Walchand College of Engineering

(Government Aided Autonomous Institute)

Vishrambag, Sangli. 416 415

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Course Contents for

S. Y. B. Tech. Electrical Engineering (Working Professional)

Semester III and IV

Applicable to AY 2026-27 and onwards

Semester- III
Professional Core Theory Courses

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7EL201
Course Name	DC Machines and Transformers
Desired Requisites:	Fundamentals of Electrical Engineering

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 provide basic concept of DC machines and transformers
2	It intends to develop skills to evaluate ratings of DC machines and transformers for various applications.
3	It intends to solve problems on DC machines and transformers.
4	This will help students to understand applications of special purpose motors.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain the Construction and working principles of DC machines, and transformers	II	Understanding
CO2	Describe the operation of special purpose machines	II	Understanding
CO3	Solve the numerical problems on DC machines and single phase transformers	III	Applying
CO4	Analyse the performance of three phase transformers	IV	Analysing

Module	**Module Contents**	**Hours**
I	**DC Machines** Constructional Details: Construction of D.C. machines, EMF equation, power flow diagram of D.C. machines. Armature Winding: Simple lap winding and wave winding, winding diagram Armature Reaction: MMF due to armature winding, flux distribution due to armature current and resultant flux distribution in a machine. Demagnetization and cross magnetization ampere turns, principle of compensation, compensating winding and its use in machines.	8
II	**D.C. Motors** Concept of back e.m.f., characteristics of D.C. motors, Method of speed controls, electro braking testing of D.C. Machines: Losses and efficiency, Break test, Swinburn's test, Hopkinson's test, Retardation test, Field test on D.C. series motor.	8
III	**Single Phase Transformer** Construction and type, EMF equation phasor diagram, equivalent circuit, efficiency, losses, regulation, Experimental determination of equivalent circuit parameters(O.C./S.C. test) Voltage regulation, parallel operation	7

IV	**Transformer Testing:** Testing of transformer as per IS, polarity test, heat run test, Sumpner's test and equivalent delta test. Calculation of efficiency. Autotransformer: Construction, Operation, Applications, Rectifier transformer, Difference between rectifier transformer and power transformer	6
V	**Three phase transformer** Construction, single phase bank, polarity test, transformer winding, V-V connection and Scott connection, Vector Grouping YD1, YD11, DY1, DY11, DZ0, DZ 6, YZ1, YZ11. Parallel operation of three phase transformer, Three winding transformer.	6
VI	**Special purpose motors** Universal motor, DC Servomotors, Permanent magnet DC motors, Stepper motors, Applications.	4

Textbooks	
1	Ashfaq Husain, Haroon Ashfaq "*Electric Machines*", Dhanpat Rai and Co, 3rd Edition, 2018.
2	J. B. Gupta, "*Theory and Performance of Electrical Machines*", S. K. Kataria and Sons, 1st Edition, 2013.
3	Kothari and Nagrath, "*Electric Machines*", McGraw Hill, 5th Edition, 2018
References	
1	Purkait and Bandyopadhyay "*Electrical Machines*", Oxford University Press, 1st Edition, 2017.
2	M. G. Say. *"The Performance and Design of Alternating Current Machines",* CBS Publishers, 3rd Edition, 2004
Useful Links	
1	https://nptel.ac.in/courses/108/105/108105017/

CO-PO Mapping

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7EL202
Course Name	Electrical Circuit Analysis
Desired Requisites:	Fundamentals of Electrical Engineering

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 develop an understanding of the fundamental laws and elements of electric circuits.
2	It will make students to learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.
3	It will make students to analyze the first and second order transient and steady state response.
4	The course intends to introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

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	Use KCL, KVL and Ohm's law to obtain voltage, current and equivalent circuit for a electrical circuit.	III	Applying
CO2	Use circuit theorems to obtain voltage, current, power,circuit equivalent and electrical parameters for a electrical circuit.	III	Applying
CO3	Identify the complete response of first and second order circuits.	IV	Analyzing
CO4	Construct the parameters of two port electrical circuits and networks.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**DC Circuits** Ohm's law, Kirchhoff's law, Dependent and independent sources, Nodes, Branches, Loops, Voltage and current division, Wye Delta transformations, Nodal analysis, Mesh analysis, linearity property, Superposition theorem, Source transformation, Thevenin's and Norton's theorem, Maximum power transfer, Reciprocity theorem, Tellegen's theorem, Millman's theorem.	8
II	**First Order Circuits** Capacitors, Series and Parallel Capacitors, Inductors, Series and Parallel Inductors, Source free RC, RL circuits, Step response of RC, RL, circuits.	5
III	**Second Order Circuits** Finding initial and final values, Source free series and parallel RLC circuits, Step response of series and parallel RLC circuits, General second order circuits.	6
IV	**AC Circuits** Sinusoids, Phasors, Impedance and Admittance, Sinusoidal steady state analysis, Nodal and Mesh analysis, Superposition theorem, Source transformation, Thevenin's and Norton's theorem.	8

V	**Power in AC Circuits** Instantaneous and Average Power, Maximum Average Power, RMS Value, Apparent Power and Power factor, Complex Power, Mutual inductance, Dot convention, Energy in coupled circuits.	6
VI	**Two Port Network** Impedance parameters, Admittance parameters, Hybrid parameters, Transmission parameters, Series connection of two two-port network, Parallel connection of two two-port network, Cascade connection of two two-port network.	6

Textbooks	
1	C. K. Alexandar and M.O. Sadiku, "*Fundamentals of Electric Circuits*", McGraw Hill Education, 7th Edition,2022
2	Hayt, Kemmerly, Durbin, "*Engineering Circuit Analysis*", TMH, 8th Edition, 2012.
3	A. Sudhakar, Shyammohan S. "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 5th Edition, 2017.
References	
1	James W. Nilsson and Susan A. Riedel "*Electric Circuits*" Pearson, 11th Edition, 2018.
2	L.P. Huelsman, "*Basic Circuit Theory*", Pearson, 3rd Edition, 2015.
Useful Links	
1	https://nptel.ac.in/courses/108/106/108106172/
2	https://nptel.ac.in/courses/108/105/108105159/
3	https://nptel.ac.in/courses/108/104/108104139/

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3												
CO2	3												
CO3		3											
CO4		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. N.V. Patel
Syllabus Checked By	Mr. A.B. Patil

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7EL203
Course Name	Analog and Digital Circuits
Desired Requisites:	Basic Electronics Engineering

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 aims to introduce students the basic features of operational amplifier.
2	It intends to provide knowledge and experience for implementing simple electronic circuits to meet or exceed design specifications.
3	It is aimed to enable students for implementing combinational logic circuits for various applications.
4	It intends to provide knowledge for implementation of sequential circuits using flip-flops.

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	Summarize the fundamental principles underlying analog and digital circuits.	II	**Understanding**
CO2	Implement analog and digital circuits to meet stated applications	III	**Applying**
CO3	Construct basic analog filters, combinational and sequential circuits	III	**Applying**
CO4	Analyze the performance of analog and digital electronic circuits for a given application	IV	**Analyzing**

Module	**Module Contents**	**Hours**
I	**Fundamentals of Op-Amps** Characteristics of Ideal and practical Operational Amplifiers, Block Diagram, op-amp powering, feedback in op-amp circuits, inverting, non-inverting amplifiers, adder, subtractor, voltage comparator, difference amplifier, op-amp parameters & ratings	6
II	**Applications of Opamps** Instrumentation amplifier, Integrator, Differentiator, Schmitt trigger, Active filters using Opamps, Current to voltage convertor, voltage to current convertor, precision rectifier, peak detector, sample & hold circuit, Logarithmic Amplifier,	7
III	**Review of Transistor Configurations, Voltage Regulators and Multivibrators** Introduction, Types of Configuration: common base, common emitter and common collector configurations, Voltage regulators, fixed voltage regulators (± 5 V, ± 12 V), Adjustable voltage regulators, Multivibrators: IC 555 Astable, Monostable and Bistable	7
IV	**Combinational Circuits and Sequential Circuits** Multiplexer, de-multiplexer, priority encoder, half & full adders, Latches – SR latch, D latch, flip-flops- D F/F, J-K F/F,T F/F, master slave J-K F/F, conversion of one F/F to another F/F.	7

V	**Applications of Sequential circuits** Counters: Modulus of Counter, Synchronous and Asynchronous counters, Ripple counters, drawbacks of ripple counters, Ring counters, Twisted Ring Counters, Shift registers, types of shift registers, design of shift registers using D, J-K FFs	6
VI	**Digital to Analog and Analog to Digital Converters** Need of Digital to Analog and Analog to Digital Converters, Binary weighted DAC, R-2R ladder DAC, Ramp ADC, dual slope ADC, successive approximation technique, flash ADC, voltage and current measurement(block level treatment only).	6

Textbooks	
1	Sergio Franco, "Design with Op-Amps and analog Integrated Circuits", Tata McGraw-Hill Publication, Third Edition, 2001
2	Allen Mottershead, "Electronic Devices &Circuits: An Introduction", Prentice Hall India, 2010
3	A. Anand Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, Fourth Edition, 2014
References	
1	R.A. Gayakwad, "Op-Amps & Linear Integrated Circuits", Prentice Hall India, Fourth Edition, 2012.
2	R. L. Boylestad and Louis Nashelsky, "Electronic Devices & Circuit Theory", Pearson Publications, Tenth Edition, 2009.
3	M. Moris Mano and Michael Ciletti, "Digital Design", Pearson Publications, Fifth Edition, 2013
Useful Links	
1	NOC:Analog Electronic Circuits, IIT Delhi https://nptel.ac.in/courses/108/102/108102112/
2	NPTEL Analog Electronic Circuits , IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
3	NOC:Digital Electronic Circuits, IIT Kharagpur https://nptel.ac.in/courses/108/105/108105132/

CO-PO Mapping

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

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. S. S. Karvekar
Syllabus Checked By	Mrs. A. A. Dhamangaonkar

Professional Core Laboratory Courses

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7EL251
Course Name	DC Machines and Transformer Lab
Desired Requisites:	Fundamentals of Electrical Engineering

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 skills to demonstrate performance operation of DC motors.
2	To develop skills to analyze operation and performance of DC machines using different tests.
3	To analyse the performance of single phase transformer by conducting different tests.
4	To perform different winding connections of three phase transformers.

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	Experiment for verification of different characteristics and performance of DC Machines.	III	Applying
CO2	Experiment to calculate efficiency and losses of DC motor by conducting different tests.	IV	Analysing
CO3	Determine circuit parameters and voltage regulation of single phase transformer.	IV	Analysing
CO4	Test the performance of three phase transformer	IV	Analysing

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Speed control of dc shunt motor (i) Armature control method (ii) Field control method.
2. Determination of efficiency of DC motor by Swinburne's test.
3. Determination of efficiency of DC motor by Hopkinson's test.
4. Brake test on shunt motor to determine its performance and efficiency.
5. Load test on compound motor i) cumulative ii) differential.
6. To perform open circuit and short circuit test for determining equivalent circuit parameters of a singlephase transformer.
7. Parallel operation of single-phase transformer to demonstrate load sharing.
8. Scott connections for converting 3 phase to 2 phase supply.
9. Equivalent Delta test or Heat run Test for determination of temperature rise and efficiency of 3 phase transformer.
10. Parallel connection of 3 phase DY1 and DY11 transformers to demonstrate load sharing.
11. Load test on transformer (single and three phase) to determine losses and efficiency using Sumpner's test.

Textbooks

1	M. G. Say. “The Performance and Design of Alternating Current Machines”, CBS Publishers, 3rd Edition, 2004.
2	O. E. Taylor, “Performance Design of AC Commutator motors”, Wheeler Publisher, 15th Reprint.
References	
1	Purkaitand Bandyopadhyay “Electrical Machines”, Oxford University Press, 1st Edition, 2017.
2	J. B. Gupta, “Theory and Performance of Electrical Machines”, S. K. Kataria and Sons, 1st Edition, 2013.
3	Fitzerald and Kingsley, “Electric Machines”, Tata McGraw Hill, 7th Edition, 2007.
4	Kothari and Nagrath, “Electric Machines”, McGraw Hill, 5th Edition, 2018.
Useful Links	
1	-------

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7EL252
Course Name	Electrical Circuit Analysis Lab
Desired Requisites:	Fundamentals of Electrical Engineering Lab

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 provide basic practical knowledge of electrical circuit analysis.
2	It intends to develop skills to demonstrate transient and steady state response of first and second order electrical circuit.
3	It aims to develop an ability to simulate and implement various basic electrical circuits.
4	It will develop skills in students to build simple hardware circuits and analyze it.

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	Implement electrical circuits using simulations and hardware in order to obtain current, voltage and equivalent resistance.	III	Applying
CO2	Examine KCL, KVL and circuit theorems by building hardware circuit and simulations.	IV	Analyzing
CO3	Measure response of first order circuit with simulation and hardware.	V	Evaluating
CO4	Measure response of second order circuit with simulation and hardware.	V	Evaluating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Implementation of electrical circuits in software tool PSpice to measure current and voltage in D.C. circuit.
2. Verification of voltage and current division rule using hardware circuit.
3. Verification of Superposition Theorem to measure current and voltage in electrical circuit using hardware and validate the result using software tool PSpice.
4. Verification of Thevenin's Theorem to obtain equivalent circuit using hardware and validate the result using software tool PSpice.
5. Verification of Norton's Theorem to obtain equivalent circuit using hardware and validate the result using software tool PSpice.
6. Determine transient and steady state behaviour of a first order circuit (R-C circuit) on hardware and validate the results using software tool PSpice.
7. Determine transient and steady state behaviour of a second order circuit (R-L-C circuit) using software tool PSpice.
8. Demonstration of transient and steady state(underdamped and overdamped) behaviour of a second order circuit(R-L-C circuit) on hardware.
9. Implementation of electrical circuits in software tool PSpice to measure current and voltage in A.C. circuit.

10. Determine the active power of a A.C. circuit using software tool PSpice.	
Textbooks	
1	C. K. Alexandar and M.O. Sadiku, "*Fundamentals of Electric Circuits*", McGraw Hill Education, 7th Edition,2022
2	Hayt, Kemmerly, Durbin, "*Engineering Circuit Analysis*", TMH, 8th Edition, 2012.
References	
1	James W. Nilsson and Susan A. Riedel "*Electric Circuits*" Pearson, 11th Edition, 2018.
Useful Links	
1	https://nptel.ac.in/courses/108/105/108105153/
2	https://nptel.ac.in/courses/108/105/108105064/

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

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

Walchand College of Engineering, Sangli

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AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7EL253
Course Name	Analog and Digital Circuits Lab
Desired Requisites:	Basic Electronics Engineering

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 lab course intends to provide basic practical knowledge of various ICs for developing linear integrated circuits.
2	It intends to impart skills to implement different electronic circuits using operational amplifier.
3	It aims to develop an ability to simulate and implement combinational and sequential circuits.
4	This course will enable students to analyze the characteristics and behavior of analog and digital circuits.

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	Implement circuits to gain practical experience in assembling and wiring both analog and digital circuits	III	Applying
CO2	Illustrate linear integrated circuits using operational amplifier	III	Applying
CO3	Implement applications of various analog and digital circuits.	III	Applying
CO4	Develop the ability to perform experiments and accurately measure circuit parameters to verify it with empirical data	III	Applying

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Demonstration of the performance of opamp in inverting configuration using opamp
2. Demonstration of the performance of opamp in non-inverting configuration and buffer using opamp
3. Implementation of a difference amplifier using operational amplifier
4. Implementation of Instrumentation Amplifier using opamp
5. Construction of Schmitt Trigger using opamp
6. Design of Summing, Averaging and Scaling Amplifier using opamp
7. Design of a first order Active Low Pass filter using opamp
8. Design of a first order Active High Pass filter using opamp
9. Illustration of op-amp as zero crossing detector & peak detector.
10. Construct half-adder and full adder using logic gates
11. Design of the astable and mono stable multi vibrators using IC 555
12. To verify the truth table of D and JK flip flop
13. Demonstrate the operation of decoder using IC74138.
14. Demonstrate the operation of multiplexor using IC74151 15. Construct ring and twisted ring counter using D flip-flops.

Textbooks

1	Sergio Franco, “Design with Op-Amps and analog Integrated Circuits”, Tata McGraw-Hill Publication, Third Edition, 2001
2	Allen Mottershead, “Electronic Devices &Circuits: An Introduction”, Prentice Hall India, 2010
3	A. Anand Kumar, “Fundamentals of Digital Circuits”, Prentice Hall India, Fourth Edition, 2014
References	
1	R.A. Gayakwad, “Op-Amps & Linear Integrated Circuits”, Prentice Hall India, Fourth Edition, 2012.
2	R. L. Boylestad and Louis Nashelsky, “Electronic Devices & Circuit Theory”, Pearson Publications, Tenth Edition, 2009.
3	M. Moris Mano and Michael Ciletti, “Digital Design”, Pearson Publications, Fifth Edition, 2013
Useful Links	
1	NOC:Analog Electronic Circuits, IIT Delhi https://nptel.ac.in/courses/108/102/108102112/
2	NPTEL Analog Electronic Circuits , IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
3	NOC:Digital Electronic Circuits, IIT Kharagpur https://nptel.ac.in/courses/108/105/108105132/

CO-PO Mapping

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

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
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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. S. S. Karvekar
Syllabus Checked By	Mrs. A. A. Dhamangaonkar

Mandatory Courses

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7MA203
Course Name	Mathematics for Electrical Engineering
Desired Requisites:	Engineering Mathematics I and Engineering Mathematics II

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

Course Objectives	
1	To develop Mathematical skills and enhance thinking power of students.
2	To introduce fundamental concepts of Mathematics and their applications in engineering fields

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Apply the Method of Laplace transforms to solve initial-value problems for linear differential equations with constant coefficients.	Applying
CO2	Construct Fourier series for any periodic function by Euler's Formulae	Applying
CO3	Understand the solution of Nonlinear Partial differential equation	Understanding
CO4	Understand the Fourier transform and its properties	Understanding
CO5	Use of basic knowledge of Z- transform to solve the problem in Signal system	Applying
CO6	Apply Various probability distribution to find the probabilities.	Applying

Module	**Module Contents**	**Hours**
I	**Laplace Transform and Its Applications** Definition, Transform of Standard functions, Properties, Transform of derivative and Integral, Inverse Laplace Transform, Convolution Theorem, Applications to solve linear differential equation	7
II	**Fourier Series** Periodic functions , Dirichlet's conditions, Definition , Determination of Fourier coefficients (Euler's formulae), Expansion of functions, Even and odd functions, Change of Interval and functions having arbitrary period, Half range Fourier sine and cosine series.	7
III	**Partial differential equations and its Application** Partial differential equations , Four standard forms, application to one dimensional Heat equation.	6
IV	**Fourier Transform** Definition, Fourier Sine and Cosine Integral, Fourier sine and Cosine transform, Inverse Fourier sine and Cosine transform, Properties, Parseval's Identity.	6
V	**Z-Transform** Definition, Z- transform of standard functions, Properties of Z-transform, inverse Z transform, Application to difference equation	6
VI	**Probability Distribution** Random variable, discrete random variable, continuous random variable, probability mass function, probability density function, Poisson distribution, Normal Distribution, Exponential Distribution.	7

Textbooks	
1	Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley& Sons,Inc,10th Edition,2017.
2	A Text Book Of Applied Mathematics, Vol I and II , P.N. and J.N. Wartikar, Vidyarthi Griha
	Prakashan, Pune, 2010.
3	Higher Engineering Maths, B.S.Grewal, Khanna Publication, 44th Edition, 2017.
4	Fundamental of Mathematical Statistics ,Gupta and Kapoor
References	
1	Higher Engineering Mathematics, B.V.Ramanna., Tata McGraw Hill Education Pvt. Ltd, 1st Edition 2007.
2	Advanced Engineering Mathematics , H.K. Dass, S. Chand and company Ltd., 1st Edition 1988.
3	An Introduction to probability and Statistics, V.K Rohatgi, Wiley Publication, 2nd Edition 2008
4	
Useful Links	
1	https://www.youtube.com/watch?v=lkAvgVUvYvY
2	https://www.youtube.com/watch?v=c9NibpoQjDk

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	2												
CO2	2												
CO3	2												
CO4	2												
CO5	2												
CO6	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	All WCE Programme
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7EE201
Course Name	Understanding Incubation and Entrepreneurship
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	03Hrs/week	MSE	ISE	ESE	Total
Tutorial	-	30	20	50	100

Credits: 3

Course Objectives

1	To familiarize the entrepreneurial framework and the start-up projects which help students to navigate through their own entrepreneurial journey.
2	To develop an entrepreneurial mind-set thereby encouraging the journey of transformation to convert an idea or a solution into a business
3	

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	Translate creative ideas into a sustainable business opportunity	II	Understand
CO2	Apply principles and practice of new entrepreneurial venture planning to assess a business idea	III	Apply
CO3	Differentiate among types of Business Models	IV	Analyze
CO4	Evaluate decision making towards establishing enterprises in real life situations	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to Entrepreneurship** Hand holding for Entrepreneurship GDC start-up stories, The Entrepreneurial Mind-Set , Corporate Entrepreneurship , Generating and Exploiting New Entries	7
II	**Innovation and Entrepreneurship Types** Methodology for Innovation, Team Building, Problem Statement Presentation	6
III	**The Innovation Process** Innovation and Entrepreneurship, Solar Oven case-study Paradigm shift from Design to Entrepreneurship, Bio- Med Innovation and Entrepreneurship, Healthcare and Innovation, Human Centered Innovation, Success Stories	7
IV	**Introduction to Incubators** Business Model Canvas, Technology led Entrepreneurship, Introduction to SINE Incubator, Lean Model Canvas SINE, Start-up Stories:	7
V	**From Corporate to Entrepreneurship** Creativity and Generating Product Ideas, From Idea to Proof of Concept, Network Entrepreneurship	7
VI	**Case Study** Learning from examples Start-up PITCHES - Using Lean Canvas Model	6

Textbooks	
1	Disciplined Entrepreneurship: 24 Steps to a Successful Startup by Bill Aulet
2	The Essence of Medical Device Innovation by B Ravi
3	THE FORTUNE AT BOTTOM OF PYRAMID: Eradicating Poverty Through Profits by C.K.Prahalad Stay Hungry

References	
1	Stay Foolish by Rashmi Bansal
2	The Entrepreneurial Connection: East Meets West in the Silicon Valley by Gurmeet Naroola
3	Innovation By Design: Lessons from Post Box Design & Development by B. K. Chakravarthy , Janaki Krishnamoorthi
4	
5	

Useful Links	
1	

CO-PO Mapping

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

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

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

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

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AY 2026-27

Course Information

Programme	All WCE Programme
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7VE201
Course Name	Value Education
Desired Requisites:	Open mind and a willingness to learn

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

Course Objectives

1	Develop holistic personal and professional skills by enhancing communication, emotional intelligence, and resilience to foster positive relationships and sustainable living practices.
2	Promote ethical and sustainable leadership through the application of integrity, teamwork, and a growth mindset to navigate success and failure while mastering effective presentation and communication skills.
3	Empower lifelong learning and contribution by reflecting on personal values, engaging in critical thinking, and committing to continuous self-assessment and professional development for addressing global challenges.

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	Learn effective communication, empathy, and relationship- building skills to foster positive interactions in personal and professional settings.	I	Remembering
CO2	Incorporate sustainable habits into daily life and build resilience through mindfulness and stress management to handle challenges and support environmental stewardship.	II	Understanding
CO3	Develop goal-setting and achievement strategies, manage success and failure, and deliver impactful presentations for overall personal and professional development.	III	Applying
CO4	Strengthen analytical skills and creative problemsolving techniques to make informed decisions and tackle complex issues in various contexts.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Interpersonal skills** Introduction to Relationships, Communication Skills, Emotional Intelligence, Conflict Resolution, Maintaining Healthy Relationships	5

II	**Sustainable Living** Introduction to Sustainability, Environmental Impact, Sustainable Practices, Community Involvement, Personal Action Plan	5
III	**Inner Peace and Resilience** Understanding Inner Peace, Mindfulness and Meditation, Stress Management, Building Resilience, Positive Mindset	5
IV	**The Art of Winning** Winning Mindset, Goal Setting, Perseverance and Adaptability, Teamwork and Leadership, Case Studies and Real-life Examples	5
V	**Success and Failure Management** Understanding Success and Failure, Learning from Failure, Growth Mindset, Balancing Success and Failure, Personal Development Plan	5
VI	**The Art of Presentation** Introduction to Presentations, Content Organization, Verbal and NonVerbal Communication, Practice and Delivery, Feedback and Improvement	5

Textbooks	
1	Stephen R. Covey, *The 7 Habits of Highly Effective People*, Free Press, 25th Anniversary Edition, 2013.
2	Daniel Goleman, *Emotional Intelligence: Why It Can Matter More Than IQ*, Bantam Books, 10th Anniversary Edition, 2005.
3	Carol S. Dweck, *Mindset: The New Psychology of Success*, Ballantine Books, Updated Edition, 2016.
4	William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the Way We Make Things*, North Point Press, 1st Edition, 2002.
5	Garr Reynolds, *Presentation Zen: Simple Ideas on Presentation Design and Delivery*, New Riders, 2nd Edition, 2011.
References	
1	Covey, S. R. (1989). *The 7 Habits of Highly Effective People*. Simon & Schuster.
2	Rosenberg, M. B. (2015). *Nonviolent Communication: A Language of Life*. PuddleDancer Press.
3	Carnegie, D. (1998). *How to Win Friends and Influence People*. Simon & Schuster.
4	Covey, S. R. (1989). *The 7 Habits of Highly Effective People*. Simon & Schuster.
5	Rosenberg, M. B. (2015). *Nonviolent Communication: A Language of Life*. PuddleDancer Press.
	Useful Links
1	https://ideas.ted.com/how-to-build-closer-relationships/
2	https://www.nationalgeographic.com/environment/article/sustainable-living
3	https://www.lexisnexis.in/blogs/family-law-in-india/
4	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8937019/
5	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8710473/
CO-PO Mapping	

CO-PO Mapping													
	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1							2	2	3		2		
CO2						2	2	2			2		
CO3				1		1	2	3	2	2	2		
CO4				3	2	2	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
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem III
Course Code	W7CEEL251
Course Name	Community Engagement Project / Field Project
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	To conduct thorough community needs assessments and analyze data to identify specific challenges and opportunities for engineering interventions.
2	To apply engineering principles, techniques, and methodologies effectively to develop innovative solutions that address identified community needs.

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 technical knowledge and skills to develop and implement community service projects.	III	Applying
CO2	Identify and analyze community needs to design appropriate engineering solutions.	IV	Analyzing
CO3	Collaborate effectively with team members and community stakeholders to achieve project goals.	V	Evaluating
CO4	Reflect on the ethical, social, and professional implications of engineering projects within the community.	V	Evaluating

List of Experiments / Lab Activities/Topics

The Community Engagement Project/Field Project integrates academic learning with community service, allowing Electrical Engineering (EE) students to apply their technical skills in real-world settings. This course aims to provide social responsibility, enhance problem-solving skills, and provide practical experience through direct involvement in community projects.

List of Community Engagement Project / Field Project Activities:

1. Solar Power Installation for Community Centres: Design and install solar panels for local schools, libraries, or community centres to provide them with sustainable energy solutions.
2. Energy Audits for Local Homes and Businesses: Conduct energy audits to help residents and businesses identify ways to reduce energy consumption and costs.
3. Smart Lighting Systems: Develop and install smart lighting solutions for public parks or community areas to enhance energy efficiency and safety.
4. Water Purification Systems: Create and implement water purification systems in areas with limited access to clean drinking water.
5. Public Wi-Fi Networks: Set up free Wi-Fi hotspots in underserved areas to help bridge the digital divide.
6. Electric Vehicle Charging Stations: Design and install EV charging stations in public spaces to encourage the use of electric vehicles.

7. Assistive Technology for Disabled Individuals: Create custom electronic devices or systems to aid individuals with disabilities in the community.
8. Renewable Energy Workshops: Conduct workshops on building small-scale renewable energy projects, like wind turbines or solar chargers, to educate and empower the community.
9. Smart Irrigation Systems: Design and implement smart irrigation systems for community gardens or local farms to optimize water usage and improve crop yields.
10. E-Waste Recycling Program: Set up a program to collect and properly recycle electronic waste, educating the community on the importance of e-waste management.
11. Home Automation for Elderly: Install simple home automation systems for elderly residents to enhance their safety and convenience.

*Note- Students must deliver a final presentation and submit a comprehensive report as the end of their project. The final presentation should be a concise, visually engaging slide deck that includes an introduction, methodology, results with data visualizations, discussion, and conclusion, followed by a Q&A session to address audience queries. Concurrently, students must submit a detailed report that documents every aspect of their project from start to finish. This report should adhere to the specified guidelines and include sections such as the title page, abstract, introduction, methodology, results, discussion, and conclusion, providing in-depth information and supporting evidence for the project's findings.

Textbooks	
1	"The Engineer's Guide to Community Service" by Jim H. Anderson
2	Teamwork and Project Management" by Karl A. Smith
3	"Engineering Your Community: The Professional Practice of Engineering in Public Service" by David T. Wells
4	Engineering Ethics: Concepts and Cases" by Charles E. Harris, Jr., Michael S. Pritchard, Michael J. Rabins, Ray W. James, and Elaine E. Englehardt

References	
1	Community-Based Participatory Research for Health: From Process to Outcomes" by Meredith Minkler and Nina Wallerstein
2	Social Entrepreneurship: What Everyone Needs to Know" by David Bornstein and Susan Davis

Useful Links	
1	https://www.globalgiving.org/
2	https://www.volunteermatch.org/
3	https://www.councilofnonprofits.org/

CO-PO Mapping

	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3		3			3							
CO2		3		3				3					
CO3					3				3				
CO4						3	3			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				
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	Dr. V. P. Mohale
Syllabus Checked By	Mr. A. N. Inamdar

Walchand College of Engineering, Sangli

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AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. III
Course Code	W7VSEL251
Course Name	Simulation Lab
Desired Requisites:	NIL

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

Course Objectives

1	This course intends to provide basic knowledge of MATLAB software for developing, modelling and programming techniques.
2	It intends to impart skills to implement different tool boxes of MATLAB Simulink for electrical engineering application
3	To solve electrical engineering problems with different tool boxes of MATLAB Simulink for electrical engineering application.
4	To design electrical systems with MATLAB Simulink software.

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	Grasp the basic aspects of MATLAB programming.	II	Understanding
CO2	Solve simple mathematical equations using MATLAB.	III	Applying
CO3	Construct MATLAB software-based projects.	IV	Analyzing
CO4	Formulate electrical systems using MATLAB.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Outline of MATLAB Programming and Computation of arithmetic, exponential, trigonometric and complex form operation using MATLB programming.
2. Demonstrate simple matrix and array manipulation using MATLAB.
3. Basic MATLAB Programming using control structures.
4. Develop a program for plotting various graphs (2D and 3D).
5. Outline to MATLAB Simulink.
6. To study different tool boxes of electrical engineering.
7. Solve electrical circuits using MATLAB Simulink.
8. To study Powergui block in MATLAB Simulink.
9. To build simple MATLAB simulations using power systems tool box.
10. To create simple MATLAB based projects.

Textbooks

1	"Modelling and simulation using MATLAB Simulink", Wiley Publication, Dr. Shailendra Jain ,Reprint :2013

References

1	“Matlab programming for Engineers”, Stephen Chapman, Thomson Learning publication, 3rd Edition.
2	“Contemporary linear systems using MATLAB”, Robert Strum and Donald Kirk, Thomson Learning publication.
3	“Power System Transient Analysis”, Theory and Practice using simulation programs, Power System, Eiichi Haginomori Junichi Arai, WILEY Publication.
Useful Links	
1	MATLAB Programming for Numerical Computation: https://nptel.ac.in/courses/103106118

CO-PO Mapping													
	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	2				1								
CO2	1	2											
CO3			3		2								2
CO4	3	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.(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. S. S. Medhekar
Syllabus Checked By	Dr. R. P. Hasabe

Semester- IV
Professional Core Theory Courses

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	W7EL221
Course Name	AC Machines
Desired Requisites:	Fundamentals of Electrical Engineering, DC Machines and Transformer

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 provide basic concepts of operation and performance of asynchronous and synchronous machines.
2	It intends to develop implicational skill to operate asynchronous and synchronous machines.
3	It intends to develop skill to determine performance asynchronous and synchronous machines.
4	Applications which will be utilized in the electrical machines with its performance and theory of operation.

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 working principle, construction and operation of asynchronous and synchronous machines	II	Understanding
CO2	Solve numerical on asynchronous and synchronous machines.	III	Applying
CO3	Analyze the performance of synchronous and asynchronous machines.	IV	Analyzing
CO4	Assess machines as per performance analysis requirement.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Synchronous Generator** Construction, Principle of operation, distribution factor, pitch factor, Three Phase Winding (Single layer, double layer), Elimination of harmonics voltage, EMF equation, leakage reactance, armature reaction, armature resistance and reactance, field excitation system, damper winding	8
II	**Performance of Synchronous Generator** Calculation of voltage regulation by synchronous Impedance method, zero power factor method, MMF method, experimental setup for above method, rating, efficiency and losses, method of synchronizing, synchronizing power, hunting, damping operation single and Infinite bus, power angle equation, short circuit ratio and its significance. Two Reaction Theory: Phasor diagram, slip test, power angle equation, saliency power.	6
III	**Synchronous Motor** Method of starting, phasor diagram, torque and torque angle equation, V curves and experimental setup, hunting and damping, synchronous condenser.	5

IV	**Three Phase Induction Motor** a. Construction, Principle of operation: Phasor diagram, equivalent circuit, analysis based on approximate equivalent circuit, Torque equation, speed equation, speed torque curve, b. Slip ring Induction Motor: Effect of increase in rotor resistance, starting, speed control of motor. c. Speed control of Induction Motor: Change of supply frequency, pole changing, cascading, Injection of EMF in secondary. d. Application and Testing: Testing as per I.S.S., Industrial applications of induction motor	8
V	**Computations and Classification of Three Phase Induction Motor** a. Computations: No load test, Blocked rotor test, and circle diagram, starting and types of starter, ratio of starting torque to full load torque. b. Double Cage Induction Motor (D.C.I.M.): Construction, Characteristics and Equivalent circuit. c. Synchronous Induction Motor: Construction, Circle diagram, Phasor diagram.	8
VI	**Single Phase Induction Motor and, Three Phase Motor Winding** Single Phase Induction Motor: Types, Construction, Double revolving field theory, Principle of operation, phasor diagram, equivalent circuit, Experimental determination of parameter, application.	4

Textbooks	
1	M. G. Say. “Performance Design of AC Machines”, CBS Publishers, 4thEdition, 1976.
2	O. E. Taylor, “Performance Design of AC Commutator Motors”, Wheeler Publisher, 15th Reprint.
References	
1	J. Chapman, “Electrical Machine”, McGraw Hill, 5th Edition, 2009.
2	P S Bimbhra, “Electrical Machinery”, KHANNA PUBLISHERS, Seventh edition, 2021
3	J. B. Gupta, “Electrical Machines”, SK Kataria and Sons, 3rd edition, 2011.
4	Fitzerald and Kingsley,“Electric Machine”, Tata McGraw Hill, 2nd Edition, 2000.
Useful Links	
1	Electrical Machines 2 NPTEL: https://archive.nptel.ac.in/courses/108/105/108105131/

CO-PO Mapping													
	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3												
CO2		3											3
CO3				2									3
CO4	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. S. S. Medhekar
Syllabus Checked By	Mrs. S. L. Shaikh

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. IV
Course Code	W7EL222
Course Name	Electrical Transmission and Distribution
Desired Requisites:	Electrical Circuit Analysis, D.C. Machine and Transformers

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

Course Objectives

1	To introduce the students to the general structure of the network for transferring power from generating stations to the consumers
2	This course will introduce the students about the structure and performance analysis of power systems
3	To expose the students to the different electrical & mechanical aspects of the power network along with its environmental and safety constraints.
4	This course will develop analytical skills in the students for investigating issues related to power 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 the basic concepts of electrical power supply related to transmission and distribution.	II	Understanding
CO2	Calculate the transmission line parameters, sag of an overhead transmission line and string efficiency of insulators.	III	Applying
CO3	Analyze the performance of various types of transmission lines and distribution system topologies.	IV	Analyzing
CO4	Scrutinize voltage and power factor control methods for improving performance of transmission and distribution systems.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Structure of Power Systems** Generation, transmission, distribution and utilization of electrical power, A.C. and D.C. Transmission, Advantage and limitation of high transmission voltage, Types of lines, Types of conductors, Voltage levels.	5
II	**Mechanical aspects of transmission lines** Support structures, Electrical clearances, Safety norms, Sag calculations, Effect of wind and ice covering of sag, Types of insulators, String efficiency of insulators.	6
III	**Transmission line representation and performance calculation** Resistance of transmission line, Skin effect, Inductance of transmission line, Concept of self GMD and mutual GMD, Capacitance of transmission line, Single Line Diagram (SLD), PU quantities, short, medium and long line models, performance calculations, ABCD constants.	8

IV	**Distribution Systems and Underground Cables** Types of feeders, distributors, AC and DC distribution systems, Sub-stations, UG cables for LT and HT systems.	6
V	**Voltage control and Power factor improvement** Methods of voltage control, AVRs, Tap changing transformers, Causes of low p.f., Effects of low p.f., Shunt capacitors, Calculation of reactive power injection and p.f. correction.	8
VI	**Economic operation of power systems** Basics of Economic load sharing, Incremental fuel cost, Economic dispatch neglecting transmissions losses, Penalty factor, General Loss Formula, optimum load dispatch considering transmissions losses.	6

Textbooks	
1	Ashfaq Husain, "*Electrical Power Systems*", CBS, 5th Edition, 2007.
2	D Das, "*Electrical Power Systems*", New Age International, 2016.
3	V.K. Mehta and Rohit Mehta, "Principles of Power System", S. Chand, 2005
References	
1	Nagrath, Kothari, Modern, "*Power System Analysis*", TMH, 2nd Edition, 2015.
2	HadiSaadat, "*Power System Analysis*", TMH, 1st Edition, 2002.
3	S. Sivanagaraju and S. Satyanarayana, "Electrical Power Transmission and Distribution",Pearson, 2009
Useful Links	
1	https://nptel.ac.in/courses/108/105/108105104/

CO-PO Mapping

	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	2											2	
CO2	3											2	
CO3		3										2	
CO4			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. N.V. Patel
Syllabus Checked By	Dr. V.P. Mohale

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. IV
Course Code	W7EL223
Course Name	Power Electronics
Desired Requisites:	Analog and Digital Circuits

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

Course Objectives

1	To provide basic knowledge of different power electronic devices, rectifiers, converters, inverters and choppers.
2	To impart skills of analysis for different types of converters such as rectifiers, controlled converters, inverters and choppers.
3	To make the students acquainted with design of different types of converters such as rectifiers, controlled converters, inverters, choppers and their associated control circuit.
4	To provide foundation for advances in power electronic circuits and 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	Describe the basics of semiconductor switches, rectifier, control converter, inverter, choppers, and cyclo-converter and matrix converter circuits.	II	Understanding
CO2	Calculate the performance of semiconductor switches, rectifier, converter, inverter, choppers, and cyclo-converter and matrix converter circuits.	III	Applying
CO3	Analyze the Power Electronic Circuits such as rectifier, converter, inverter, choppers, and cyclo-converter and matrix converter circuits.	IV	Analyzing
CO4	Evaluate the performance of power electronic circuits such as rectifier, converter, inverter, choppers, and cyclo-converter and matrix converter circuits.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Power Semiconductor Switches:** Characteristics of ideal switch, V-I Characteristics, Rating, protection and cooling of power semiconductor devices such as power diodes, transistor, MOSFET, IGBT and GTO, Study of the driver circuits for thyristor, GTO and IGBT, Introduction to smart power modules, Comparative study of MOSFET, thyristor, GTO, BJT and IGBT.	6
II	**Single Phase and Three Phase AC to DC rectifiers** Single phase half wave and single-phase full wave diode bridge. Three phase half wave and three phase full wave diode bridge, Transformer power rating for above configurations. Source current and output voltage analysis.	6

III	**Phase Controlled AC to DC Converters** Classification of converters, Single phase half controlled and fully controlled thyristor converters, three pulse and six pulse controlled converters, operation of converter with freewheeling diode. Effect of source inductance on the performance of the converter, overlap – angle. Performance factors for the converter such as displacement factor, distortion factor, total harmonic distortion, ripple factor and transformer utilization factor. Introduction to 12 pulse converter, single phase and three phase dual converter, firing scheme for 1 phase and three phase converter, Brief introduction to commutation methods. Introduction to PWM converters.	8
IV	**DC to DC Converters** Control of DC-to-DC converters, step down (buck) converter, Analysis of buck converter with RLE load, step up converter, buck – boost converter, full bridge DC to DC converter, concept of multiphase choppers, cuk converter.	6
V	**Switch Mode DC – AC Inverters** Basic concepts of switch mode inverters, types: VSI and CSI, single phase half bridge and full bridge inverter, three phase six step inverter, 1200 mode of conduction, 1800 mode of conduction, three phase PWM Inverter, sinusoidal PWM and selective harmonics elimination methods of PWM. Effect of blanking time on output voltage in PWM inverters, auto sequentially commutated CSI, Solar Inverters, Introduction to multilevel inverters.	7
VI	**Cycloconverters and Matrix Converter** Introduction to Single phase and three phase cycloconverters. Working and topologies of Matrix converter, control methods, performance analysis of matrix converter.	6
Textbooks		
1	M. H. Rashid "Power Electronics, Circuits, Devices and Applications", Pearson Education Inc., 4th Edition, November 2017.	
2	P. S. Bhimra, "Power Electronics",3rd Edition, Khanna Publishers, 2002.	
References		
1	B.K. Bose, "Modern Power Electronics and A.C. Drives", Prentice Hall of India Pvt. Ltd. Publication, 2002.	
2	Mohan, Undeland Robins, "Power Electronics, Converter Applications and Design", John Wiley and sons (Asia) Pvt. Ltd., 3rd Edition, 2010.	
3	G. K. Dubey and Others "Thyristorised Power Controller", New Edge International Publishers, 1st Edition Reprint, 2005.	
Useful Links		
1	https://nptel.ac.in/courses/108105066	
2	https://archive.nptel.ac.in/courses/108/102/108102145/	

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

Professional Core Laboratory Courses

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. IV
Course Code	W7EL271
Course Name	AC Machines Lab
Desired Requisites:	Fundamentals of Electrical Engineering, DC Machines and Transformers

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 performance operation of synchronous and asynchronous machines.
2	It intends to develop skills to analyse operation and performance of asynchronous and synchronous machines.
3	To understand the equivalent circuit of a synchronous and asynchronous machines.
4	To obtain the characteristics of Synchronous and Asynchronous machines by performing suitable test.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Demonstrate experiment to verify electrical characteristics and performance of induction and synchronous machines	III	Applying
CO2	Analyse performance of induction motors and synchronous machines.	IV	Analysing
CO3	Estimate appropriate ratings and develop circuit connections for an experiment as a group activity.	IV	Analysing
CO4	Design winding diagrams as per given specification	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. No load and Blocked rotor test on induction motor and performance of 3 phase I.M. from circle diagram.
2. Study of A.C. Machines parts.
3. Study of Induction motor starters.
4. Speed control of Induction Motor
5. Parameter calculation of single phase induction motor from No load and Blocked rotor test.
6. Determination of voltage regulation of alternator using Synchronous Impedance method.
7. Determination of voltage regulation of alternator using MMF method.
8. Determination of voltage regulation of alternator using Zero power factor method.
9. Synchronization of alternator with bus bar.
10. V-Curves of Synchronous motor.
11. Study of starting method of synchronous motor.
12. No load and Blocked rotor test on induction motor and performance of 1 phase I.M.
13. Design of 3 phase armature winding for synchronous and asynchronous machines.

Textbooks

1	M. G. Say. "Performance Design of AC Machines", CBS Publishers, 4thEdition, 1976.

2	O. E. Taylor, “Performance Design of AC Commutator Motors”, Wheeler Publisher, 15th Reprint.
References	
1	J. Chapman, “Electrical Machine”, McGraw Hill, 5th Edition, 2009.
2	P S Bimbhra, “Electrical Machinery”, KHANNA PUBLISHERS, Seventh edition, 2021
3	J. B. Gupta, “Electrical Machines”, SK Kataria and Sons, 3rd edition, 2011.
4	Fitzerald and Kingsley,“Electric Machine”, Tata McGraw Hill, 2nd Edition, 2000.
Useful Links	
1	Electrical Machines 2 NPTEL: https://archive.nptel.ac.in/courses/108/105/108105131/

CO-PO Mapping													
	Programme Outcomes (PO)											**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3												
CO2		3											
CO3			2										1
CO4	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.(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. S. S. Medhekar
Syllabus Checked By	Mrs. S. L. Shaikh

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. IV
Course Code	W7EL272
Course Name	Power Electronics Lab
Desired Requisites:	Analog and Digital Circuits Lab

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 provide the practical knowledge of different power electronics devices.
2	To impart skills of working of different power electronic converter through simulation and experimentation.
3	To make the students acquainted with simulation, analysis and design of power electronic converters.
4	To provide foundation for advances in power electronic circuits and 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	Demonstrate experiments on basics of converters such as rectifier, inverter, and Chopper etc.	III	Applying
CO2	Construct different types of converters such as rectifier, inverter and Chopper with their control techniques using simulation.	III	Applying
CO3	Measure the performance of converters such as rectifier, inverter, and Chopper.	IV	Analysing
CO4	Design and Analyze power converter circuits and select suitable power electronics devices by assessing the requirements of application fields.	V	Evaluate

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Verify the Voltage and current relationship in 3 phase full wave diode bridge rectifier and evaluate the input current harmonic spectrum.
2. Evaluate the load side performance of single-phase full wave half control converter.
3. Evaluate the load side performance of single-phase full wave full control converter.
4. Evaluate the load side performance of three phase full wave half-controlled converter.
5. Evaluate the load side performance of three phase full wave full controlled converter.
6. Develop the firing angle control scheme for single phase full wave, half controlled and full controlled converters.
7. Develop the firing angle control scheme for three phase full wave half-controlled converter.
8. Develop the firing angle control scheme for three phase full wave full controlled converter.
9. Evaluate the performance of MOSFET based buck converter.
10. Evaluate the performance of MOSFET based boost converter.
11. Develop the control circuit for single phase PWM Inverter.
12. Develop the control circuit for three phase square wave Inverter.

Textbooks

1	M.H.Rashid “Power Electronics, Circuits, Devices and Applications”, Pearson Education Inc., 4th Edition, November 2017.
2	P. S. Bhimra, “Power Electronics”, 3rd Edition, Khanna Publishers, 2002.
References	
1	B.K. Bose, “Modern Power Electronics and A.C. Drives”, Prentice Hall of India Pvt. Ltd. Publication, 2002.
2	Mohan, Undeland and Robins, “Power Electronics, Converter Applications and Design”, John Wiley and sons (Asia) Pvt. Ltd., 3rd Edition, 2010.
3	G. K. Dubey and Others “Thyristorised Power Controller”, New Edge International Publishers, 1st Edition Reprint, 2005.
Useful Links	
1	

CO-PO Mapping

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

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	Dr. D. S. More
Syllabus Checked By	Dr. Mrs. A. S. Karvekar

Multidisciplinary Minor

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	W7MDEL221
Course Name	Multi-Disciplinary Minor I : Electrical Machines
Desired Requisites:	Fundamentals of Electrical Engineering

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

Course Objectives

1	To make students understand operation and performance of ac and dc machines.
2	To make students learn characteristics of ac and dc machines.
3	To develop skills to choose ratings of ac and dc machines for various applications.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Explain the construction and working principle of A.C. and D.C. Machines.	Understand
CO2	Examine the various characteristics of A.C. and D.C. machines.	Apply
CO3	Analyze the performance of A.C. and D.C. machines for various applications.	Analyze
CO4	Evaluate the efficiency and regulation of transformers and machines for optimal design.	Evaluate

Module	**Module Contents**	**Hours**
I	**DC Motors** Review of Construction, Working and Types, Back emf, Speed equation, Armature Reaction, Torque equation, Speed torque characteristics, Applications, Power losses in d.c. motors. Need of starter speed control of D.C. shunt and series motor, Thyristor based speed control for D.C. motor. Reversal of rotation, Electric braking of shunt and series motor.	6
II	**Single Phase Transformer** Construction and type, EMF equation phasor diagram, equivalent circuit, efficiency, losses, regulation, Experimental determination of equivalent circuit parameters and calculation of efficiency and regulation, Introduction to three Phase Transformer, Connection of three Phase Transformer, Applications of Transformers	6
III	**Single-Phase Induction Motor** Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, capacitor run, and shaded pole motors. Comparison of single-phase motors and applications.	6
IV	**Three Phase Induction Motor** Construction, Types, Working, Speed equation, Torque equation, Starting torque, Concept of full load torque, torque speed characteristics, Power stages in motor, Induction Generator.	7

V	**Synchronous Machines** Alternator, Construction of Alternator, Synchronous Motor, Equivalent Circuit, Motor on load, Pull-Out Torque, Motor Phasor Diagram, Mechanical Power Developed by Motor, Power Factor of Synchronous Motor, Application of Synchronous Motor, Comparison of Synchronous Motor with Induction Motor.	7
VI	**Special-Purpose Electric Machines** Stepper motor-Variable-Reluctance Motor, Permanent Magnet Motor, Hybrid Stepper Motor, Servomechanism, D.C. Servomotors, A.C. Servomotors, Switched Reluctance Motor, Permanent Magnet D.C. Motor, Brushless D.C. Motor. Selection and Sizing of Motors based on applications.	7

Text Books

1	S. J. Chapman, "Electric Machinery Fundamentals", Tata Mc Graw Hill publication, 4th Edition, 2011, ISBN: 9780071070522
2	M. G. Say. "Performance Design of AC Machines", CBS Publishers, 3rd Edition, 2017, ISBN: 9788123910277

References

1	SK Bhattacharya, "Electrical Machines", Tata Mc Graw Hill, 3rd Edition, 2010, ISBN: 9789332902855
2	J. B. Gupta, "Electrical Machines", SK Kataria and Sons, 2013, ISBN: 9789350140550

Useful Links

1	https://nptel.ac.in/courses/108/102/108102146/
2	https://nptel.ac.in/courses/108/105/108105155/
3	https://nptel.ac.in/courses/108/105/108105131/

CO-PO Mapping

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

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:Hi|h
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. A. N. Inamdar
Syllabus Checked By	

Mandatory Courses

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2026-27

Course Information	
Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem. IV
Course Code	W7ESEL201
Course Name	Signals and Systems
Desired Requisites:	Engineering Mathematics III

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 develop an understanding of the basic concepts of signals and systems.
2	It will make students to learn signal and system operations and analysis techniques such as convolution for continuous and discrete time.
3	It will make students to study and analyze the continuous time signals and systems in laplace and fourier domain.
4	It will make students to study and analyze the discrete time signals and systems in z-domain and discrete time fourier domain.

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 mathematical principles of continuous time, discrete time systems and applications of signal processing techniques.	II	Understanding
CO2	Use mathematical concepts for signal and system response like convolution.	III	Applying
CO3	Calculate the response of linear systems in continuous time domain using tools laplace transform and fourier transform.	IV	Analyzing
CO4	Calculate the response of linear systems in discrete time domain using tools z- transform and discrete time fourier transforms.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Introduction to Signals and Systems** Continuous and Discrete time signals , standard signals, signal representation, classification of signals, systems – Introduction ,representation, classification, Linear, Time invariant, causal, BIBO stable, Static, dynamic.	8
II	**Time Domain Analysis of Continuous and Discrete Time Systems** Zero state and Zero input response, Impulse response, Convolution integral and convolution sum, graphical representation of convolution.	6
III	**Fourier Domain Analysis of Continuous Time Signals and Systems** Fourier series, Exponential form, Dirichlet Conditions, Frequency domain representation of periodic signals, Fourier Transform representation of aperiodic signals, Properties of CTFT, Convolution – time and frequency domain, system response using CTFT.	6
IV	**Laplace Transform Analysis of Signals and System** Definition, Properties, magnitude and phase, Solution of differential equation. Transfer function, Poles and Zeroes, Initial conditions, System analysis using laplace transform with and without initial conditions, Stability in s-domain.	7

V	**Fourier Domain Analysis of Discrete Time Signal and Systems** Representation of CT signals using Samples, Nyquist Sampling Theorem Discrete time Fourier Transform, Representation of aperiodic sequence, Properties of DTFT: time reversal, Convolution. System response using DTFT	6
VI	**Z Transform Analysis of Discrete Time Signals and Systems** Definition, Properties, Solution of difference equation. Transfer function, Poles and Zeroes, System analysis using Z-Transform with and without initial conditions, Stability analysis using z-plane.	6
Textbooks		
1	A.V. Oppenheim, A.S. Willsky, S.H. Nawab, "*Signals and Systems"*, Prentice Hall, 1997.	
2	B. P. Lathi, "*Linear systems and signals"*, Oxford University press, 2005.	
References		
1	Simon Haykin, Barry Van Veen, "*Signals and systems"*, Wiley, 2003.	
2	M. J. Roberts, "*Signals and systems"*, Tata McGraw Hill, 2005.	
Useful Links		
1		

CO-PO Mapping

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

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. A.B. Patil
Syllabus Checked By	Mrs. S.P. Diwan

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B.Tech. (All branches)
Class, Semester	Second Year B.Tech., Sem - II
Course Code	
Course Name	Employability Skills Development (ESD)
Desired Requisites:	--

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	4Hrs/week	**ISE**	**MSE**	**ESE**	**Total**
Tutorial	-	20	30	50	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives

1	To improve the problem-solving skills of students
2	To understand the approach towards problem solving
3	Understanding the sectional cut-offs for different companies

Course Outcomes

CO1	Ability to improve the accuracy percentage	
CO2	Understand the current changing recruitment trends	
CO3	Understanding the differential marking scheme in papers	
CO4	Performance improvement in competitive exams like CAT, GATE	

Module	**Module Contents**	**Hours**
I	**Arithmetic I** Ratio, Proportion, Mark Up & Discount, Averages, Mixtures & Alligations, Simple & Compound Interest	6

II	**Arithmetic II** Percentages, Profit & Loss, Time & Work, Time, Speed & Distance, Boat & Streams, Linear Races s	8
II	**Numbers** Cyclicity, Remainders, Cyclicity of Remainders, Indices, Factors, LCM, HCF	4
III	**Permutation, Combination, Probability** Fundamental principal of counting, Arrangements, Selection, Grouping, Distribution, Independent Events, Conditional Probability, Binomial Distribution	6
IV	**Logical Reasoning** Clocks, Calendars, Games & Tournaments, Analytical Puzzles, Binary Logic, Blood relations, Directions, Coding, Decoding, Seating Arrangement (Linear, Circular & Rectangular)	6
V	**Verbal Ability I** Vocabulary - Synonyms, Antonyms, Analogies Reading Comprehension, Para Jumbles	6
VI	**Verbal Ability II** Parts of Speech, Tenses, Subject Verb Agreement	4
Text Books		
1	Quantitative Aptitude - Abhijit Guha	
2	Quantitative Aptitude - Sarvesh Agarwal	
References		
1	Quicker Maths - M. Tyra	
2	Quantitative Aptitude - Chandresh Agarwal	
3	Puzzles to puzzle you - Shakuntala Devi	
Useful Links		
1	www.campusgate.co.in	
2	www. Lofoya.com	
3	www.brainbashers.com	

CO-PO Mapping													
	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1										3			
CO2						2							
CO3								3					
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
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	B. Tech. (All Branches)
Class, Semester	Second Year B. Tech., Sem III & IV
Course Code	W7IK201
Course Name	Introduction to Ancient Indian Technology
Desired Requisites:	General curiosity, maturity expected from adult student.

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	02 Hrs/week	MSE	ISE	ESE	Total
Tutorial	-	30	20	50	100
		Credits: 2			

Course Objectives	
1	The course is designed for undergraduate students, interested in learning about the ancient Indian technology which is the hallmark of glorious Indian civilization.
2	The objective is to emphasize on nature centric aspects of ancient Indian technologies that can be adopted in modern time.
3	The course is to expose the students to ancient science and technologies which can be adopted for modern technological development.

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	Name the ancient Indian technological achivments	1	Remenbering
CO2	Comprehend the concept of Indian traditional knowledge and its relevance	2	Understanding
CO3	Explain the Indian contribution to the world at large	2	Understanding
CO4	Judge the ancient Indian technology.	5	Evaluating

Module	**Module Contents**	**Hours**
I	Introduction: Why are ancient Indian science and technology relevant today? What is science? How is it different from technology? .	4
II	Philosophy of ancient Indian technology, how is different from modern technology? Ancient Indian Scientific methods. Glimpses of ancient Indian science and technology?.	4
III	Material technology in ancient India : Mining, Metals and Metallurgy, Iron Making and craftsmanship, Wootz Steel Technology	5
IV	Extraction of Zinc in ancient India, Glass making, Bead making Techniques, Ceramic Technology.	4
V	Water Harvesting Technology, Irrigation Systems. Town planning, Building construction, Sanitation from ancient India period.	5

	VI	Agriculture and Textile Technology in context of ancient India i.e Bharat.	4

	Textbooks	
	1	Transcript of the NPTEL course available at https://archive.nptel.ac.in/courses/101/104/101104065/. Title of the course "Introduction To Ancient Indian Technology" by Prof. D.P. Mishra Department of Aerospace Engineering, IIT Kanpur
	References	
	1	The NPTEL course available at https://archive.nptel.ac.in/courses/101/104/101104065/. Title of the course "Introduction To Ancient Indian Technology" by Prof. D.P. Mishra Department of Aerospace Engineering, IIT Kanpur
	Useful Links	
	1	https://archive.nptel.ac.in/courses/101/104/101104065/

CO-PO Mapping

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

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 Tests, assignments, oral, seminar etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 30 - 40% weightage on modules 1 to 3 and 60 - 70% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

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AY 2026-27

Course Information

Programme	B. Tech. Electrical Engineering (Working Professional)
Class, Semester	Second Year B. Tech., Sem IV
Course Code	W7VSEL271
Course Name	Advance Simulation Lab
Desired Requisites:	NIL

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

Course Objectives

1	This course intends to provide advance knowledge of MATLAB, PSIM and ETAP software for developing modelling and programming techniques.
2	It intends to impart skills to implement different tool boxes of MATLAB Simulink, PSIM and ETAP for electrical engineering application
3	To solve complex electrical engineering problems with different tool boxes of MATLAB Simulink, PSIM and ETAP for electrical engineering application.
4	To design complex electrical systems with MATLAB Simulink, PSIM and ETAP software's.

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	Grasp the aspects of MATLAB simulation, PSIM, ETAP and OPALRT simulation tools.	II	Understanding
CO2	Solve complex mathematical equations using MATLAB.	III	Applying
CO3	Construct MATLAB, PSIM, ETAP and OPAL-RT software-based projects.	IV	Analysing
CO4	Design complex electrical systems using MATLAB, PSIM, ETAP and OPAL-RT.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Modelling of complex electrical systems with MATLAB.
2. Modelling and analysis of power systems with MATLAB.
3. Study of fault analysis using MATLAB.
4. Study of built-in library examples of electrical engineering with ETAP.
5. Modelling of electrical systems with ETAP and simulation tools.
6. Modelling and analysis of power systems with ETAP.
7. Modelling and simulation of power flow diagram in ETAP.
8. Study of interface and built-in library of PSIM.
9. Modelling of electrical systems with PSIM.
10. Introduction to OPAL-RT (real time digital simulator).
11. Modelling of electrical systems with MATLAB and OPAL-RT (software in loop).

Textbooks

1	"Modelling and simulation using MATLAB Simulink", Wiley Publication, Dr. Shailendra Jain ,Reprint :2013

References	
1	“Matlab programming for Engineers”, Stephen Chapman, Thomson Learning publication, 3rd Edition.
2	“Power System Transient Analysis”, Theory and Practice using simulation programs, Power System, Eiichi Haginomori Junichi Arai, WILEY Publication.
3	User manual of ETAP, PSIM and OPAL-RT.
Useful Links	
1	MATLAB Programming for Numerical Computation: https://nptel.ac.in/courses/103106118

CO-PO Mapping													
	Programme Outcomes (PO)											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	2				1								
CO2	1	2											
CO3			3		2								2
CO4	3	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.(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. S. S. Medhekar
Syllabus Checked By	Dr. R. P. Hasabe