyse the effect of changing CSS styles and dynamic styling using JavaScript, and evaluate web application security and database-driven dynamic web solutions.	IV	Analyze

Module	Module Contents	Hours
I	**Module 1: Introduction to World Wide Web** Overview of the Internet and the World Wide Web, Evolution of web technologies and their impact on society, Understanding web browsers and web servers, Introduction to Web Developer Tools	4
II	**Module 2: HTML Basics and HTML5** Introduction to HyperText Markup Language (HTML), Creating a simple HTML page with headings, paragraphs, and lists, Working with hyperlinks and anchor tags, Advances in HTML5	4
III	**Module 3: CSS Basics** Introduction to Cascading Style Sheets (CSS), Styling HTML elements: text, colors, backgrounds, and borders, creating layouts using CSS positioning and floats	5
IV	**Module 4: Introduction to JavaScript and Document Object Model (DOM)** Basics of JavaScript programming language, Variables, data types, and operators, JavaScript functions and control structures, Understanding the DOM and its significance, Manipulating HTML elements using JavaScript, Handling events and user interactions	5
IV	**Module 4: Introduction to JavaScript and Document Object Model (DOM)** Basics of JavaScript programming language, Variables, data types, and operators, JavaScript functions and control structures, Understanding the DOM and its significance, Manipulating HTML elements using JavaScript, Handling events and user interactions	5
V	**Module 5: Responsive Web Design and Introduction to Backend Technologies** Design principles for mobile-friendly websites, Using media queries for responsive layouts, Working with Flexbox and Grid for flexible designs **Backend Technologies:** Overview of server-side scripting languages (e.g., PHP or Node.js), Introduction to databases and data storage, Building a simple server-side application	4
VI	**Module 6: Web Forms and Data Validation, Web Hosting and Web Security** **Forms and Validation:** Creating HTML forms for user input, Form handling using JavaScript and server-side scripting **Web Hosting:** Understanding web hosting and domain registration, Configuring and deploying a basic website on a hosting server, Introduction to Content Management Systems (CMS) **Web Security:** Common web security threats and vulnerabilities, Best practices for securing web applications, Implementing user authentication and authorization	4

List of Experiments / Lab Activities/Topics

List of Experiments:

1. Get acquainted with web browsers and web development tools.
   a. Uninstall and install Google Chrome and Firefox
   b. Start localhost server
   c. Install Visual Studio Code
2. Create a basic HTML page with headings, div, paragraphs, and lists.
   a. Create website for registering students to 'ExcelTech College of Engineering' having 3 pages home.html, signup.html, login.html.
   b. Use appropriates tasks for following content on home.html
      Name of the college, address of the college, information and image of the college
   c. Create separate sections for: list of UG academic programs, list of PG academic programs, list of faculty members and contact information. Give appropriate title for each section.

3. Understand the concept of hyperlinks and anchor tags.
   a. Provide hyperlinks for Sign up and Login on home.html. On click of Sign up, user should get navigated to signup.html page. On click on Login page, user should get navigated to login.html. These 2 pages can be blank.
   b. Provide a search link at the top that navigates to www.google.com.
   c. Provide navigation links on the top of the page on home.html for the following: UG program, PG program, Faculty. On clicking on these links user should get navigated to respective section on the same page.
4. Apply styles to HTML elements using CSS
   a. Add CSS rules to change the text colour, font, and size of all headers on home.html.
   b. Set background colour for the page and for paragraph tag.
   c. Apply borders and margins to elements to create visual effects for paragraph and header tags.
5. Understand how to create layouts using CSS positioning and floats.
   a. Create a simple two-column layout using CSS positioning for home.html.
   b. Add various sections on home.html to div tags. Create float-right, float-left CSS class and apply to div tags.
   c. Convert links for UG programs, PG programs and Faculty into visually appealing boxes using div tag and appropriate styling.
6. Familiarize with the basics of JavaScript programming.
   a. Perform arithmetic operations (add, subtract, divide and multiply) by creating functions and using JavaScript operators.
   b. Write a function that accepts 2 strings and returns concatenates string.
   c. Write a function to check if a number is odd or even.
   d. Write a function that accepts a number n and outputs all numbers from 0 to n in increasing order.
7. Understand the Document Object Model (DOM) and its significance.
   a. Create login.html which accepts Username and Password. Provide Submit button.
   b. On click of button, check if the username is ‘admin’ and the password is ‘PwD123’. If entered details are correct, navigate to home.html and provide text message ‘Login successful!’ on the home.html in green. If details are incorrect, navigate to home.html and provide text message ‘Unsuccessful login.’ on the home.html in red.
8. Create HTML forms for user input and handle form submission using JavaScript.
   a. Design signup.html to accept following information from user: First name, Last name, Age, Contact number, Address (multi-line input should be accepted), Email ID, Username, Password and Confirm Password. Provide Submit button.
   b. Modify home.html, signup.html and login.html to give common header of name of college and suitable colour scheme. Align all elements, if required, suitably.
   c. Perform following validation of fields on signup.html. Give pop up error message.
      i. Names should be alphabets only
      ii. Age should be numeric
      iii. Contact number should contain only digits and must be exactly 10 digits long.
      iv. Email ID should contain @
      v. Password and Confirm Password should be same.
9. Apply design principles for mobile-friendly websites using media queries.
   a. Apply media queries to home.html, signup.html and login.html.
   b. Test responsive UI on browsers by web developer tools in the browser.
   c. Observe how div tags are floating and change CSS if required.
   d. Use off the shelf responsive UI frameworks like Bootstrap and create a home-responsive.html using grid layout.
10. Understand server-side scripting languages, databases, and data storage.
    a. Install and set up a server-side scripting environment (PHP or Node.js).
    b. Connect to a database (e.g., MySQL) and perform basic CRUD operations.
    c. Display data from the database on a web page.
    (Instructor to provide necessary table creation script and data. Students are only expected to retrieve the data from the database and display it on a web page.)

11. Understand web hosting and domain registration concepts.
   a. Explore various web servers.
   b. Explore how to enable localhost on Windows system.
   c. Host home.html on local system
   d. Explore various domain providers and their costings

12. Implementing User Authentication and Authorization
   a. Provide user authorization and authentication such that
   b. All users should be able to access home.html, signup.html and login.html.
   c. Only the following users should be navigated to home.html with an appropriate success message.

Username	Password
User1	PwD125
User2	PwD124
admin	PwD123

   d. Validate all pages properly and check for security issues, if any.

13. Get familiar with Content Management Systems.
   a. Explore popular CMS platforms (e.g., WordPress, Joomla).
   b. Install and set up a CMS in a local development environment.
   c. Create and manage content using the CMS's interface.

Textbooks

1	Web Technology: Theory and Practice by M. Srinivasan, Released June 2012, Publisher(s): Pearson India, ISBN: 9788131774199

References

1	Web Application Security by Andrew Hoffman, Released March 2020, Publisher(s): O'Reilly Media, Inc. ISBN: 9781492053118
2	Web Technologies by Achyut Godbole and Atul Kahate, Publication: Tata McGraw-Hill Education Pvt. Ltd., ISBN13: 9781259062681

Useful Links

2	https://www.w3schools.com/

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3								3	2		1	
CO2	3	1	2		3				3	2		1	
CO3	1	1								2		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, and preferably to only one PO.

Assessment

LA	Continuous Learning Assessment based upon performance in the Laboratory sessions, Lab reports and Viva	30 Marks
MSE	Written / Online Test based upon approximately 50% of the theory course content	20 Marks
ESE	Written Examination based upon 100% of the theory course content giving 70% weightage on post midsem portion	50 Marks

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	First Year B.Tech, Sem II
Course Code	8VS160
Course Name	Digital Marketing with AI
Desired Requisites:	Basic Computer Knowledge

Teaching Scheme		**Examination Scheme (Marks)**			
Interaction	1 Hrs/week	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
		Credits: 01			

Course Objectives

1	Understand the concepts, tools, and applications of digital marketing in modern business environments.
2	Develop knowledge of Search Engine Optimization (SEO), Search Engine Marketing (SEM), and social media marketing strategies.
3	Analyse customer behaviour and digital marketing analytics for data-driven decision-making.
4	Design and manage digital advertising campaigns using contemporary platforms and tools.
5	Apply ethical, legal, and professional practices in digital marketing and online branding.

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 concepts, tools, and channels of digital marketing.	II	Understand
CO2	apply SEO, SEM, and social media marketing techniques using appropriate digital tools.	III	Apply
CO3	compare digital content strategies and marketing campaign performance to determine their effectiveness in online audience engagement	IV	Analyse
CO4	asses web analytics, campaign performance metrics, and emerging digital marketing trends to assess the effectiveness of digital marketing strategies.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to Digital Marketing:** Evolution of Marketing and Digital Transformation, Traditional Marketing vs Digital Marketing, Digital Marketing Ecosystem, Digital Consumer Behaviour, Digital Marketing Channels	2
II	**Website and Digital Presence:** Domain and Hosting Basics, Digital Marketing Planning Framework, Role of AI and Automation in Digital Marketing	2
III	**Search Engine Marketing (SEM) and Online Advertising:** Introduction to Search Engines, Working of Search Engines and Crawlers, Keyword Research and Analysis, On-Page SEO, Off-Page SEO and Link Building, Technical SEO, Local SEO, SEO Tools and Metrics.	3
IV	**Search Engine Marketing (SEM) and Online Advertising:** Introduction to SEM and PPC, Google Ads Fundamentals, Campaign Planning and Ad Groups, Keyword Match Types, Ad Copywriting, Display and Video Advertising, Remarketing and Retargeting, Budgeting and Bidding Strategies, Performance Metrics (CTR, CPC, Conversion Rate)	2

V	**Social Media, Content and Email Marketing:** Social Media Platforms and Business Applications, Social Media Strategy, Content Calendar Planning, Influencer Marketing, Community Engagement, Content Marketing, Blogging, Video Marketing, Copywriting, Storytelling, Email Marketing, Marketing Automation, A/B Testing	2
VI	**Analytics, Ethics and Emerging Trends:** Web Analytics Fundamentals, Google Analytics Overview, Traffic Sources and User Behaviour Analysis, Conversion Tracking, ROI Measurement, Cyber Security and Privacy Issues, Legal and Ethical Issues, AI, Chatbots, Voice Search, Marketing Automation, Future Trends	2

List of Activities:

1. Create a personal website using WordPress.
2. Register a blog and publish an SEO-friendly article.
3. Perform keyword research using Google Keyword Planner/Ubersuggest.
4. Optimize a webpage using On-Page SEO techniques.
5. Analyze a website using SEO tools (Google Search Console, SEMrush/Ahrefs demo).
6. Design a Google Ads campaign and identify target keywords.
7. Create a one-month social media content calendar.
8. Design promotional social media creatives using Canva.
9. Create and analyze an email marketing campaign using Mailchimp.
10. Mini Project: Develop a digital marketing strategy for a startup/business and present analytics-based recommendations.

Textbooks

1	"Digital Marketing" by Dave Chaffey and Fiona Ellis-Chadwick, Pearson.
2	"Digital Marketing Strategy" by Simon Kingsnorth, Kogan Page.
3	"Social Media Marketing" by Tracy L. Tuten and Michael R. Solomon, Sage Publications.
4	"Marketing 5.0", by Philip Kotler, Wiley.

References

1	"The Art of Digital Marketing" by Ian Dodson.
2	"SEO 2025" by Adam Clarke.

Useful Links

1	https://learndigital.withgoogle.com/digitalgarage
3	https://analytics.google.com/analytics/academy

CO-PO Mapping

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

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.