Walchand College of Engineering

(Government Aided Autonomous Institute)

Curriculum Structure and Credit System

First Year B.Tech. (Information Technology)

Applicable from A.Y. 2026–27 and Onwards

Semester I

Sr.	Course Particulars			Course Delivery					Credits	Assessments			
	Category	Code	Name	L	T	I	P	Hrs		ISE/LA1	MSE/LA2	ESE	Ext.
1	BSC	8BS117	Linear Algebra and Calculus	2	1			3	**3**	20	30	50	--
2	BSC	8BS120	Molecular Foundation for Computing	2			2	4	**3**	30	20	50	--
3	ESC	8ES151	Engineering Exploration	2			4	6	**4**	30	30	40	--
4	ESC	8ES115	Engineering Graphics and CAD	2			2	4	**3**	30	20	50	--
5	PCC	8IT101	Basics of Computing System	3				3	**3**	20	30	50	--
6	VSEC	8VS161	Computer Hardware proficiency Skills				2	2	**1**	30	30	40	--
7	CCA	Refer list	CCA 1				2	2	**1**	30	30	40	--
8	AEC	8AE101	Professional Communication		1	1		2	**2**	30	30	40	--
			Totals	**11**	**2**	**1**	**12**	**26**	**20**				

DAC/Secretary, BoS

Head, Information Technology.Dept./
Chairman, BoS

Dean Academics

Walchand College of Engineering

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Semester I

Sr.	Course Particulars			Course Delivery					Credits	Assessments			
	Category	Code	Name	L	T	I	P	Hrs		ISE/LA1	MSE/LA2	ESE	Ext.
1	BSC	8BS117	Linear Algebra and Calculus	2	1			3	**3**	20	30	50	--
2	BSC	8BS120	Molecular Foundation for Chemistry	2			2	4	**3**	30	20	50	--
3	ESC	8ES151	Engineering Exploration	2			4	6	**4**	30	30	40	--
4	ESC	8ES115	Engineering Graphics and CAD	2			2	4	**3**	30	20	50	--
5	PCC	8IT101	Basics of Computing System	3				3	**3**	20	30	50	--
6	VSEC	8VS161	Computer Hardware proficiency Skills				2	2	**1**	30	30	40	--
7	CCA	Refer list	CCA 1				2	2	**1**	30	30	40	--
8	AEC	8AE101	Professional Communication		1	1		2	**2**	30	30	40	--
			Totals	**11**	**2**	**1**	**12**	**26**	**20**				

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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

7Walchand College of Engineering, Sangli
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AY 2026-27

Course Information

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

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

Desired Knowledge

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

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

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

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

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

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

CO-PO Mapping (Theory)

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

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

Assessment (Theory)

The assessment is based on MSE and ESE.
MSE shall be typically on modules 1 to 3.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Assessment (Lab)

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

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

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

Syllabus Prepared By	Dr. N. R. Prasad, Dr. R. P. Gaikwad, Prof S. D Pujari & M. Rathi, Smt A. B Rathi
Syllabus Checked By	HoD. Dr. A. R. Suryawanshi, Dr. U. B. Charan, Dr. V. N. Waghmare

Walchand College of Engineering, Sangli

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Course Information

Programme	B. Tech. Information Technology
Class, Semester	First Year Semester I
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	B. Tech. Information Technology
Class, Semester	First Year Semester I
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 simple geometrical objects. Principles of visual perception and graphical visualization techniques used in computer graphics and gaming applications.	5

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 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

Assessment

The assessment is based on MSE, ISE/LA and ESE.

MSE shall be typically on modules 1 to 3.

ISE/LA shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be lab work, assignment, orals etc. and is expected to map at least one higher order PO.

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

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-2027

Course Information

Programme	B. Tech. Information Technology
Class, Semester	First Year Semester I
Course Code	8IT101
Course Name	Basics of Computing System
Desired Requisites:	Digital Electronics

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

Course Objectives

1	Explain the basic organization and architecture of a computer system.
2	Analyze instruction execution, addressing modes, and CPU operations.
3	Compare different memory hierarchies and input/output techniques.
4	Evaluate processor performance and identify architectural features of modern computers.

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	Discuss the design issues in computer organization and architecture for concurrent execution of instruction set	II	Understanding
CO2	Apply memory management techniques for efficient computation	III	Applying
CO3	Estimate the performance metrics for computer architecture with pipelining	IV	Analysing
CO4	Evaluate the operation and performance of modern computer systems.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Computer Architecture and Organization** Computer Organization vs Computer Architecture, Evolution of Computing Systems, Functional Units of a Computer, Von Neumann Architecture, Harvard Architecture.	6
II	**Data Representation and Arithmetic Operations** Number Systems (Binary, Octal, Decimal, Hexadecimal), Signed Number Representation, 1's and 2's Complement, Binary Arithmetic Operations, Fixed Point Representation, Floating Point Representation (IEEE 754 Basics), Arithmetic Logic Unit (ALU)	7
III	**CPU Organization and Instruction Set Architecture** Encoding of machine instructions. CPU registers, Instruction formats, Addressing modes division Execution of a complete instruction, sequencing of control signals, micro programmed control, microinstruction format Instruction cycle Design of signed multiplication, Booth's algorithm, bit-pair recording algorithm,	7
IV	**Memory Organization** Computer memory organization, RAM, ReadOnly memories, cache memories, mapping functions, replacement algorithms, performance consideration: Multimodal memories & interleaving, hit rate & miss penalty, multilevel cache organization, virtual memories, address translation, memory management requirement	7

V	**Input-Output Organization** I/O Interface Concepts, Programmed I/O, Interrupt Driven I/O, Direct Memory Access (DMA), Interrupt Handling Mechanism, Bus Structure and Bus Arbitration	6
VI	**Pipelining** Basic concepts in pipelining, data hazards, instruction hazards, control hazards, influence of pipelining on instruction set, data-path & control considerations,	6
	performance considerations, and Flyn's classification of computer architectures.	
Textbooks		
1	J. Hayes , "Computer Architecture and Organization", McGraw Hill, 3rd Edition, 2017	
2	C. Hamacher et. al, "Computer Organization", 5th Edition, 2010`	
3	M. Morris Mano & Michael D. Ciletti,"Digital Design", Pearson Prentice Hall Publication, 4th Edition, 2008	
References		
1	D. Patterson, Morgan Kaufmann "Computer Architecture", 6th Edition, 2017	
2	Floyd & Jain, "Digital fundamentals", Pearson education, Eighth Edition, 2007.	
Useful Links		
1	https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials	
2	Computer Architecture and Organization (IIT Kharagpur) **Prof. Indranil Sengupta & Prof. Kamalika Datta**	
3	Computer Organization and Architecture (IIT Madras, Prof. V. Kamakoti)	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2											
CO2		1	3		2								1	
CO3	2	2		3									2	3
CO4	3		3		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)

Walchand College of Engineering, Sangli

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AY 2026-27

Course Information	
Programme	B. Tech. Information Technology
Class, Semester	First Year Semester I
Course Code	8VS161
Course Name	Computer Hardware proficiency Skills
Desired Requisites:	

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

Course Objectives	
1	To develop practical knowledge of computer hardware, storage management for effective system installation, configuration, security and maintenance.
2	To acquire skills in network setup, wireless communication, user administration.
3	To design, troubleshoot, and manage IT infrastructures by applying hardware, software, networking, and preventive maintenance 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	Understanding computer hardware components, peripheral devices, Storage devices, networking equipment along with maintenance.	II	Understanding
CO2	Install, configure, and integrate computer hardware, software, Peripheral devices and networking components to establish a functional computing environment.	III	Applying
CO3	Examine computer hardware and network-related issues to identify Faults and determine their underlying causes.	IV	Analyzing
CO4	Applying prevention techniques tools, safety standards, and Technical documentation practices.	V	Evaluating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Study and identification of Hardware Components & Maintenance
2. Configure BIOS/UEFI Settings, CMOS Parameters, and analyse the System Boot Process
3. Install and configure Operating System and Dual Boot Operating System Setup
4. Perform partitioning of Hard-Disk and Format Hard-Disk Drive with various file systems.
5. Installation of basic software's.
6. Design User & Group Management, Windows Administrative Tools.
7. Study of Network Types, Devices, Tools, perform Network Configuration (VLAN, Switch, Router)
8. Configuration of Wi-Fi, access point setup, hotspot, basic security (WPA2/WPA3).
9. Study of Basics Physical and Digital Security
10. Study of System Troubleshooting: Hardware troubleshooting (RAM, HDD, display issues), Software troubleshooting (OS errors, driver issues), Network troubleshooting (connectivity issues)
11. Install, configure, and manage antivirus software, perform scheduled scans, generate security reports, and implement preventive security measures to protect systems and shared resources.
12. CASE STUDY 1 : Design and implement a fully functional small IT infrastructure consisting of multiple computers with properly installed operating systems, configured hardware Shared network connectivity, and user management system. System support secure data sharing, internet access, and centralized control of user accounts.
13. CASE STUDY 2: Design a system should identify hardware/software faults, resolve network issues, and implement preventive maintenance techniques.

Textbooks	
1	E Balagurusamy "FUNDAMENTALS OF COMPUTERS "Tata McGraw-Hill 1*
2	Computer Networks by Andrew S. Tanenbaum & David J. Wetherall, Pearson Education

References	
1	Pradeep K. Sinha and Priti Sinha, *Computer Fundamentals*, BPB Publications, New Delhi.

Useful Links	
1	https://nptel.ac.in/courses/106105214
2	https://nptel.ac.in/courses/106105183

CO-PO Mapping

	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	2			2							1	3
CO2	3		3		3				1	1			3
CO3		3	1	2	2					1		1	
CO4	2		2		3	3	1	2	1	3	1	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, and preferably to only one PO.

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

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AY 2026-2027

Course Information

Programme	B. Tech. Information Technology
Class, Semester	First Year Semester I
Course Code	8AE101
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 | 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	

Walchand College of Engineering

(Government Aided Autonomous Institute)

Curriculum Structure and Credit System

First Year B.Tech. (Information Technology)

Applicable from A.Y. 2026–27 and Onwards

Semester II

Sr.	Course Particulars			Course Delivery					Credits	Assessments			
	Category	Code	Name	L	T	I	P	Hrs		ISE/LA1	MSE/LA2	ESE	Ext.
1	BSC	8BS119	Numerical Methods for Computation	2	1			3	**3**	20	30	50	--
2	BSC	8BS118	Quantum Foundation for Computing	2			2	4	**3**	30	20	50	--
3	ESC	8ES118	Logic circuit design	2			2	4	**3**	30	20	50	--
4	IKS	8IK151	Indian Knowledge System	1		1		2	**2**	30	30	40	--
5	ESC	8ES114	Problem Solving and Programming			2	2	4	**3**	30	20	50	--
6	ESC	8ES155	Python Programming	1			2	3	**2**	30	30	40	--
7	PCC	8IT102	Web Technology	2			2	4	**3**	20	30	50	--
8	VSEC	8VS162	Data Visualization skills and AI tools				2	2	**1**	30	30	40	--
9	CCA	Refer list	CCA 2	1				1	**1**	30	30	40	--
			Totals	**13**	**1**	**1**	**12**	**27**	**21**				

DAC/Secretary, BoS

Head, Information Technology.Dept./
Chairman, BoS

Dean Academics

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

Programme	B.Tech.
Class, Semester	First Year (CSE/IT/AIML), Semester II
Course Code	8BS119
Course Name	Numerical methods for Computation
Desired Requisites:	Mathematics 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

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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AY 2026-27

Course Information

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

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

Course Objectives

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

Course Outcomes (CO) with Bloom's Taxonomy Level

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

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

Module	**Module Contents**	**Hours**
I	**Modern Physics:** Introduction, black body radiation, Planck's quantum theory, phase velocity, group velocity and particle velocity, de-Broglie's hypothesis, Photo electric effect, Compton effect.	5
II	**Quantum Mechanics:** Heisenberg's uncertainty principle, wave function and physical significance, Schrödinger's wave equation, Particle in 1D Box, Eigen value and Eigen function.	5
III	**Fibre Optics and LASER:** Introduction, Interference and Diffraction of Light, Principle of Optical Fibre, Acceptance Angle, Numerical Aperture, Types of Optical Fibres, LASER Fundamentals, Applications of LASER.	4
IV	**Semiconductor Physics:** Introduction, Classification of Solids, Energy Bands in Solids, Density of States, Fermi-Dirac Statistics, Fermi Level, Effect of Temperature on Fermi Level, Electrical Conductivity of Metals and Semiconductors, Hall Effect.	5

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

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

Textbooks	
1	M. N. Avadhanulu and P. G. Kshirsagar, "A Text book of Engineering Physics", S.Chand Pub.
2	Bhattacharya & Nag, Engineering Physics
3	Harnam Singh, *Advanced Practical Physics for Students*, S. Chand & Company Ltd., Revised Edition, 2011, Volumes I & II.
References	
1	Beiser, Arthur, Concepts of Modern Physics, McGraw-Hill Education, 7th Edition, 2015.
2	Ghatak, Ajoy, Optics, McGraw-Hill Education, 6th Edition, 2017.
3	Kulkarni, S. K., *Nanotechnology: Principles and Practices*, 3rd Edition, Springer, 2015.
4	Streetman, Ben G. and Banerjee, Sanjay Kumar, Solid State Electronic Devices, Pearson Education, 7th Edition, 2015.
5	Thyagarajan, K. and Ghatak, A. K., Lasers: Fundamentals and Applications, Springer, 2nd Edition, 2010.

Useful Links	
1	https://onlinecourses.nptel.ac.in/e-learning
2	https://swayam.gov.in/nc_details/NPTEL
3	https://ocw.mit.edu/search/

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

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

Assessment (Theory)

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

Assessment (Lab)

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

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

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

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

HOD CSE HOD IT

HOD AIML

Walchand College of Engineering, Sangli

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AY 2026-27

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	First Year, Sem II
Course Code	8ES118
Course Name	Logic Circuit Design
Desired Requisites:	

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

Course Objectives

1	Understand the fundamentals of digital systems and Boolean algebra.
2	Analyze and simplify logic expressions using minimization techniques.
3	Design combinational and sequential logic circuits.
4	Understand number systems and arithmetic operations used in digital computers.

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	Apply Boolean algebra and logic simplification techniques.	III	Apply
CO2	Design Combinational logic circuits.	VI	Create
CO3	Analyze sequential logic circuits and memory elements.	IV	Analyze
CO4	Understand fixed-point and floating-point arithmetic operations.	II	Understand

Module	**Module Contents**	**Hours**
I	**Fundamentals of Digital Systems and Number Systems:** Analog and Digital systems, Basic digital logic concepts, Number systems: Decimal, Binary, Octal, Hexadecimal, Number system conversions, Binary arithmetic: addition, subtraction	4
II	**Boolean Algebra and Logic Gates:** Basic postulates and theorems of Boolean algebra, DeMorgan's theorems, Logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Universal gates and implementation of Boolean functions, SOP and POS forms.	5
III	**Logic Minimization Techniques:** Minterms and Maxterms, Karnaugh Maps (K-Maps), Simplification of Boolean expressions using K-Maps, Don't care conditions.	4
IV	**Combinational Logic Circuits:** Half adder and Full adder, Half subtractor and Full subtractor, Multiplexers and Demultiplexers, Encoders and Decoders.	5

V	**Sequential Logic Circuits:** Introduction to sequential circuits, Latches and Flip-Flops: SR, JK, D, T, Registers and Shift Registers, Counters	5
VI	**Computer Arithmetic and Floating-Point Representation:** Fixed-point arithmetic, Overflow and underflow, Floating-point number representation, Arithmetic operations on floating-point numbers	3

List of Experiments / Lab Activities/Topics

List of Lab Activities (Minimum 10) :

1. Study and verification of basic logic gates using truth tables
2. Implementation of universal gates (NAND and NOR) for realization of basic gates
3. Verification of Boolean algebra laws and DeMorgan's theorems
4. Number system conversion and binary arithmetic operations
5. Design and simplification of Boolean expressions using Karnaugh Maps
6. Design and implementation of Half Adder and Full Adder circuits
7. Design and implementation of Half Subtractor and Full Subtractor circuits
8. Design and implementation of Multiplexer and Demultiplexer circuits
9. Design and implementation of Encoder and Decoder circuits
10. Design and verification of Magnitude Comparator circuit
11. Study and implementation of SR, JK, D and T Flip-Flops
12. Design and implementation of Shift Registers
13. Design and implementation of Asynchronous Counters
14. Design and implementation of Synchronous Counters

Textbooks

1	Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Pvt. Ltd., 2016.
2	R. P. Jain, "Modern Digital Electronics", 5th Edition, McGraw Hill Education, 2018.

References

1	Donald P. Leach, Albert Paul Malvino & Goutam Saha, "Digital Principles and Applications", 8th Edition, McGraw Hill Education, 2015.
2	M. Morris Mano & Michael D. Ciletti, "Digital Design", 6th Edition, Pearson Education, 2018.

Useful Links

1	https://nptel.ac.in/courses/117105080
2	https://de-iitr.vlabs.ac.in/List%20of%20experiments.html

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1	-	3	-	-	-	-	-	-	-	2	1	-
CO2	2	2	2	2	3	-	-	-	2	-	-	1	2	-
CO3	2	2	2	-	3	-	-	-	2	-	-	1	2	-
CO4	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

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

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AY 2026-27 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

Course Information

Programme	B.Tech. (Information Technology)
Class | Semester	First Year Semester II
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

	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	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

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. (Information Technology)
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	
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

	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

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. (Information Technology)
Class, Semester	First Year, Semester -II
Course Code	8IT102
Course Name	Web Technology
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lectures	2 Hrs/week	**LA1**	**LA2**	**Lab ESE**	**Total**
Laboratory	2 Hrs/week	30	30	40	100
		Credits: 3			

Course Objectives

1	To make students understand technologies involved in a web application.
2	To enable students to develop simple web form using basic web technologies and host it
3	To enable students to develop a responsive web application.
4	To make students understand security issues involved in web applications and how to handle them.

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 Understand the architecture, components, and working of the Internet, World Wide Web, web browsers, web servers, and web development tools.	II	Understanding
CO2	Develop structured and semantic web pages using HTML5 and style web content using CSS3 techniques including layouts and responsive design principles.	III	Applying
CO3	Inspect interactive and dynamic web applications using JavaScript, DOM manipulation, and event-driven programming concepts.	IV	Analyzing
CO4	Create new responsive web applications integrating forms, validation, backend fundamentals, hosting, and deployment concepts.	VI	Creating

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to Web Designing:** Internet,Concept of Client server architecture, Understanding web browsers and web servers ,Overview of WWW, basics of Web site, Types of websites, Web contents, Static and Dynamic web Contents. Evolution of web technology and its impact on society, Introduction to Web Developer Tools.	4
II	**Module 2: Introduction to Hyper Text Markup Language (HTML)** Introduction to HTML and HTML5 **HTML Tags**: concept of Tag, types of HTML tags, Text formatting and other text effects through HTML, List, Adding graphics to HTML document by using image tag and its attributes , through HTML use of table tag and its attributes. **Concept of hyperlink**: linking to the beginning of document, linking to a particular location in a document, Images as hyperlinks, **HTML5 Features.**	5

III	**Module 3: CSS Basics and Web Page Styling** Introduction to Cascading Style Sheets (CSS), Styling HTML elements: text, colors, backgrounds, and borders, Creating layouts using CSS positioning and floats.	4
IV	**Module 4: Client-Side Scripting and DOM Programming** **Introduction to scripting**: client side java Script, **Basic JavaScript Techniques**: Data types, literals, variables and operators, Java Script arrays, operators, **Java Script Programming Construct**: Assignment, data declaration, if, switch, while, do -while, for ,label, break, Continue, function , manipulating HTML element in JAVASCRIPT, Handling events and user interactions, Understanding the DOM.	5
V	**Module 5 : Responsive Web Design and Backend Fundamentals** **Introduction to Responsive Web Design** , Responsive web design principles, Mobile-first design approach. Using media queries for responsive layouts , **Modern Layout Systems** : Flex box and CSS Grid **Introduction to Server-Side Development**: Client-side vs Server-side architecture, Introduction to server-side technologies Node.js and Express.js. Introduction to databases and data storage (DBMS), Building a simple server-side application.	4
VI	**Module 6: Web Forms, Deployment and Web Security** HTML forms and form controls, Form validation and processing Web hosting (Netlify, firebase hosting and Deployment using Git-based platforms, Domain Registration, CMS (Wordpress, Wix, Drupal etc), Web security concepts and Best Practices.	4

List of Experiments / Lab Activities

1. Install and configure web development tools (VS Code, browser tools).
2. Create a basic HTML web page using fundamental tags such as headings, `<div>`, paragraphs, and lists.
3. Implementation of interconnected Web Pages Using Anchor Tag and Navigation Bar for efficient Website Navigation.
4. Apply CSS using inline, internal, and external styles.
5. Design and Implementation of Web Page Layouts using CSS Positioning and Float Property.
6. Create responsive layout using CSS Flex box and grid.
7. Implementation of DOM Manipulation Using JavaScript Methods **`get Element By Id`** and **`Query Selector.`**
8. Design a user input form using HTML form elements.
9. Validate user input in an HTML form using client-side JavaScript and ensure correct data entry before form submission.
10. Design a basic calculator user interface using HTML `<table>` layout and implement dynamic functionality using JavaScript.
11. Develop a complete responsive website with HTML, CSS, JS, forms, and deployment.
12. Get familiar with Content Management Systems (Wordpress, Wix, Drupal etc).

Text Books

1	**David Flanagan**, *"JavaScript: The Definitive Guide"*, 8th Edition, **2023**, O"Reilly Media.
2	**Jon Duckett**, "Front-End Back-End Development with HTML, CSS, JavaScript, jQuery, PHP, and MySQL", 1st Edition, 2022, Wiley.
3	**Elian Greystone**, "The Complete Guide to Web Development in 2025: HTML, CSS, JavaScript, and React", 1st Edition, **2025**, KDP Publishing.

References	
1	Zak Ruvalcaba, Anne Boehm, Mary Delamater, “Murach‟s HTML and CSS”, 6th Edition, 2024, Mike Murach & Associates.
2	Achyut Godbole and Atul Kahate, “Web Technologies: TCP/IP, Web/Java Programming and Cloud Computing”, 3rd Edition, 2017.,McGraw Hill,
3	Elisabeth Robson, Eric Freeman,” Head First HTML & CSS”, 2nd Edition, 2012. O,,Reilly .
Useful Links	
1	https://javascript.info
2	https://expressjs.com
3	https://wordpress.com/learn

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	2	1	1	1	1	1	1	1	2	1	2	2	1
CO2	2	2	3	1	2	1	1	1	2	2	1	2	3	2
CO3	3	3	2	2	3	1	1	1	2	2	1	2	3	2
CO4	3	3	3	2	3	2	2	2	3	3	2	3	3	3
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.														

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	First Year, Semester II
Course Code	8VS162
Course Name	Data Visualization Skills and AI tools
Desired Requisites:	

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

Course Objectives

1	To introduce students to the fundamentals of data collection, data cleaning, and data visualization techniques for effective representation and interpretation of data.
2	To develop practical skills in creating charts, graphs, dashboards, and visual reports using modern data visualization tools and AI-assisted platforms.
3	To enable students to apply AI tools for data analysis, insight generation, and the design of interactive visualizations and infographics for data-driven decision-making.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand data collection, cleaning, and visualization principles.	II	Understand
CO2	Create charts, graphs, and dashboards using visualization tools.	III	Apply
CO3	Apply AI tools for data analysis and insight generation.	III	Apply
CO4	Develop interactive visualizations and infographics.	VI	Create

List of Experiments / Lab Activities/Topics

List of Lab Activities: (Minimum 09)

Students Must Perform at least 03 lab activitives from each Part

Part A : Microsoft Excel / Goole Sheets

1. Creating Basic Charts in Excel (Bar, Line, Pie Charts etc)
   Objective: Develop fundamental visualization skills using Microsoft Excel.
2. Conditional Formatting & Sparklines.
   Objective: Visualize data trends within cells without separate charts using Microsoft Excel.
3. Data Collection and Data Cleaning using Spreadsheets.
   Objective: Prepare datasets for analysis.
4. Data Visualization using Google Sheets.
   Objective: Build cloud-based visualizations.
5. Introduction to Power BI Desktop.
   Objective: Load data and create basic visualizations.

Part B: Visualization Tools

6. Data Cleaning in Power Query Editor.
   Objective: Clean messy data without writing code.
7. Creating Interactive Dashboards in Power BI.
   Objective: Link multiple visuals with cross-filtering.
8. Create charts usingTableau Public.
   Objective: Connect to data and create basic charts.
9. Maps and Geographic Visualization in Tableau.
   Objective: Plot data on interactive maps.
10. Create a Dashboard for Open Government Datasets with Actions in Tableau.
    Objective: Build an interactive dashboard with filters.

Part C: AI Tools

11. Building Reports in Google Looker Studio.
    Objective: Connect to Google Sheets and create visualizations.
12. Building Infographics using AI Design Tools.
    Objective: Create attractive visual reports Using Canva AI/Microsoft Designer etc.
13. Create Automated Insights with Google Gemini and Sheets.
    Objective: Use AI to generate full reports from natural language.
14. Introduction to Julius AI – Creating Basic Charts from Raw Data.
    Objective: Learn to upload data to Julius AI and generate basic visualizations (bar charts, pie charts, line graphs) using natural language commands without any coding.
15. Capstone – End-to-End Dashboard Project.
    Objective: Combine multiple AI-assisted tools to build a complete dashboard.

Textbooks	
1	K. Healy, *Data Visualization: A Practical Introduction*, Princeton University Press, 2019.
2	C. N. Knaflic, *Storytelling with Data*, Wiley, 2015.
3	C. O. Wilke, *Fundamentals of Data Visualization*, O'Reilly Media, 2019
References	
1	Aurélien Géron, *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, O'Reilly Media, 2022
2	Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, Pearson, 4th Edition, 2021
Useful Links	

1	Tableau Public Learning Resources, Available: https://public.tableau.com/en-us/s/resources
2	OpenAI Documentation, Available: https://platform.openai.com/docs

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