Walchand College of Engineering

(Government Aided Autonomous Institute)

Curriculum Structure and Credit System
First Year B. Tech. (Electrical Engineering)

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*	8BS109	Linear Algebra, Calculus and DE	2	1			3	**3**	20	30	50	--
2	*BSC*	8BS110	Quantum Physics and Electronics	2			2	4	**3**	30	20	50	--
3	*ESC*	8ES107	Engineering Mechanics and Applications	2			2	4	**3**	30	20	50	--
4	*ESC*	8ES108	Programming for Engineers	2			2	4	**3**	30	20	50	--
5	*PCC*	8EL101	Basic Electrical Engineering	3				3	**3**	20	30	50	--
6	*VSEC*	8VS155	Electrical Workshop Practices				2	2	**1**	30	30	40	--
7	*CCA*	Refer List	CCA 1 *(from CCA list)*				2	2	**1**	30	30	40	--
8	*IKS*	8IK151	Indian Knowledge System			2		2	**2**	30	30	40	--
			Totals	**11**	**1**	**2**	**10**	**24**	**19**				

DAC/Secretary, BoS

Head, Electrical Engg.Dept./
Chairman, BoS

Dean Academics

Walchand College of Engineering

(Government Aided Autonomous Institute)

Curriculum Structure and Credit System
First Year B. Tech. (Electrical Engineering)

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	8BS111	Mathematical Transforms and Series	2	1			3	3	20	30	50	--
2	BSC	8BS112	Electrical Engineering Material	2			2	4	3	30	20	50	--
3	ESC	8ES109	Electrical Power Generation	2				2	2	20	30	50	--
4	ESC	8ES151	Engineering Exploration	2			4	6	4	30	30	40	--
5	AEC	8AE151	Professional Communication		1	1		2	2	30	30	40	--
6	ESC	8ES110	Engineering Graphics and CAD	2			2	4	3	30	20	50	--
7	PCC	8EL102	Measurement and Instrumentation	2	1			3	3	20	30	50	--
8	VSEC	8VS156	Skill Development Lab				2	2	1	30	30	40	--
9	CCA	Refer List	CCA 2 *(from CCA list)*				2	2	1	30	30	40	--
			Totals	**12**	**3**	**1**	**12**	**28**	**22**				

DAC/Secretary, BoS

Head, Electrical Engg.Dept./
Chairman, BoS

Dean Academics

Semester- I

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

Program	B. Tech.
Class, Semester	First Year (Electrical), Semester I
Course Code	8BS109
Course Name	Linear Algebra, Calculus and Differential Equations (DE)
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 fundamental concepts of matrix theory and linear algebraic equations.
2	To present foundational techniques of partial differentiation and improper integrals.
3	To outline analytical methods for solving first and higher-order differential equations.
4	To detail elementary numerical schemes for approximating ordinary differential equation solutions.

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 concepts of Linear Algebra to describe linear systems.	II	Understanding
CO2	**Understand** the mathematical properties of improper integrals and Beta-Gamma functions	II	Understanding
CO3	**Apply** analytical and numerical Methods to solve Ordinary Differential Equations	III	Applying
CO4	**Apply** partial differentiation approximations and system optimization points**.**	III	Applying

Module	**Module Contents**	**Hours**
I	**Linear algebra** Matrices and Rank, system of Linear equations, Gauss elimination method, Eigen value and Eigen vector, Cayley Hamilton Theorem.	5
II	**Differential Calculus** Partial derivative, error and approximations, maxima and minima, Mean value theorems.	4
III	**Integral Calculus** Introduction, Improper integral, Gamma function and its properties, Beta function and its properties.	5
IV	**Ordinary Differential Equation of First Order and First Degree** Introduction, Exact Differential equation, Non exact Differential equation, Linear Differential equation and Bernoulli's Differential equation.	5

V	**Numerical Solutions to Ordinary Differential Equation** Introduction, Euler's Method, Modified Euler's method, Runge Kutta 4th order method.	4
VI	**Linear Differential Equations of Higher Order** Introduction, Complimentary function, particular integral for exponential function, trigonometric function, polynomial and arbitrary function, Applications to Electrical Engineering.	5

Text Books	
1	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.
2	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.
3	Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition
References	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2015.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.
3	George B. Thomas, Maurice D. Weir, and Joel Hass, Thomas' Calculus, Pearson Education, 14th Edition, 2018.
4	S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5th Edition, 2012.
5	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th Edition, 2018.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_ma37/preview

CO-PO Mapping

CO	Programme Outcomes (PO)											PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	—	—	—	—	—	—	—	—	—	—	—
CO2	3	3	—	—	—	—	—	—	—	—	—	—	—
CO3	3	3	—	—	—	—	—	—	—	—	—	—	—
CO4	3	3	—	—	—	—	—	—	—	—	—	—	—

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

2	https://onlinecourses.nptel.ac.in/noc22_ma75/preview
3	https://onlinecourses.nptel.ac.in/noc19_ma28/preview

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
(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Program	First Year B. Tech. Electrical Engineering
Class, Semester	First Year B. Tech., Sem. I/II
Course Code	8BS110
Course Name	Quantum Physics and Electronics
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, Photoelectric effect, Compton effect.	5
II	**Quantum Mechanics:** Heisenberg's uncertainty principle, wave function and physical significance, Schrödinger's wave equation: time dependent and time independent, Eigen value and Eigen function.	4
III	**Applications of Quantum Mechanics:** Particle in a rigid box, Step potential- reflection and transmission coefficients, Potential barrier-tunnelling effect (qualitative treatment), One dimensional simple harmonic oscillator (operator method).	4
IV	**Semiconductor Physics:** Introduction, formation of energy bands, number levels in a band, density of states, Fermi-Dirac statistics, Variation of Fermi level with temperature, electrical conductivity of metal and semiconductor, Hall effect.	5
V	**Semiconductor Diodes:** Formation of P-N Junction, V-I Characteristics of Forward and Reverse Bias of P-N, Rectifier, Clipper & Clamper, Zener Diode, Applications of Diodes.	4

VI	**Electromagnetism:** Coulomb's law, Gauss's law, Biot-Savart law and Ampere's law, Electromagnetic induction, Faraday's laws of induction, Maxwell's equations, Electromagnetic waves and their propagation.	4

List of Experiments/ Lab Activities (Any 8-10)	
1	Find the diameter of thin 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	To study the I-V characteristics of a transistor and determine its current gain.
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	R. K. Gaur and S. L. Gupta "Engineering Physics", Dhanpat Rai Publications, 2011
3	Harnam Singh, *Advanced Practical Physics for Students*, S. Chand & Company Ltd., Revised Edition, 2011, Volumes I & II.
References	
1	Sakurai, J. J., and Jim Napolitano. *Modern Quantum Mechanics*. 3rd ed., 2020.
2	Zettili, Nouredine. Quantum Mechanics: Concepts and Applications. Chichester: John Wiley & Sons, 2001.
3	Sze, S. M., & Ng, K. K. *Physics of Semiconductor Devices* (3rd ed.). John Wiley & Sons, 2021.
4	Griffiths, David J. *Introduction to Electrodynamics*. 4th ed.2017.

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)				
There is one component of lab assessment that is Lab ESE. 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, Department of Electrical Engineering

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	First Year B. Tech. Electrical
Class, Semester	First Year B. Tech., Sem I
Course Code	8ES107
Course Name	Engineering Mechanics and Applications Lab
Desired Requisites:	Engineering Mechanics

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

Course Objectives

1. To understand the fundamental principles of engineering mechanics and their interdisciplinary applications.
2. To apply concepts of force, equilibrium, friction, stress, strain, and dynamics in engineering systems.
3. To develop analytical and problem-solving skills relevant to Electrical Engineering applications.
4. To introduce students to modern engineering applications in renewable energy, EVs, robotics, and smart systems.
5. To provide hands on practice for the conduct of experiments to verify the principles of mechanics
6. To demonstrate the graphical methods to verify analytical solutions

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	Describe the principles of force systems and equilibrium and demonstrate the verification of fundamental laws and principles of mechanics through experiments.	II	Understand
CO2	Apply the principles of friction, motion, force systems, beams, and frames to solve engineering problems using analytical, graphical, and experimental methods.	III	Apply
CO3	Analyze stress, strain, deformation, and structural behavior of engineering materials and components through analytical and laboratory methods.	IV	Analyze
CO4	Evaluate dynamics principles and apply them to rotating and moving electrical/electromechanical systems using interdisciplinary, analytical, and experimental approaches.	V	Evaluate

Module	Module Contents	Hours
I	**Fundamentals of Engineering Mechanics** Introduction to Engineering Mechanics, Scalars and vectors, SI units and dimensions, Force systems and resolution of forces, Resultant of coplanar force systems, Free body diagrams, Equilibrium of particles and rigid bodies	5
II	**Centroid, Moment of Inertia and Structural Mechanics** Centroid of simple and composite sections, Area moment of inertia, Radius of gyration, Parallel and perpendicular axis theorems, Simple beams and support reactions, Introduction and analysis of trusses and frames	6
III	**Friction and Engineering Applications** Laws of friction, Static and dynamic friction, Friction on inclined planes, Belt friction and screw jack, Rolling resistance, Friction in electromechanical systems	4

IV	**Stress, Strain and Mechanical Properties of Materials** Concept of stress and strain, Types of stresses and strains, Hooke's Law, Stress-strain relationship, Elastic constants, Thermal stresses, Factor of safety, Simple numerical problems on stress and strain calculations	4
V	**Dynamics of Particles and Rigid Bodies** Kinematics of particles, Linear and angular motion, Newton's laws of motion, Work, power, and energy, Impulse and momentum, Rotational motion and flywheel basics	5
VI	**Interdisciplinary and Emerging Engineering Applications** Mechanics in renewable energy systems, Basics of vibration and stability, Smart materials and biomechanics, Mechanics in robotics and automation, Engineering failure analysis and safety, Sustainable and Industry 4.0 engineering systems	4

List of Experiments/ Lab Activities / Mini project activities….	
1)	Verification of force equilibrium
2)	Friction experiment
3)	Stress-strain testing of materials
4)	Determination of centroid and moment of inertia
5)	Beam reaction experiment
6)	Beam reaction by graphical method
7)	Analysis of Truss using graphical Method
8)	Mini-project on interdisciplinary engineering application

Textbooks	
1	R.C. Hibbeler – Engineering Mechanics
2	Beer & Johnston – Vector Mechanics for Engineers
3	S.S. Bhavikatti – Strength of Materials and Engineering Mechanics
4	Lab Manual Link – https://atifmohd077.files.wordpress.com/2019/03/em-lab-manual-1.pdf
5	Lab Manual Link – https://jecassam.ac.in/wp-content/uploads/2018/10/1_Engineering-Mechanics-Laboratory-2nd-SEM-DU-Old-Course.pdf

References	
1	Ramamrutham, S. Textbook of Applied Mechanics, Dhanpat Rai Publishing Company Limited, 2008.
2	Beer, F. P. and Johnston, E. R. Vector Mechanics for Engineers, Vol. I and II, McGraw Hill Company Publication, 2011, 9th Edition.
3	Meriam & Kraige – *Engineering Mechanics*
4	Bansal – *Strength of Materials*

Useful Links	
1	https://nptel.ac.in/courses/112106286
2	https://www.youtube.com/watch?v=9Yt3I4bP-90

CO-PO Mapping (Theory)

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

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

Assessment

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

Walchand College of Engineering, Sangli
(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Program	B. Tech. Electrical Engineering
Class, Semester	First Year B. Tech., Sem. I
Course Code	8ES108
Course Name	Programming for Engineers
Desired Requisites	Basic Computer Literacy

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

Course Objectives

1	To Develop computational thinking and programming skills.
2	To Introduce C programming for engineering computation and visualization.
3	To Build proficiency in Python programming.
4	To Apply programming to solve electrical engineering problems.

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 programming concepts and C language constructs for engineering computations.	III	Applying
CO2	Create modular C programs using functions, arrays, pointers, structures, and files.	III	Applying
CO3	Develop Python programs using control structures, functions, and data handling techniques.	III	Applying
CO4	Analyze and solve engineering problems using Python-based numerical computing and visualization tools.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Fundamentals of Programming and C Language** Introduction to computational problem solving and programming concepts, Algorithms, flowcharts, and pseudocode, Structure of a C program, compilation and execution process, Tokens, identifiers, keywords, constants, variables, and data types, Input-output functions	4
II	**C Programming Constructs** Operators and expressions, Type conversion and type casting, Decision-making statements, Iterative statements, Loop control statements	4
III	**Advanced C Programming** Arrays and strings, User-defined functions and recursion, Scope and storage classes, Structures and pointers, Basic file handling and engineering applications in C	4
IV	**Python Programming Fundamentals** Python environment and program execution, Variables, data types, identifiers, and keywords, Operators and expressions, Input-output operations and formatted printing, Decision-making and iterative programming constructs	4
V	**Advanced Python Programming** Functions, arguments, return values, and recursion, Modular programming, String handling and manipulation, Python data structures, File handling operations	5

VI	**Numerical Computing and Engineering Applications using Python** Introduction to NumPy and Matplotlib, Array operations and numerical computations, Data visualization and plotting, Numerical methods: roots, interpolation, differentiation, and integration, Electrical engineering applications: waveform analysis, RMS and power calculations, circuit computations, and mini-project development using Python	5

List of Laboratory Experiments

C Programming Experiments

1. Develop programs using variables, data types, operators, and formatted input-output functions for engineering calculations.
2. Develop programs using if-else, nested if-else, and switch-case statements for solving engineering problems.
3. Implement programs using for, while, and do-while loops for numerical computations.
4. Develop programs for one-dimensional and two-dimensional arrays, matrix addition, multiplication, and transpose operations.
5. Implement programs using strings and standard string manipulation functions.
6. Develop programs using functions, parameter passing, and recursive techniques for mathematical computations.
7. Implement programs using structures and pointers for handling engineering data.
8. Develop programs for reading, writing, and processing engineering data using files.

Python Programming Experiments

9. Develop programs using variables, data types, operators, input-output statements, and type conversion.
10. Implement programs using conditional statements and iterative constructs for engineering calculations.
11. Develop programs using user-defined functions, recursion, and modular programming concepts.
12. Implement programs using lists, tuples, dictionaries, and sets for data processing applications.
13. Develop programs for string manipulation and text file operations.
14. Perform array operations, matrix manipulations, and numerical computations using NumPy.
15. Generate and customize plots for engineering data and electrical waveforms.
16. Develop programs for waveform generation, RMS and power calculations, simple circuit analysis, and electrical data visualization.

Any 8-10 experiments out of the list mentioned above may be included in the laboratory sessions. (Preferably equal weightage to be given to C programming and Python programming experiments)

Textbooks

1	Byron S. Gottfried, "*Programming with C"*, Schaum's Outline Series, McGraw Hill Education, 4th Edition, 2018.
2	Y. Daniel Liang, "*Introduction to Programming Using Python*", Prentice Hall Publishers, 2012.

References

1	Brian W. Kernighan and Dennis M. Ritchie, "*The C Programming Language"*, Pearson Education, 2nd Edition, 1988
2	E. Balagurusamy, "*Programming in ANSI C"*, McGraw Hill Education, 8th Edition, 2019.
3	Allen B. Downey, "*Think Python*", Shroff/O'Reilly publishers, 2024.
4	John V. Guttag, "*Introduction to Computation and Programming Using Python*", MIT Press, 2016.
5	Reema Thareja, "*Python Programming Using Problem Solving Approach*", Oxford University Press, 2017.

Useful Links

1	https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_cs40
2	https://www.python.org/doc/
3	https://onlinecourses.nptel.ac.in/e-learning/preview/noc22_cs40

CO-PO Mapping													
	Program Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	2			2							2	
CO2	2	3	3		2							2	2
CO3	2	3	3		3							2	2
CO4	3	3	3	2	3	2						3	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	Dr. Mrs A. S. Karvekar.
Syllabus Checked By	Mrs. A. A. Dhamangaonkar

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Program	B. Tech. Electrical Engineering
Class, Semester	First Year B. Tech., Sem- I
Course Code	8EL101
Course Name	Basic Electrical Engineering
Desired Requisites	NIL

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

Course Objectives

1	This course intends to summarize and solve DC and AC electrical circuits.
2	It imparts skill to identifying principles, construction and working of electrical machines.
3	It develops skill to describe the wiring system, lamps and low voltage installation components.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand the principles of electric and magnetic circuit fundamentals	II	Understanding
CO2	Apply network theorems to analyse and solve electrical circuits.	III	Apply
CO3	Explain the construction, operation, and characteristics of electrical machines and transformers.	II	Understanding
CO4	Explain low-voltage electrical installations, wiring systems and Earthing.	II	Understanding

Module	**Module Contents**	**Hours**
I	**Basic Concepts** Concept of power generation, Single line diagram of electrical power system. Series and Parallel Circuit, Equivalent Resistance, Practical Voltage and current Source, Source Conversion. Kirchhoff's Laws, Sign Convention, Illustration of Kirchhoff's Laws. Maxwell's Mesh Current Method, Nodal Analysis, Review of R-L-C- Electrical circuit elements, Star- delta conversion Numerical.	6
II	**Magnetic circuit** Introduction, Magnetic field due to a straight conductor, Solenoid, Permeability, Force on current carrying conductor, Magnetic circuit, Quantities associated with magnetic circuit, Comparison between magnetic and electric circuit, B – H curve, Hysteresis loop, Series magnetic circuit, Numerical on magnetic circuit.	7
III	**AC Circuits** Generation of AC waveform, Peak, RMS values, phasor representation of voltage and current, real, reactive and apparent power. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC (series and parallel) circuits and three-phase balanced circuits. Voltage and current relations in star and delta configurations.	7
IV	**Electrical Machines** Construction, working principle and types of DC generator and Motor. Speed Torque characteristics. Construction and working principle of single and three-phase induction motor. Types, Speed-Torque characteristics and applications of induction motor.	7

V	**Transformer** Construction, working principle and types of single-phase transformer, Losses, efficiency, all-day efficiency and voltage regulation. Open circuit and short circuit test, EMF equation of transformer.	6
VI	**Wiring, Electrical Installations and Components of LT Switchgear** Earthing and types of earthing, Switch fuse unit, MCB, Types of wire and cables. Staircase, Godown and Domestic wiring, CFL, LED, Fluorescent tube. Lighting schemes, types of batteries, characteristics of batteries.	6

Textbooks	
1	V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering", 2nd edition, Tata McGraw Hill.
2	J. B. Gupta, "Basic Electrical Engineering", S. Kataria publications.
References	
1	D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2	C. L. Wadhwa, "Basic Electrical Engineering", 4th Edition, New age Publications
Useful Links	
1	Fundamentals of Electrical Engineering, IIT Kharagpur, by Prof. Debapriya Das , "https://nptel.ac.in/courses/108105112"

CO-PO Mapping

	Program Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	
CO1	3											2	
CO2	3											2	
CO3		3											2
CO4	2	3	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	Mr. M. S. Mahagaonkar
Syllabus Checked By	Mr. S . S. Medhekar

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Program	B. Tech. Electrical Engineering
Class, Semester	First Year B. Tech., Sem- I
Course Code	8VS155
Course Name	Electrical Workshop Practices
Desired Requisites	NIL

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

Course Objectives

1	This course intends to demonstrate basic knowledge of Electrical engineering.
2	It intends to develop skills to recognize working principle, construction and types of electrical Machines.

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	**Describe** basic concepts of electrical circuits and various theorems.	II	Understanding
CO2	**Measure and Analyze** electrical parameters such as voltage, current, resistance, and power using standard laboratory instruments.	III	Analyze
CO3	**Test** basic DC and AC electrical circuits and interpret experimental results with proper observations and calculations.	IV	Analyze
CO4	**Demonstrate** the use of transformers and AC/DC machines.	III	Applying

List of Experiments / Lab Activities/Topics

1. Electrical Safety Measures.
2. To verify KVL and KCL theorems.
3. To study series-parallel RL, RC and RLC circuits
4. To measure Voltage, current and power factor of 1-phase R-L-C series circuit.
5. To study construction and working of single phase transformer.
6. To measure voltage, current and power in single phase transformer.
7. To study DC machines parts and their functions.
8. To study speed control techniques of DC machines.
9. To understand three phase star and delta circuits.
10. To study construction and working of AC Machines (Rotating).
11. Study of installation techniques using fuse, MCB and MCCB.

Textbooks

1	D.C. Kulshreshtha, "Basic Electrical Engineering", 1 st revised editionMcGraw Hill, 2012.
2	D.P Kothari and I.J Nagrath, "Basic Electrical Engineering",Tata McGraw Hill, 2010.

References

1	V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering", 2nd edition, Tata McGraw Hill, 2005.

Useful Links

1	Virtual Labs, An Initiative of Ministry of Education Under the National Mission on Education through ICT, 1. https://www.vlab.co.in/broad-area-electrical-engineering 2. http://vlabs.iitkgp.ac.in/asnm/#

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates 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	Mr. M. S. Mahagaonkar
Syllabus Checked By	Mr. S. S. Medhekar

Semester- II

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

Program	B.Tech.
Class, Semester	First Year (Electrical), Semester II
Course Code	8BS111
Course Name	Mathematical Transforms and Series
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 fundamentals of transform techniques and complex analysis.
2	To develop the ability to analyse functions using Fourier and Laplace transforms.
3	To study analytic functions, complex integration, and series expansions.
4	To apply Z-transform techniques for discrete-time system analysis.

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 concepts and properties of Laplace and Fourier transforms.	II	Understanding
CO2	**Apply** transform techniques to solve engineering and mathematical problems.	III	Applying
CO3	**Apply** the principles of complex analysis to evaluate functions and integrals.	III	Applying
CO4	**Apply** Z-transform techniques for the analysis of discrete-time systems.	III	Applying

Module	**Module Contents**	**Hours**
I	**Laplace Transform** Definition and standard Laplace transform, Properties of Laplace transform, inverse Laplace transform, Applications.	**5**
II	**Fourier Series** Definition and Euler formulae, even and odd functions, Fourier series for arbitrary period, Fourier sine and cosine series.	**5**
III	**Partial Differential Equations** Introduction, Classification of PDEs, Lagrange's Linear Partial Differential, One-Dimensional Wave Equation, one dimensional heat equation.	**4**

IV	**Fourier Transform** Fourier integral, Fourier transform, Fourier Sine and Cosine transform, Properties of Fourier transform, Parseval's identities.	**5**
V	**Complex Analysis** Analytic function, Cauchy Riemann equation, Taylor's series, Maclaurin's series, Laurent's series, Residue Theorem.	**5**
VI	**Z-Transform** Z-Transform, Properties of Z-Transform, Inverse Z-Transform, Applications of Z-Transform.	**4**

Textbooks	
1	B. V. Ramana, Higher Engineering Mathematics, The McGraw Hill companies, 2006.
2	H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 1st Edition, 2014.
3	Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition

References	
1	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2015.
2	R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 5th Edition, 2016.
3	George B. Thomas, Maurice D. Weir, and Joel Hass, Thomas' Calculus, Pearson Education, 14th Edition, 2018.
4	Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Academic Press, 6th Edition, 2020.
5	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th Edition, 2018.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_ma75/preview
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview
3	https://onlinecourses.nptel.ac.in/noc23_mg51/preview

CO-PO Mapping

CO	Program Outcomes (PO)											PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	2	2	—	—	—	—	—	—	—	—	—	—	—
CO2	3	2	—	—	—	—	—	—	—	—	—	—	—
CO3	3	3	—	—	—	—	—	—	—	—	—	—	—
CO4	3	3	—	—	—	—	—	—	—	—	—	—	—

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 *(Government Aided Autonomous Institute)*						
AY 2026-27						
Course Information						
Programme	First Year B. Tech. Electrical					
Class, Semester	First Year B. Tech., Sem. I/II					
Course Code	8BS112					
Course Name	Electrical Engineering Material					
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	To introduce students to the engineering principles and applications of various materials used in technology and industry.
2	To provide basic knowledge of chemical analysis and material characterization techniques used in engineering.
3	To familiarize students with phase equilibria and phase rule concepts relevant to material science and engineering.
4	To develop an understanding of renewable energy materials and their applications in sustainable energy generation, storage, and electrical systems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	**Understand principles of chemical analysis and instrumental techniques** for the characterization of materials.	II	Understand
CO2	U**nderstand concepts related to corrosion science, renewable energy materials, and phase equilibria.**	II	Understand
CO3	A**pply knowledge of engineering materials and energy systems,** including conducting, semiconducting, dielectric, and magnetic.	III	Apply
CO4	Demonstrate chemical analysis experiments, interpret experimental 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)-basic concepts, Introduction to SEM & TEM for material characterization, Application examples: alloy composition, quality evaluation	8

II	**Electrical Engineering Materials** Conducting materials (Cu, Al, ACSR Aluminium Conductor reinforce, superconductors – basics), Semiconductor materials (Si, Ge – intrinsic & extrinsic), Dielectric materials (ceramics, polymers, composites), Magnetic materials (soft & hard magnetic materials), Insulating materials.	3
III	**Battery & Fuel cell:** 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, electrolyzer.	4
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	**Phase Rule**: Gibbs phase rule, Explanation of the terms Phase, Component, Degree of freedom, Phase reactions, types of equilibrium, equilibrium conditions. One component system-Water system, Sulphur system, Two component system- Lead Silver system, Application of Eutectic system.	3
VI	**Renewable Energy Materials and Systems:** Solar photovoltaic materials (Si, Thin film – basics), Wind energy materials (composites in blades), Materials for hydrogen production.	3
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	Determination of viscosity using Ostwald viscometer.	
12	Determination of corrosion rate by weight loss method.	
13	Gravimetric estimation of Ba from $BaSO_4$ as BaO.	
14	Preparation of resin.	
Textbooks		
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	C. Baird and M. Cann, *Environmental Chemistry*, 5th ed. New York, NY, USA: W. H. Freeman and Company, 2012.	
4	J. R. Mihelcic and J. B. Zimmerman, *Environmental Engineering: Fundamentals, Sustainability, and Design*, 2nd ed. Hoboken, NJ, USA: John Wiley & Sons, 2014.	
5	S. Rani, *Laboratory Manual on Engineering Chemistry*. New Delhi, India: Dhanpat Rai Publishing Co., 2018.	
References		

1	J. Mendham, R. C. Denney, J. D. Barnes, and M. Thomas, *Vogel's Textbook of Quantitative Chemical Analysis*, 6th ed. Harlow, U.K.: Pearson Education, 2000.
2	S. S. Dara and S. S. Umare, *A Textbook of Engineering Chemistry*. New Delhi, India: S. Chand Publishing, 2015.
3	A. K. De, *Environmental Chemistry*, 8th ed. New Delhi, India: New Age International Publishers, 2017.
4	S. S. Dara and S. S. Umare, *Practical Engineering Chemistry*. New Delhi, India: S. Chand Publishing, 2014.
5	S. Sahay, *Quantitative Chemical Analysis*. New Delhi, India: Tata McGraw-Hill Education, 2012.

Useful Links

1	www.apha.org
2	swayam.gov.in
3	nptel.ac.in
4	https://onlinecourses.nptel.ac.in/noc25_ee163/preview?utm`
5	www.vlab.co.in

CO-PO Mapping (Theory)

	Program 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	3	1		

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

Assessment (Theory)

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

Assessment (Lab)

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

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

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

Syllabus Prepared By	
Syllabus Checked By	

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Program	B. Tech. Electrical Engineering
Class, Semester	First Year B. Tech., Sem- II
Course Code	8ES109
Course Name	Electrical Power Generation
Desired Requisites	Basic Electrical Engineering

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

Course Objectives

1	To understand the working principles and performance characteristics of steam and hydro power plants.
2	To study the operation, components, and applications of nuclear, diesel, and gas turbine power plants.
3	To understand renewable energy-based power generation systems including solar, wind, and emerging technologies.
4	To analyze load characteristics, power plant economics, cost of generation, and electricity tariffs.

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 operating principles, components, and performance characteristics of steam and hydro power plants.	II	Understanding
CO2	Describe the construction, operation, and applications of nuclear, diesel, and gas turbine power plants.	II	Understanding
CO3	Analyze renewable energy systems: solar, wind, geothermal, tidal, biomass, and fuel cells.	IV	Analyzing
CO4	Apply economic principles to evaluate load curves, power plant performance factors, cost of generation, and electricity tariffs.	III	Applying

Module	**Module Contents**	**Hours**
I	**Steam Power Station** Basic thermodynamic cycles, site selection, schematic arrangement & working of steam power plant, types of boilers, types of turbine, fuel handling, electrostatic precipitator, draught systems, numerical.	5
II	**Hydro Power Station** Site selection, schematic arrangement & working of hydro power plant, classification of hydro power plants, types of hydro turbine, selection of turbines, storage & pondage, pumped storage power plant, hydrograph, flow duration curve, mass curve, numerical.	5
III	**Nuclear power station** Introduction, nuclear reaction, site selection, schematic arrangement & working of nuclear power plant, types of reactors, nuclear waste disposal.	4
IV	**Diesel and Gas Turbine Power Plant** Diesel power plant: Introduction, choice and characteristics of diesel engines, schematic arrangement, layout of diesel power plant, applications. Gas turbine power plant: Introduction, schematic arrangement, open cycle, closed cycle, combined cycle gas turbine power plant.	4

V	**Renewable Energy Sources** Wind Power Plant**:** Components, working, types of wind turbine plants, speed control of wind turbine. Solar Power Plant**:** Solar constant, cloudy index, concentration ratio, methods of measurement of solar radiation, types solar collector, central receiver tower solar thermal power plant, types of PV systems. Introduction to Geothermal energy, tidal energy, wave energy, biomass energy, fuel cell.	4
VI	**Power Generation Economics and Tariff** Load curves, load duration curves, connected load, maximum load, peak load, base load and peak load power plants, load factor, plant capacity factor, plant use factor, demand factor, diversity factor, cost of power plant, tariffs, numerical.	4

Textbooks	
1	P. K. Nag, "Power Plant Engineering", Tata McGraw Hill Publications.
2	R.K. Rajput, "Non-Conventional Energy Sources and Utilization", S. Chand Publications.
References	
1	Arora and Domkundwar, "A course in Power Plant Engineering", Dhanpat Rai Publication.
2	Dr. S. P. Sukhatme, "Solar Energy" Tata McGraw Hill Publications.
3	A Chakrabarti, M. L. Soni, P. V. Gupta, U. S. Bhatnagar, "A Text book of Power System Engineering", Dhanpat Rai Publication.
4	Gilbert Masters John, "Renewable Energy", Wiley and sons' publications.
Useful Links	
1	https://nptel.ac.in/courses/108102047

CO-PO Mapping

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

Syllabus Prepared By	Mr. V. S. Sathe
Syllabus Checked By	Dr. M. P. Thakre

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27 onwards

Course Information

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

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

Course Objectives

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

Course Outcomes (CO)

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

CO – PO mapping

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

Module	**Module Contents**	**Hours**
I	**Module 1: Introduction to Engineering and Engineering Study** Requirements and expectations of Engineering, disciplines of engineering, Expectation of modern engineer and Graduate Attributes Significance of teamwork, Significance of Agile practices, Significance of documentation	03 + 04
II	**Module 2: Sustainability and Ethics in Engineering** Introduction to sustainability, Sustainability leadership matrix, Life cycle assessment, carbon footprint, embodied energy calculation, alternative material selection and justification Identifying Engineering as a Profession, Significance of Professional Ethics, Code of Conduct for Engineers, Identifying Ethical Dilemmas in different tasks of engineering, Applying Moral Theories and codes of conduct for resolution of	03 + 04

	Ethical Dilemmas.	
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	Problem definition & formulation, concept generation (function tree,	**10**	6 (1)	8-15

		(team submission)	morphological chart), concept selection (Pugh chart), material selection justification			
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/

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-2027

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

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

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

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

Module	**Module Contents**	**Hours**
	Foundations of Communication	
1	Communication -Nature, Types, and Principles. Barriers to Effective Communication and overcoming them. Developing Effective Listening Skills: Types, listening and note-making.	**2**
	Language Skills & Communicative Grammar	
2	Vocabulary precision, clarity. Modal verbs, passives, phrasal verbs. Common errors & editing Communicative Grammar: modal verbs, question tags, misplaced modifiers, passives Reading comprehension	**2**
	Non-Verbal Communication & Vocalics	

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

	Textbooks
1	Adler, R.B. & Rodman, G. — Understanding Human Communication, Oxford University Press
2	Sanjay Kumar & Pushpalata — Communication Skills, Oxford University Press, First Edition, 2012
3	Cialdini, R. — Influence: The Psychology of Persuasion, Harper Business
	References
1	Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hills publishing Company 2006
2	William Sanborn Pfeiffer, T.V.S. Padmaja, Technical Communication: A Practical Approach, Pearson, Sixth Edition 2012
3	Reynolds, G. — Presentation Zen: Simple Ideas on Presentation Design and Delivery, New Riders
4	Exercises in Spoken English, Parts I and II, CIEFL, Hyderabad, Oxford University Press
	Useful Links
1	www.ted.com/talks — TED Talks on Communication

Course Assessment Plan — Notional Learning Hours

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

Sl. No.	Assessment Type	Brief Description	Marks	Notional Learning Hours (NLH)	A T*	CO Mapped	Bloom's Taxonomy Level
1	Tutorial Exercise	Structured exercises based on Module I & II topics	20	8	LA1	CO2	Apply (L3)
2	Listening +	Audio-visual	10	8	LA1	CO1,	Apply (L3)

Sl. No.	Assessment Type	Brief Description	Marks	Notional Learning Hours (NLH)	A T*	CO Mapped	Bloom's Taxonomy Level
	Note-Making Task	listening exercise with note-making and summary writing from Module I				CO2	
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, Sangli
(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B.Tech. Electrical/Electronics Engineering
Class, Semester	First Year B. Tech. SEM-II
Course Code	8ES110
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**	**ESE**	**Total**
Tutorial	-	20	30	50	100
Lab	2 Hrs/week	**Credits: 3**			

Course Objectives

1	To develop fundamental engineering drawing and visualization skills required for electrical and electronics engineering applications.
2	To impart knowledge of engineering graphics principles including projections, sections, and development of surfaces.
3	To familiarize students with standard electrical symbols, schematic diagrams, wiring layouts, and electrical drafting practices.
4	To introduce CAD-based drafting techniques for preparation of professional electrical engineering drawings and layouts.

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 engineering graphics using standard BIS conventions and drafting practices.	I	Demonstrating
CO2	Explain principles of projections, sections, and graphical representation of engineering objects.	II	Understanding
CO3	Apply engineering graphics principles to prepare electrical diagrams, layouts, and installation drawings.	III	Applying
CO4	Create CAD-based electrical engineering drawings, panel layouts, and wiring schematics following industry standards.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction to Engineering Graphics and Curves**: Importance of engineering graphics in engineering communication; drawing instruments and BIS conventions; lettering and dimensioning; scales (plain, diagonal, and vernier scales); construction of conic sections (ellipse, parabola, hyperbola); engineering curves such as cycloid, epicycloid, hypocycloid, and involute.	4
II	**Projection of Points, Lines and Planes:** Principles of orthographic projection; projection of points in different quadrants; projection of lines inclined to one or both reference planes; determination of true length and true inclinations; projection of plane surfaces inclined to HP and VP; auxiliary views and true shape determination.	5
III	**Projection of Solids:** Projection of prisms, pyramids, cylinders, and cones in various positions; solids inclined to one or both reference planes; visible and hidden edges; applications of projections in engineering visualization.	4
IV	**Sections and Development of Solids:** Sectioning of prisms, pyramids, cylinders, and cones; true shape of sections; development of surfaces of prisms, pyramids, cylinders, and cones; applications in electrical enclosures,	5

	ducts, cable trays, and fabrication works.	
V	**Electrical Engineering Drawings and Layouts:** Standard electrical symbols as per BIS/IEC standards; circuit diagrams and schematic representation; single-line diagrams; domestic wiring diagrams; staircase and godown wiring; electrical installation layouts; distribution boards; earthing layouts; electrical panel layouts; switchgear representation; transformer and motor installation drawings; introduction to substation single-line diagrams.	5
VI	**CAD Applications in Electrical Engineering:** Introduction to CAD and AutoCAD; drawing setup, coordinate systems, layers, and drawing aids; preparation of electrical symbols and libraries; schematic diagrams, wiring diagrams, panel layouts, cable routing drawings, and substation layouts using CAD; dimensioning, annotation, plotting, and printing of drawings.	4

Module wise Measurable Students Learning Outcomes:

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

[1] Draw engineering curves, scales, and geometrical constructions using BIS standards and drafting practices.

[2] Prepare orthographic projections of points, lines, and planes and determine their true dimensions using projection techniques.

[3] Construct projections of engineering solids in various orientations with respect to reference planes.

[4] Generate sectional views and developments of engineering solids for practical engineering applications.

[6] Prepare and interpret electrical symbols, schematic diagrams, single-line diagrams, wiring layouts, and electrical installation drawings.

[7] Create professional CAD-based electrical engineering drawings including schematics, panel layouts, and installation drawings using AutoCAD.

Text Books	
1	Bhatt N.D., Panchal V.M. and Ingle P.R., Engineering Drawing, Charotar Publishing House, 2014.
2	Surjit Singh, *Electrical Engineering Drawing*, Dhanpat Rai Publications, New Delhi.
3	K. V. Natarajan, *A Textbook of Electrical Engineering Drawing*, Dhanpat Rai & Co.
References	
1	Narayana, K.L. and P Kannaiah, Text book on Engineering Drawing, Scitech Publishers, 2008.
2	Fredderock E. Giesecke, Alva Mitchell and Others, *Principles of Engineering Graphics*, Maxwell McMillan Publishing, 2010.
3	Uppal S. L. and Rao S., *Electrical Wiring, Estimating and Costing*, Khanna Publishers.
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 Electrical Engineering Department															
	Program Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11		1	2	
CO1	3				2					1			2		
CO2			2										1		
CO3					3					1			2		
CO4											3		1		
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

CO-PO Mapping For Electronics Engineering Department															
	Program 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 2026-27

Course Information	
Program	B. Tech. Electrical Engineering
Class, Semester	First Year B. Tech., Sem. II
Course Code	8EL102
Course Name	Measurement and Instrumentation
Desired Requisites	Basic Electrical Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	1 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives	
1	To provide basic concepts of errors in measurements and basic fundamentals of Measuring systems, formal representation, computational methods, notation, and vocabulary of linear models.
2	To impart skills to classify bridges, measuring instruments and equipments.
3	To demonstrate digital instruments, advance instruments.
4	To impart basic knowledge of transducer.

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	Describe fundamental concepts of measurement and identify errors in measurement and its statistics.	II	Understanding
CO2	Explain working principle and mechanism of measuring instrument.	III	Applying
CO3	Implement a proper measuring instrument and modern techniques for measurement of electrical parameters for given application.	III	Applying
CO4	Implement a proper measuring instrument and modern techniques for measurement of physical parameters for given application.	III	Applying

Module	**Module Contents**	**Hours**
I	**Measuring Systems** Units, Dimensions and Standards, Structure of Measurement Systems, Instrument Types- Active, Passive, Static Characteristics & Dynamic Characteristics of Instruments, Measurement Errors, Sensors and Transducers - Overview, Definition, Classification, Selection Criteria.	5
II	**Measuring Instruments** Indicating, Integrating, Recording Instruments, Essentials of Indicating Instruments: Deflecting, Controlling And Damping Systems. Construction, Working Principle, Torque Equation, Advantages & Disadvantages of Moving Iron (MI) (Attraction And Repulsion), Permanent Magnet Moving Coil (PMMC) & Dynamometer Type Instruments, Induction Type Instruments, Range Extension of MI Instruments.	5
III	**Measurement of Power and Energy** Active And Reactive Power Measurement in Three Phase System for Balanced and Unbalanced Load Using Two Wattmeter Method & One Wattmeter Method. Construction, Working Principle, Torque Equation of Single Phase Conventional (Induction Type) Energy Meter, Calibration of Energy Meter, Digital Energy Meter	5

IV	**Measurement of Electrical Quantities** Measurement of Low, Medium and High Resistance, Wheatstone Bridge, Kelvin's Double Bridge, Ammeter-Voltmeter Method, Megger, Earth Tester for Earth Resistance Measurement, Maxwell's Bridge, Hay's Bridge, Anderson's Bridge, Schering Bridge and Wien's Bridge.	3
V	**Measurement of Non-electrical Quantities** Force Measurement Using Strain Gauges, Displacement Measurements Using LVDT, Temperature Measurement Using RTD, Thermistor, Thermocouple, Bellows and Diaphragm. Flow Measurement Using Rotameter, Electromagnetic Flow Meter. Speed Measurement Using Magnetic Pick-Up And Photoelectric Pick-Up.	5
VI	**Output devices and Recent Developments** Digital output devices: LCD, LED, seven-segment display, DSO, Power Analyser, Wave Analyser, Harmonic Distortion Analyzer, Instrument Transformers, Digital Ammeter & Voltmeter	3

Textbooks	
1	A. K. Sawhney, "A Course in Electrical and Electronics Measurement and Instrumentation", Dhanapat Rai & Company, New Delhi, reprint, 17th Edition, 2005.
2	Alan Morris "Principles of measurement and instrumentation", Prentice Hall- India, 2004 ISBN: 0134897099.
3	Rangan, Mani and Sharma, "Instrumentation Devices and Systems", Tata McGraw Hill, New Delhi, 2nd Edition.
References	
1	M. A. Baldwin, "Fundamentals of Electrical Measurements", Publication – Lyall Book Depot, Ludhiyana.
2	Albert D. Helfric, "Modern Electronics measurement & instruments", PHI Ltd, 2003.
3	Murthy D. V. S., "Transducers and Instrumentation", Prentice Hall of India Pvt. Ltd., New Delhi.
Useful Links	
1	elearning.vtu.ac.in/, nptel.iitg.ernet.in/
2	https://nptel.ac.in/courses/108/105/108105153

CO-PO Mapping

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

Assessment

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. A.A. Dhamangaonkar
Syllabus Checked By	Dr. S. D. Patil

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Program	B. Tech. Electrical Engineering
Class, Semester	First Year B. Tech., Sem I
Course Code	8VS156
Course Name	Skill Development Lab
Desired Requisites	Basic Electrical Engineering

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

Course Objectives	
1	Develop practical skills for measurement and verification of basic electrical circuit concepts.
2	Familiarize students with residential wiring materials, accessories, switchgear, and distribution components.
3	Train students to design, assemble, test and troubleshoot basic residential wiring circuits and domestic electrical appliances.
4	Develop an understanding of electrical safety, earthing, energy metering, and energy consumption analysis in residential systems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Measure electrical quantities and verify basic electrical circuit laws using appropriate instruments.	III	Applying
CO2	Identify electrical wiring materials, accessories, switchgear and distribution components used in residential installations.	II	Understanding
CO3	Design, assemble and test basic residential wiring circuits and domestic electrical connections following safety standards.	III	Applying
CO4	Test, troubleshoot and analyze domestic electrical appliances, earthing systems and energy metering installations.	IV	**Analyzing**

List of Experiments/Lab Activities/Topics

1. Verification of Ohm's Law and analysis of series and parallel resistive circuits.
2. Calibration of single-phase energy meter
3. Measurement of power in a three-phase circuit using two-wattmeter method.
4. Study and identification of various types of electrical wires, cables and wiring accessories used in residential installations.
5. Design and implementation of basic residential wiring circuits including one-way and two-way control.
6. Preparation of earthing pit and measurement of earth resistance for electrical installation safety.
7. Dismantling, assembly, testing and fault finding of ceiling fan / table fan.
8. Study of electrical distribution board and identification of its components and connections.
9. Preparation and testing of extension board with socket, switch and indicator.
10. Study of solar photovoltaic system and identification of its main components.
11. Identification and testing of electrical wiring accessories and switchgear components using Virtual Lab.
12. Measurement and analysis of energy consumption of household electrical loads using Virtual Lab.

Textbooks

1	**D.P. Kothari and I.J. Nagrath,** *Basic Electrical Engineering*, McGraw Hill Education.
2	**S. K. Bhattacharya,** *Basic Electrical Engineering*, Pearson Education.

References

1	**B.L. Theraja and A.K. Theraja,** *A Textbook of Electrical Technology (Vol. I -Basic Electrical Engineering)*, S. Chand Publications.
2	**Edward Hughes,** *Electrical and Electronic Technology*, Pearson Education.

3	**H. Cotton,** *Advanced Electrical Technology*, CBS Publishers & Distributors.
Useful Links	
1	IIT Bombay Virtual Labs – Electrical Engineering: https://iitb.vlabs.co.in/discipline.html?discipline=Electrical_Engineering
2	NPTEL Online Courses: https://nptel.ac.in

CO-PO Mapping

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

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

Assessment

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

Syllabus Prepared By	Dr. Mohan P. Thakre
Syllabus Checked By	Dr. Mrs. Aditi Karvekar